JAN
Dy
Oil
36

The impact of oil: 16th Century Netherlandish responses to Italian challenges

• ARIE WALLERT •

Detail of Fig. 1
JAN VAN SCOREL,
Dying Cleopatra.
Oil on panel,
36 x 61 cm.

Around the middle of the 15th century Northern methods of oil painting had been adopted, adapted and expanded quite rapidly in Italy, especially in Venice.[1] During the 16th century Giorgione, Titian, Tintoretto and Veronese explored the possibilities of the new material and raised them to unprecedented levels of sophistication.

From that time on the situation reversed: Northern painters now went to Italy to learn the newest tricks of the trade, adapt their style to the newest fashion, read their *Gerusalemme Liberata*, *Metamorphoses*, and *Hypnerotomachia*, and learn about anatomy, chiaroscuro, classical antiquity, geometrical perspective and composition. They learned to become sophisticated and literate artists rather than humble craftsmen.

They also learned about a specific type of imagery that fits right into the Venetian idiom: elegant figures near antique ruins in classically inspired landscapes. The type of paintings that is usually described as 'Nymph' or 'Reclining Venus', more or less undressed voluptuous ladies, sensually lying about in lush landscapes. This pictorial innovation was pioneered by Giorgione around the 1510s and is related to the literature of Sannazaro's *Arcadia*, and Pietro Bembo's 1505 dialogue on love, *Gli Asolani*. The most prominent examples of this type of paintings can, of course, be found in Giorgione's extremely sensuous *Sleeping Venus* in the Gemäldegalerie in Dresden, or in Jacopo Palma's equally sumptuous *Nymph in a Landscape* of 1518, also in Dresden.[2] Furthermore, a rather early and possibly seminal example of this type of imagery may be found in a *Sleeping Nymph* in the *Hypnerotomachia Poliphili* from 1499.[3]

Already by the beginning of the 16th century, the theme of Venus was fused with the established nymph formula. In Venice, especially because of their enticing qualities, the themes of nymphs were conflated with those of Venus and Cleopatra in their most generative guises. Since Venus, Cleopatra and Nymphs are personifications of enticement and carnal love, they were favourite themes for ladies who practiced that on a professional level.[4] Some of these paintings are not only seductive but also remarkably portrait-like. And giving the impression that they portray individual ladies in their professional environment, some of these paintings may even have had a soliciting function.[5]

The Rijksmuseum has two paintings by Netherlandish Renaissance painters that seem to tie in quite early and quite nicely with this development. Both painters produced compositions

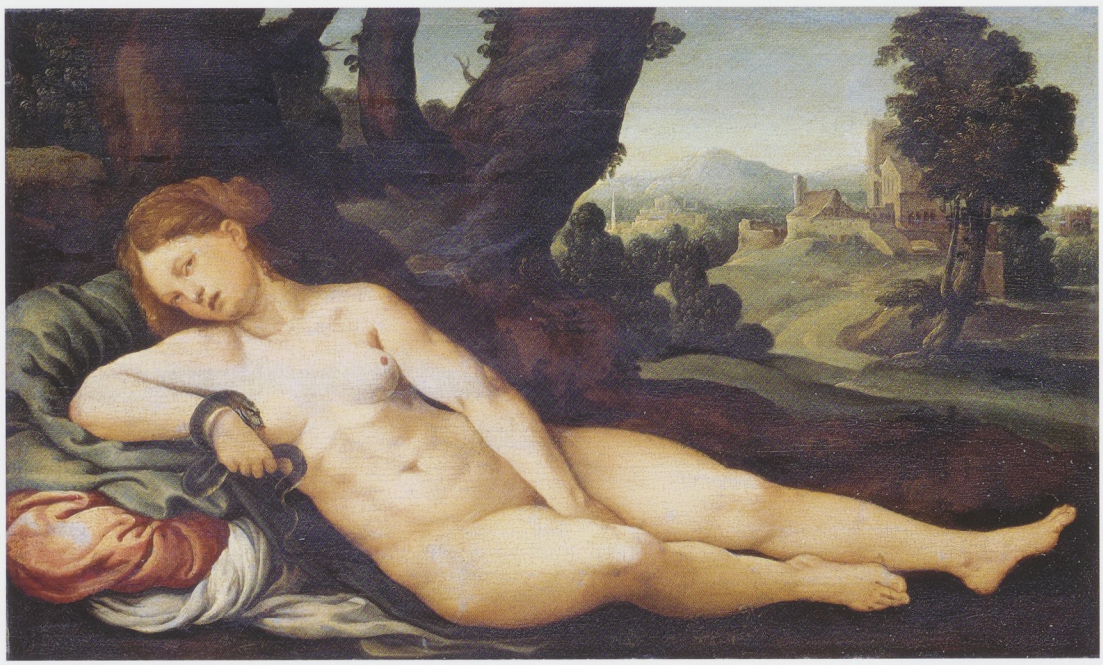

Fig. 1
JAN VAN SCOREL, *Dying Cleopatra*. Oil on panel, 36 x 61 cm. Rijksmuseum, Amsterdam (inv.no. SK-A-2843).

of overt eroticism depicting rather stylised bodies of female nudes with their gaze directly addressing the spectator. Both women are depicted in a similar pose and with rather explicit erotic implications by the placement of the woman's left hand on the groin.[6]

Both painters were inspired and challenged by the same developments in Italy, but each had a different response.

