

Frans van Mieris's Painting Technique as One of the Possible Sources for Willem Beurs's Treatise on Painting

Carol Pottasch,
Senior conservator, Mauritshuis
The Hague, The Netherlands

Abstract

The seventeenth-century artist Frans van Mieris was masterful in the realistic rendering of different materials, like satin, velvet, fur and metal. His work could well have been the source for the slightly younger Willem Beurs's 1692 treatise on painting. This paper will show how acute Van Mieris observations were in depicting these materials, and the role that reflections play in our perception of their realism.

1. Introduction

Frans van Mieris (Leiden, 1635–1681) was one of the most famous '*fijnschilders*', i.e., 'fine painters', of the seventeenth century. He is best known for the remarkable painting techniques he used to achieve the perfect rendering of materials. Contemporary sources explicitly mention the outstanding way Van Mieris could depict (white) satin, velvet, fur and silverware (De Bie, 1662, pp. 404–405; Houbraken, 1721, pp. 2–6). Four paintings in the Mauritshuis collection show fine examples of his skill: *The Oyster Meal* (1661, Fig. 1), *Man and Woman with Two Dogs*, 1660, Fig. 2), *Boy Blowing Bubbles* (1663, Fig. 3), and *Brothel Scene* (c. 1658/9, Fig. 4). These paintings were investigated in the conservation department of the Mauritshuis under the binocular microscope. In some cases, micro-samples were taken and mounted as cross-sections; in other cases, handheld X-ray fluorescence (HH-XRF) was used to identify the elements in the pigments.

This paper describes the effects that Van Mieris was striving for, and how he applied paint layers to depict various materials. We have no documentary evidence about Van Mieris's painting technique; however, other seventeenth-century text sources provide us with useful information. Remarkably, Van Mieris's paintings show a strong resemblance to the prescriptions for painting different materials in the 1692 treatise *De Grootte Waereld in 't Kleen* by Willem Beurs. Beurs described the various mixtures necessary to render all sorts of materials: from peaches to insects, copper, silver, glass, red and yellow flowers, or snow. To paint these objects, he indicated the pigment mixtures artists should use for the monochrome undermodelling (dead colouring), the shadows, and the 'day' i.e. the side of the object that catches the light. Since Beurs's treatise was written after Van Mieris's death, Van Mieris might have been the source for Beurs's descriptions.

2. Observations on Material Properties

In the seventeenth century, the need to observe the characteristic properties of different textile materials was recognised. In fact, it was listed as one of the essential requirements of a painter that: "*he make a proper distinction between silk, velvet, wool and linen stuffs, for very rarely does one see velvet attire that appears to have the sheen of velvet, nor do they observe the creases and folds, nor take*

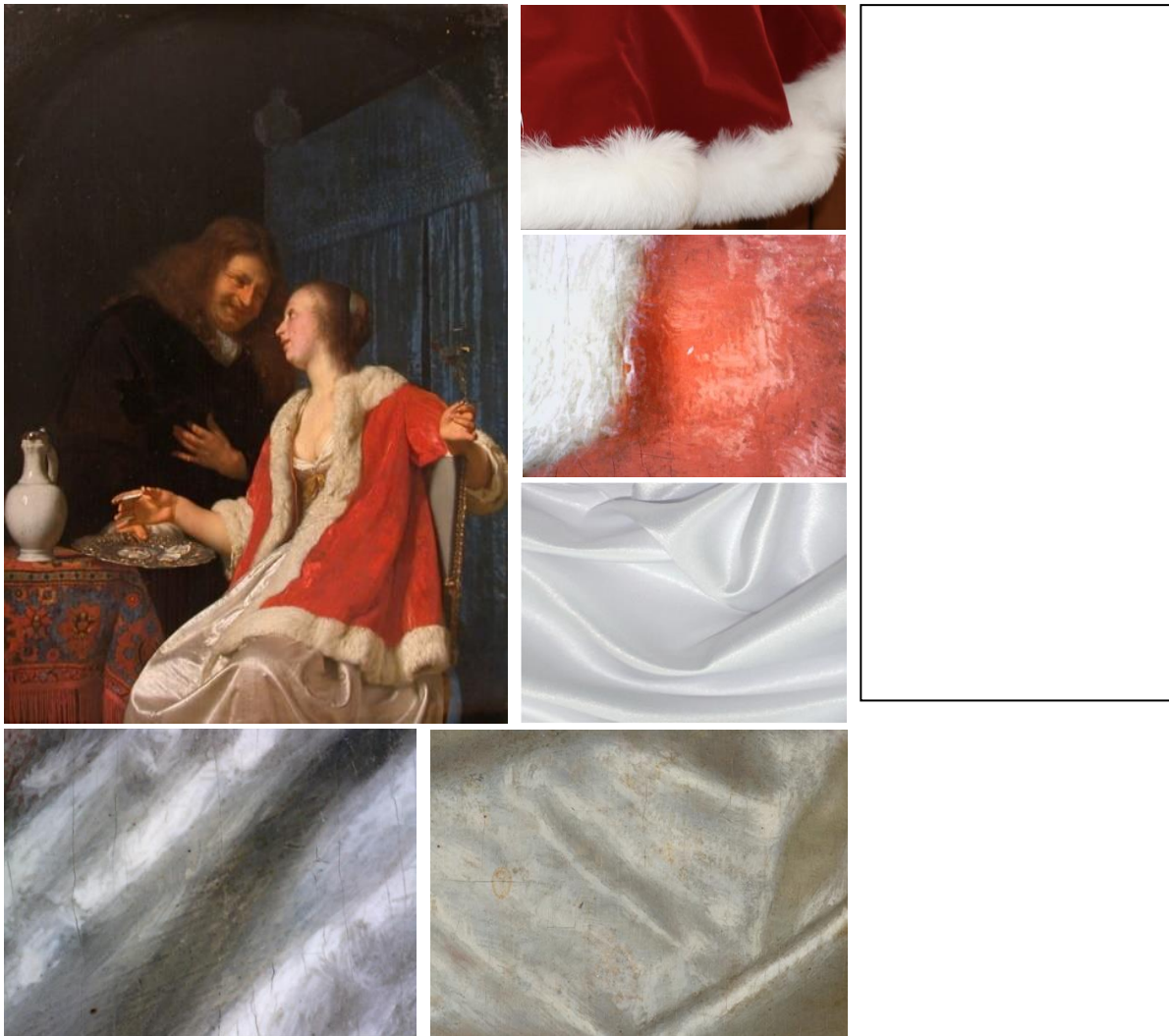


Figure I. Clockwise: (A) Frans van Mieris, *The Oyster Meal*, 1661, 27 × 20 cm, signature and date: bottom right. Mauritshuis, The Hague (photo Margareta Svensson). (B) Real velvet (Internet). (C) Detail of velvet, image taken with Zeiss microscope at 20× magnification. (D) Detail of real satin. (Internet) (E) Detail of satin dress. The blue arrow is a large particle of ultramarine. In the half tones on the right a mixture of black and ochre is visible. Image taken with Zeiss microscope at 8× magnification. (F) Detail of satin dress. The highlight has a cool ultramarine glaze. Image taken with a Zeiss microscope at 20× magnification.

note of the difference between woollen and linen stuffs, nor the gloss that is found more in satin than in silk from Tours, and they also miss the thinness that should be imitated in fine linen and thin crepe” (Angel, 1642, p. 55 [Hoyle and Miedema, 1996, p. 248]).

2.1. Satin

Satin draperies — with their multitudes of lights and shadows, differences in texture, shimmering colours and shiny surfaces — force painters to use all their abilities in rendering direct and indirect light, and all possible half-tones. Because the surface of silk fibres is so smooth, it tends to reflect rather than scatter the light that falls on it. In other words: silk satin tends to display rather more specular reflection than diffuse reflection. In specular reflections, the light from the source is fully directed from the surface of the object to the eye. Reflected light, therefore, displays much stronger contrasts than diffuse lights.

In perfectly specular reflective surfaces — such as a flat mirror, metal plate, or the still water of a lake — almost all the incident light is reflected, and it does so at the same angle. Specular reflection therefore occurs when the surface normal of the object is precisely halfway between the direction of incident light and that of the viewer. This half-angle direction bisects the angle between the two directions of light. The angle of reflected light is the same as the angle of incident light. In the case of a flat object like a mirror, there is usually only one half-angle, and things are simple.

A satin textile of course behaves differently. It is never perfectly flat, but has curves, folds, and pleats. Therefore, the angles at which the incident light hits the surface are constantly different, which also makes the reflected light quite variable. Light falling on vertical and horizontal threads is reflected differently and so, as the fabric moves and light strikes it at different angles, it seems to shimmer (Fig. 1C). One common method to evoke this effect in paintings is to increase the contrast between the strongest highlight and the mid-tone.

In his 1692 handbook, Willem Beurs gave advice for depicting reflections. On the painting of the white of snow, he wrote that: “*to paint its proper day* [part that faces the light], *white and black are mixed as required: and if it would appear too blue, some red lake should be mixed in. The shadow demands some carbon black and a bit of white and light ochre mixed in a gradient scale of each [pigment], according to the demands of nature. Such would also be good for the reflections if more white and light ochre is added*” (Beurs, 1692) (see Note 1).

For painting white satin, Beurs prescribed the same mixtures as for snow; however, he specified that it should be painted with more shine: “*the mixture that is required to paint white satin closely resembles the mixture used to paint snow, but it has slightly more sheen, so that its white must be found in schilpwit* [flake white] (Note 2). *And it must be painted purely, and particularly quite warm in the sunlight. To render the tenderness of the side* [of the satin drapery] *that catches the light with the black and white, some ultramarine or smalt is used. The shadow must be glowing and mixed with black and slightly lighter ochre than you would use to paint snow. Make the reflection a bit lighter than the shadow with some white, black, light ochre and a little bit of vermilion*” (Beurs, 1692) (Note 3).

Examination of the satin drapery in *The Oyster Meal* (Fig. 1; Note 4) shows that Van Mieris applied these pigments in similar combinations and layers to those described by Beurs. Van Mieris used a systematic, additive, method: working from a flat dead coloured mid-tone, using darker tones for the shadow areas, and completing it with touches of bright lead white and probably the expensive ultramarine for the highlights (Figs. 1E, F; Note 5). He also used strong contrasts to emphasise the specular reflective properties of silk satin. But simply painting sharp contrasts with few smooth gradients between dark and light reflective surfaces was not enough to make it appear real: Van Mieris also paid attention to the ‘blur’ of the specular highlight.

Satin has a much more loosely bound weave than tabby or twill. The weft thread passes under one warp thread, over four or more, under one and so on.

This produces a weave in which the face shows virtually only the weft and the reverse is nearly all warps, so the face surface of the texture can be very smooth, especially if the wefts are silk. The warp threads may also be silk, but more often of cotton, both for strength and economy. Because each reflective silk weft thread passes over several white light-scattering linen warp threads, the surface is not perfectly smooth. The satin’s surface is composed of a multitude of tiny surfaces, each of which would act as individual specular reflector. These tiny silk surfaces, interrupted by nonreflective linen surfaces, represent small reflective surfaces, tiny ‘micro-mirrors’, aligned in one prominent direction (Heidrich and Seidel, 1998). These small features all have individual normals that are distributed about the general normal of the approximating smooth surface of the satin: A perfectly flat, specular reflective surface like a mirror would show a specular highlight as a sharp reflected image of the light source. In contrast, because of its weave, satin has not one continuous surface, but instead a multitude of micro-mirrors aligned in slightly different orientations. Therefore, it shows rather blurred specular highlights.

The degree to which these individual normals differ from a smooth general surface normal is determined by the roughness of the surface. At points on the object — for instance a satin drapery — where the smooth normal is close to the half-angle direction, many of these micro-mirrors are directed

towards the half-angle direction. Their specular highlight is bright. If the centre of the highlight moves away, the smooth normal and the half-angle direction get farther apart. This means that the number of ‘micro-mirrors’ — the shiny parallel fibres — decreases, and so does the intensity of the highlight.

These blurred specular highlights on satin appear where folds, dents and creases are the correct half-angles between viewer and light source. In Van Mieris’s paintings, the strongest highlights of the satin are connected as lines on the tops of the folds (Figs. 1D–F). In the *Brothel Scene* the woman wears a shiny



Figure 2. (A) Frans van Mieris, *Man and Woman with Two Dogs*, 1660, panel, 27,5 × 20 cm, Mauritshuis, The Hague (photo Margareta Svensson). (B) Real velvet, thinner kind. (C) Detail of fur and velvet (photo Margareta Svensson). Ca. 5× magnification. (D) Detail of velvet highlights on sleeve. Image taken with Zeiss microscope at 20× magnification.

bodice in which the strong highlight on the tops of the fold identify it as satin (Fig. 4B). Van Mieris rendered the depths of the pleats and areas that deviate from those angles as steely grey tones. This shows quite nicely in *The Oyster Meal*, where the satin drapery folds over her upper legs in roundish curves and is pushed forward by her proper left knee into a triangle of folds. This emphasis on almost ‘tubular’ curves of highlights on satin seems idiosyncratic to Van Mieris’s approach and can be found in many of his paintings (Note 6).

2.2. Velvet

The painting of velvet, such as the red jacket in *The Oyster Meal*, posed different demands than the depiction of satin. In satin, the basic optical feature is reflection, whereas in velvet, it is the scattering of light. Furthermore, it is usually the weft that determines the optical characteristics in satin; in velvet, it is the material of the warp.

Velvet is woven in a sophisticated and idiosyncratic manner. During the weaving process, two layers of fabric are woven together at the same time: one on top of the other, the two are joined together using a second warp thread. Afterwards, when the pile is cut to separate the two layers, the cut warp threads

protrude vertically from the fabric. In velvet, therefore, there are two types of warp threads: the pile warps that are cut to provide the tufted pile surface, and the cloth warps to provide integrity and strength to the whole structure. Cloth warps and wefts hold it all together.

The result is a fabric with threads that protrude vertically from the structure: the tufted soft pile effect that is typical of velvet. These standing soft fibres makes the velvet very soft to the touch, and just a gentle stroke of a hand may change the orientation of the fibres. The direction of the hairs can easily be felt by running the hand length-ways over the right side of the fabric. The hairs lie smooth and flat with the nap, and feel slightly rough against the nap. This difference in orientation changes the way the fabric reflects light. It gives different colour shades from different angles. If the tufts are flattened away from the viewer, the colour looks shinier and deeper, if the nap turns towards the viewer, the light from the tufted ends is scattered and results in a lighter and more matte colour. This feature is particularly evident in areas of sharp convex folds where the pile opens up to expose more of the tufted ends, so that they appear as lighter soft scattering ridges. The appearance of velvet changes as it drapes and folds and the light scatters off the various angles (Fig. 1B).

In paintings by Van Mieris, this light scattering can be perceived in the red velvet jackets worn by the women in *The Oyster Meal* and *Man and Woman with Two Dogs* (Figs. 1C and 2C) (Note 7). It is even more evident in the fluffy velvet bonnet on the windowsill of *Boy Blowing Bubbles* (Fig. 3B and C) (Note 8).

Willem Beurs described the colours and combinations of pigments that should be used to paint “*red velvet like peonies: Painting vermilion in the sunlight, and mixing with it a little black, so that you can make its ‘own day’ or, middle tone. Just as black and brown, red for the shadows, and slightly more brownish red to black is used for the reflections. If it is dry they [the velvets] desire the same glazing and glosses as the ranunculi’s. [Just as with the ranunculi’s] ‘if they are dry they are overpainted very thinly, or glazed with just a little Florentine lake, to lower the contrast between the strongest highlights and deepest colours. And make a thin scumble with a little bit of high-quality lead white over the highlights’*” (Beurs, 1692) (Note 9). This description indicates that, contrary to the sharp contrasts of satin, the contrasts in velvet should be softened. In Beurs’s approach, this was accomplished by optically fusing lights and shadows through the application of a red lake glaze. Also decreasing the colour contrasts helped. He advised not to use the bright and powerful vermilion alone, but to tone it down with browns and blacks.

The approach seems to have been generally accepted. We find a slightly similar, but simplified, description in the De Mayerne manuscript, 1620–1646: “*Red velvet; red lake with copperas. Shade with the same colour and a bit of lamp black. On the day a few touches of vermilion. To make a nice carmine velvet you should use a very good red lake with a little bit of vermilion and touch it up on the day with vermilion to which you can add a little red lead for drying’*” (Van der Graaf, 1958) (Note 10).

This is consistent with the findings from HH-XRF analyses of the Van Mieris paintings in the Mauritshuis (Note 11). The red velvet coat of the young woman in *The Oyster Meal* was painted in an opaque layer of vermilion. Mid-tones were achieved by mixing in some bone black, while the shadows were probably rendered with a little umber and probably also some bone black. The mid-tones and shadows were probably glazed with a — now rather faded — red carmine lake (Note 12). Lead white was added sparingly for the reflection of the fur, as were the orangey touches.

A similar approach can be found in the visual centrepiece of *Man and Woman with Two Dogs*: the beautiful red velvet coat of the lady. With minute brushstrokes, Van Mieris breathed life into the fabric. For the highlights and to suggest the reflection of the fur, he stippled an abundance of not only fine white lines, but also yellowish strokes. The sleeve still appears red, but examination through the microscope and HH-XRF analyses indicated that here too the red glaze, the potassium-rich cochineal lake has faded.

The velvet cap on the windowsill of *Boy Blowing Bubbles* (Fig. 3A, B) was meant to be even darker than the coat in *Man and Woman with Two Dogs*. Originally the cap might have had a burgundy colour, as it contains more black pigment. In terms of paint application, however, it is painted in a similar way. The crisp lead white touches are indications of light reflections. In the areas of the boy’s cap where the pile opens at the folds exposing more of the tufted ends (Fig. 3C), the scattering of light is indicated by

subtle touches of lead white (Note 13). Again, Van Mieris's practice is consistent with the description by Beurs.

2.3. White Fur

The red jackets in *The Oyster Meal* and *Man and Woman with Two Dogs* (Figs 1 and 2) both have a white fur lining, which appears as a fuzzy, diffuse reflecting fringe around the neck, cuffs and border. While the white fur must have had a functional purpose, it was also a display of luxury, and gave the artist an extra motivation to depict a challenging surface structure.

The hairs of the fur usually protrude out of the animal skin at a specific angle. This causes the fine, long hairs to fall to one direction, leaving hardly any gaps between the hairs. The thickness and density of the fur produce an irregular surface that causes diffuse reflections. The reflection of fur is, on the one hand, very similar to that of velvet, as it makes little difference whether the light scatters from the tops of the silk tufts or from the tops of hairs. This is where the strongest, specular, reflections occur, while the deepest shadows occur in folds or bends. On the other hand, fur is also like satin, as the hairs can be compared to the parallel threads of silk. The predominantly diffuse reflection of the white light that scatters from the fur lining is evoked by very low contrasts. Therefore, fewer and softer shadows arise.



Figure 3. (A) Boy Blowing Bubbles, 1663, 25,5 × 19 cm. Mauritshuis, The Hague (photo Margareta Svensson). (B) Detail of hat on windowsill. (C) Real velvet (photo A. Wallert).

Van Mieris characterises the fur lining using soft touches of white paint. The fine hairs are mostly out of focus, but some individual hairs can be recognised, especially along the contours. He started to paint by applying a dark underlayer. On top of this, he meticulously painted the separate hairs using a warm colour consisting of lead white and yellow earth pigment. The separate hairs build up to thick tufts of fur. Sometimes, where the fur folds, or where tufts of hair are divided, the dark underlayer shimmers through as a shadow. In the next stage, Van Mieris applied deeper shadows with scumbles of black to provide extra modelling. In light areas, he painted hairs with a slightly warmer tone, with more yellow earth. Finally, the pure white highlights were applied. This is very much the way Beurs advised painters to depict blond hair (Note 14).

2.4. Metal

Van Mieris was not only a master in rendering soft materials. The pewter jug held by the woman in the *Brothel Scene* (Fig. 4B, C) shows that he also studied the reflections on metal carefully. If the metal has a flat and smooth surface, it will — as previously mentioned — reflect most of the incident light, but the pewter jug also has cylindrical and round forms.

Discussing reflections on metals Beurs wrote: “if one adds a bit of red lake and ochre under the white and black you can paint all the household goods, . . . , from the right angle and light, following the reflections of the light, following the mathematics, that so few painters do, but they can learn to

understand so much, that they will not make noticeable mistakes” (Note 15). He added later: ‘the reflections of light curves on concave surfaces was used, . . . But it is not necessary to research this as Christiaan Huygens already did.’ The angle of the incident light changes as it hits each differently formed surface. Furthermore, the fact that an object like a jug has an overall cylindrical form means that it can reflect the light from different angles around the object. It will not only reflect light directly from the light source, but also light that has been reflected from other surfaces. Due to its smooth surface, the metal will act as a mirror-like surface and will not only reflect its own colour and the colour of the light, but will also reflect the surrounding colour(s).



Figure 4. (A) Frans van Mieris, *Brothel Scene*, c. 1658, 42,8 × 33,3 cm, Mauritshuis, The Hague (photo Margareta Svensson). (B) Detail of nozzle of jug showing specular reflections. (C) Detail showing fingers and jug.

Van Mieris’s pewter jug in the *Brothel Scene* was painted in accordance with Willem Beurs’s description. The white daylight coming from the window shows the dominant specular reflectance (Fig. 4B). The dimmer reflections show the blues and reds that the viewer sees in the interior. Van Mieris draws our attention to the fingers of the woman by painting their reflection in the jug, thus adding to the realism of the object (Fig. 4C). Examination of the painting under the microscope shows that he mixed white, black and yellow earth pigments to create the colour of the pewter. Instead of a bright white reflection, he dabbed yellow earth pigment on the surface to suggest slightly dimmer reflections. Other dabs of colour reflect the skirt and the soldier’s cloak.

3. Discussion

During their training, painters were taught about the properties of pigments and paints, and the prescribed sequences of their application. When depicting fabrics, they either painted them from life, or by using prescribed formulas (Vandivere and Clarke, 2011). In the fifteenth century, there was a real turning point around 1430 when painters like Jan van Eyck and the Flemish Primitives adapted the earlier 'schematic' painting systems to represent and differentiate individual fabric textures, like velvet, wool and silk. The realistic effect was not only the result of material innovation — exploiting the visual and handling properties of oil paint — but also of careful observation. The concept of painting after life was not new, but it seems that not all artists followed this advice. Leonardo da Vinci observed that the decline of art from classic to Romanesque art could only be stopped by looking at natural objects (Stumpel, 1993). All of the 17th-century authors of painting treatises mentioned in this paper state that, to depict satin correctly, it must be painted from life, or true to nature (*naar de natuer*). Beurs (1692) urges to paint “when it is life in front of you” (p. 39). Slightly later, De Lairese wrote: “But here I must warn many painters on the nature of fabrics, particularly the coloured ones. They believe that they can paint satin after white silk cloth [...]: but this is very wrong, because what is found on plain silk will appear very dark in satin. It should therefore be observed from nature” (Note 16).

In his paintings, Frans van Mieris was unsurpassed in faithfully depicting the true optical characteristics of the objects. Without very thoughtful and intelligent observation, the chances to achieve such a high level of pictorial quality would have been anywhere from difficult to hopeless. It took his combination of meticulous craftsmanship and his stunning ability for careful observation to make the depiction of realistic fabrics a success. In his 1662 overview of seventeenth-century artists, Cornelis de Bie considered Van Mieris to be one of the best painters of his time. It is no surprise that De Bie relates this to his painting from nature: “That hides nothing but the example that nature gives” (Note 17).

Rendering fabrics realistically was a preoccupation of many of the *fijnschilders* of the second half of the 17th century, and indeed there was a market for paintings painted from life (Van der Wetering, 1993). Genre painting was at its height when the young Willem Beurs started his training. Earlier studies showed that the *fijnschilders* influenced each other in composition, subject and technique, and borrowed each other's inventions (Gifford and Glinsman, 2017, pp. 78–80, 83). Van Mieris's work must have set an example for him and for many other young artists, like Beurs and his contemporary Houbraken; both were pupils of Willem van Drillenburgh in Dordrecht at the same time. There is no evidence that Beurs and Van Mieris actually met. However, Houbraken describes and praises Van Mieris's work, and recorded that he received very high prices for his work (Houbraken, 1721, p. 6). It seems very likely that if Houbraken had seen Van Mieris's work, Willem Beurs would have had first-hand knowledge of it too. Beurs was the first to describe the techniques and the importance of a profound understanding of the characteristics of materials that had been used to make successful paintings a generation earlier.

4. Conclusion

These examples of details from paintings in the Mauritshius collection suggests that Frans van Mieris carefully observed the precious materials he painted in his *genre* scenes. The way he painted the various fabrics make them easily recognisable: for instance, as velvet, satin or metal. A profound understanding of various types of reflections is underlies his ability to render the materials with their own characteristics.

The way Van Mieris depicted reflections was fundamental in differentiating different materials. *The Oyster Meal* (Fig. 1) reveals that generally, the smoother the material, the more complete and stronger the reflections (Wallert, 2004, pp. 31–41). Van Mieris depicted the diffuse reflections in the fur lining of the lady's coat with soft touches of white paint. This differentiates it from the slightly smoother vermilion touches on the red velvet in the rest of the jacket. The slick light touches on her satin dress evoke the specular reflections, and show more contrast. The abrupt dots have an even larger contrast within the metal dish for the oysters. It is through the differences in the intensity of the reflections that the characteristics of the materials are expressed.

The fact that Van Mieris was praised by his contemporaries for his masterful rendering of fabrics could have made him an example for Beurs. In turn, Beurs's treatise was an example for artists of the next generations: helping them to find the right painting materials and application methods for rendering specific materials.

Acknowledgements

I would like to thank Arie Wallert for his extensive and contextual help and advice, and Abbie Vandivere for her help and advice on the text. Ralph Haswell, Shell Technology Centre Amsterdam, for SEM-EDX-analyses of paint cross-sections and Melanie Gifford and Lisha Deming Glinsman, National Gallery Washington, for making available their HH-XRF analyses.

Notes

1. W. Beurs (1692), p. 30: “(*Sneeuw*) *Om die in zijn eigen dag te schilderen mengeltmen wit en koolswart na behooren: zoo ‘t wat te blaauw viel, doet er wat lak onder. De schaduwe wil koolswart en een weynig wit en ligter oker hebben tot zoo een trap van yeder, als ‘t leven gebieden zal. ‘t Zelve is voor de weersteutinge goed, als er wat meer wit en ligten oker by is.*” On the Beurs treatise, see also: M. van Eikema-Hommes et al. (1999), note 14, pp. 32–36.
2. On p. 8, Beurs (1692) describes schulpwit as a high quality white pigment, which he thinks is made by grinding shells: “*Onder de Stoffen van wit te voren genoemt, is het Schulpwit het beste [...] Daar toe dan kiestmen uit de dikste Schulpen, als de beste, die men in zeer schoon en helder water vrijft.*” However, it is unlikely that shells were used as a white pigment. Nowadays ‘schulpwit’ is generally thought to be a high quality, pure lead white. See: Van de Graaf (1958), pp. 33–35, and Noble et al. (2002), pp. 48–49.
3. W. Beurs (1692), p. 31: “*..., ‘t zelve mengsel met de satynen vereischende: zy heeft met de sneeuw groote gemeenschap, dogz’ heeft wat meer glans, zoo dat haar wit, door schilp wit moet gevonden worden, en ze zuiver moet geschildert zijn, en gans warm in’t sonneligt, daar en boven; om de teederheid van zijn dag uittedrukken neemtmen tusschen ‘t swart en wit wat ultramarijn of smalt. De schaduwe moet gloeyend zijn en getempert worden met swart en wat meer ligten oker als de sneeuw, en men maakt de weersteutinge wat ligter als de schaduwe door wat wit, swart, ligten oker en een weynig vermilioen.*”
4. Frans van Mieris the Elder, *The Oyster Meal*, oil on panel 27.6 × 20.8 cm, signed and dated: F. van Mieris fecit / Leyd. Bat. / Ao 1661, Mauritshuis inv. no. 819.

5. The ultramarine was tentatively identified through visual observation through the microscope (Gifford and Deming Glinsman, 2012, p. 80).
6. A very fine example can, for instance, be found in the swirling curves in the soft silk sleeves of Frans van Mieris' *Woman writing a Letter* in the Rijksmuseum, (RMA inv. SK-A 261).
7. Frans van Mieris the Elder, *Man and Woman with Two Dogs*, oil on panel 22.7 × 19.9 cm, signed and dated: Fv Mieris Ao 1660, Mauritshuis inv. no. I08
8. Frans van Mieris the Elder, *A Boy Blowing Bubbles*, oil on panel 25.2 × 18.3 cm, signed and dated: MDCLXIII / F. van Mieris fecit. Lugd. Bat., Mauritshuis inv. no. I06
9. W. Beurs (1692), p. 38 "*Rood fluweel als peonien: Vermilioen in 't zonnelyt schilderen, en daar by een weinig swart mengende, den eigenen dag of tusschen koleur kunnen maken; gelijk er swart en bruin, rood tot de schaduwe en wat meer bruinroodals swart tot de weersteutinge gebruikt werd. Droog zijnde begeerenze dezelve laxeringen en opglansinge van de ranunculin [net als ranonkels alsze. . . droog zijn laxeert of overstrijkt menze om de kragt der hoogsels en diesels wat te verflaauwen dun met enkel florentijns lak en glantze op de hoogsels met een weynig dun schulpwit]*".
10. De Mayerne, T. T. (1620–1646). *Pictoria Sculptoria et quae subalternarum artium*: "*Velours rouge. Lacque avec couperose. Enfoncés avec la mesme couler et un peu de noir de lampe. Sur le jour du vermillon seul par traits. Pour faire un beau velours ceramoisy fault prendre de la Lacque tresbonne avexc un peu de vermillon, et toucher sur le jour avec vermillon et tant soit peu de mine pour seicher*"(Van der Graaf, 1958, p. 154, no. 34b).
11. Unless otherwise noted, pigment compositions were inferred by examination of the paint surface at magnifications up to 50× by the author and from elemental data obtained by X-ray fluorescence spectroscopy (XRF) by M. Gifford and L. Deming Glinsman in 2015. Bruker Tracer III-SD handheld XRF equipped with a rhodium anode target X-ray tube and silicon drift detector. When analysis was optimized for detection of heavy elements, a titanium–aluminium excitation beam filter was used with operating parameters of 40kV X-ray tube accelerating voltage, 11 μA X-ray tube current, and accumulation lifetime of 100 s. To enhance the detection of light elements (aluminium, silicon, phosphorus) the filter was removed (operating parameters were 15kV, 25 μA, 200 s).
12. The tentative identification of the dyestuff as cochineal was based on the presence of aluminium and high potassium levels in the HH-XRF spectra. See: Gifford and L. Deming Glinsman (2017), pp. 68 and notes 12 and 13 p. 281.

13. In the highlights for the beautiful red velvet coat of the lady in the *Man and Woman with Two Dogs*, Van Mieris also added some lead tin yellow for a warmer and richer appearance.
14. W. Beurs (1692), p. 113: “*Blond hair is started with white, umber, light ochre and a bit of black, and you can build-up those colours as needed.*”
15. W. Beurs (1692), p. 117: “*wanneer men onder het wit en swart een weinig lak en oker doen wilt; dan kanmen loot voortbrengen, en een gantschen huisraad ... op 't regte oogpunt en dag gestelt zijnde; of na de wetten van de weersteutingen van 't light, volgens de wiskonst, daarmen den Schilderen beswaarlijk aankrijgt: maar zy konnen light 'er zoo veel van leeren verstaan, datze geen merkelijke fouten en begaan, en haar werk genoegzaam verdedigen konnen.*”
16. G. De Lairese (1707), p. 216: “*Maar hier moet ik een waarschouwing doen aan veele Schilders omtrent de natuur der stoffen, en byzonder der gekoleurde. Zy gelooven na witte zyde lappen zatynen te zullen konnen maaken; en na gekoleurde zyde, wederschyn: doch dit gaat zeer mank: want het geen in effene zyde ligt op den dag zal zyn, zult gy dikwils in zatyne heel bruin vinden. Derhalven moet dit in de natuur waargenomen worden.*”
17. C. de Bie (1662), p. 404: “*Waer in niet anders schuyt als t'voorbeeldt van Natuer*”.

References

- Angel, P. (1642). *Lof der Schilder-Konst*, Willem Christiaens, Leiden [The Netherlands] [translation: M. Hoyle and H. Miedema (1996), 'Philips Angel, Praise of Painting', *Simiolus*, 24, 227–258].
- Beurs, W. (1692). *De Grootte Waereld in 't Klein Geschildert, of Schilderagtig Tafereel van 'Weerelds Schilderyen. Kortelyk Vervat in Ses Boeken. Verklarende de Hoofverwen, haare Verscheide Mengelingen in Oly en der zelve Gebruik*. Johannes en Gillis Janssonius van Waesberge, Amsterdam [The Netherlands].
- De Bie, C. (1662). *Het Gulden Cabinet van de Edele Vry Schilder-Const, deel 2*. Juliaen van Montfort, Antwerpen [Belgium].
- De Lairese, G. (1707). *Groot Schilderboek, Vierde Deel*. Willem de Coup, Amsterdam [The Netherlands].
- Gifford, E. M. and Deming Glinsman, L., (2012), The making of a luxury image: van Aelst's painting materials and artistic techniques, in: *Elegance and Refinement: The Still-Life Paintings of Willem van Aelst* (Exhibition Catalogue), T. Paul, A. K. Wheelock, Jr., J. Clifton, Di Filippo, J., Roth Bucci, J. (Eds), pp. 67–89. Skira Rizzoli, New York, NY, USA.
- Gifford, E. M. and Deming Glinsman, L. D. (2017). The collective style and personal manner, in: *Vermeer and the Masters of Genre Painting* (Exhibition Catalogue), A. E. Waiboer, A. K. Wheelock Jr., B. Ducos, P. Bakker, P. Buvelot (Eds), pp. 65–83. Yale University Press, New Haven, CT, USA.

- Heidrich, W. and Seidel, H.-P. (1998). Efficient rendering of anisotropic surfaces using computer graphics hardware, in: *Image and Multi-dimensional Digital Signal Processing Workshop '98 (IMDSP)*, Erlangen, Germany, pp. 315–318. Available at: <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.45.4462>.
- Houbraken, A. (1721). *De Grootte Schouburgh der Nederlantsche Konstschilders en Schilderessen*, Vol III, 's Gravenhage [The Netherlands] [Editio AQ3 n 1976].
- Noble, P., Boon, J. J. and Wadum, J. (2002). Dissolution, aggregation and protusion – lead soap formation in 17th century grounds and paint layers, in: *ArtMatters - Netherlands Technical Studies in Art*, Vol. I, E. Hermens (Ed.), pp. 46 –61, Waanders Publishers, Zwolle, The Netherlands.
- Stumpel, J. (1993). De bolle knieën van Naldini, in: *Kunstschrift*, 37(6), 8–19.
- Van de Graaf, J. A. (1958). *Het Mayerne Manuscript als Bron voor de Schildertechniek van de Barok*. Verweij, Mijndrecht, The Netherlands.
- Van der Wetering, E. (1993). Het satijn van Gerard Ter Borch, *Kunstschrift*, 37(6), 28–37.
- Vandivere, A. and Clarke, M. (2011). *Purpura and proto-changeant*: the earliest representations of shot-silk fabrics, in: ICOM-CC, Lisbon, Portugal. Available at: <https://www.icom-cc-publications-online.org/publicationDetail.aspx?cid=8ec33bb5-6098-4839-820f-2e2e9d6ca4ee>.
- van Eikema-Hommes, M., de Bruijn, J. and Hermens, E. (1999). *Still Lives: Techniques and Style: an Examination of Paintings from the Rijksmuseum*, Rijksmuseum, Amsterdam and Waanders, Zwolle, The Netherlands.
- Wallert, A. (2004), The miracle of Gerard ter Borch's satin, in: A. K. Wheelock (Ed.), *Gerard ter Borch*, pp. 31–42. National Gallery of Art Washington, DC, USA.