Cleopatra

Probably on his way back from Rome to Utrecht, Jan van Scorel must have painted his *Dying Cleopatra*.[7] A nude painted in the Venetian tradition (fig. 1). In the background is a succulent mountainous landscape with buildings in aerial perspective. In her right hand is the snake that she holds to her breast.

Scorel must have learned about this type of painting when he was in Venice in the early 1520s. Brown convincingly argued that Cleopatra's pose and the landscape are similar in several respects to Palma il Vecchio's *Nymph in a Landscape*, now in Dresden. Michiel (Anonimo Morelliano, 1888, 86 and 94) stated that in 1521 Jacopo Palma's painting was in the collection of Francesco Zio in Venice. Around that time Zio also bought a painting by Scorel.[8] It is generally assumed that Scorel must have seen Palma's painting on that occasion.[9] Both Scorel's *Dying Cleopatra* and Jacopo Palma's *Nymph in a Landscape* appear closely related to Domenico Campagnola's print of a *Nymph in a Landscape*. All these images are thought to ultimately derive from a now lost prototype by Giorgione.

Clearly, the type of the reclining Venus / Nymph / Cleopatra is specific to Venice, and Scorel could have taken the inspiration for his Cleopatra and this specific type of imagery only in Venice. Yet, however typically Venetian the subject may be, the painting itself was almost certainly not made in Venice. Scorel's *Dying Cleopatra* is usually dated around 1523-24, when he returned from Rome back the Netherlands. It is painted on beech wood

(*Fagus sp.*). This type of wood would be extremely exceptional for a panel in Italy, where poplar was almost exclusively used.[10] Beech wood is equally uncommon for the Netherlands, where almost all panels were made of oak (*Quercus spp.*) from the Baltic region. It was only in the Germanic countries, Austria, Swabia, Bavaria that panels of beech wood appear to occur with some frequency.[11] This supports the assumption that the painting could have been made during the trip between Venice and the Netherlands,[12] in the German or Austrian territories, possibly during a stop on the way back in Obervellach, where in 1519 he had made his famous altarpiece on his pilgrimage to Jerusalem.[13] Also the composition of the pigments seem to indicate that the painting was made after Scorel's departure from Italy. On the painting we found an azurite of fine quality for the pale hazy bluish vista in the distance and for the blue of the sky.[14] In Venice, any painter would certainly have used natural ultramarine for this passage. That, however, was a pigment that could hardly be found anywhere in the Germanic territories: *Ultra maryn plo. Wirdt für das aller kostlichest gschetzt, doch in hochtütschen landen wenig und selten gsehen.*[15]

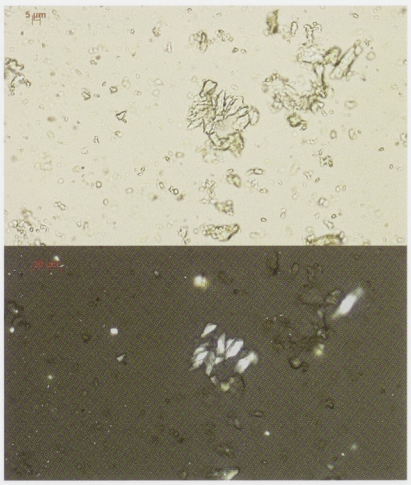

Fig. 2
Particles of the ground for the *Dying Cleopatra*.
a.: micrograph transmitted light, 500x;
b.: micrograph transmitted light, 500x, slightly crossed polars.

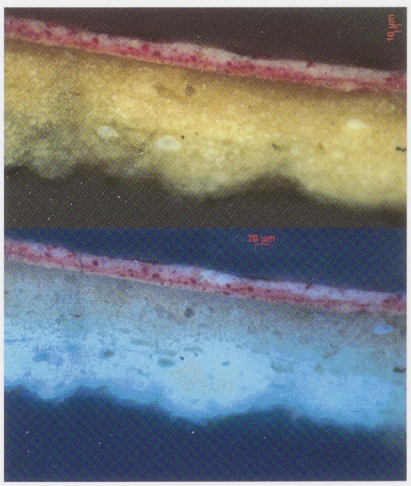

Fig. 3
Paint cross section (30/17) of paint for the red pillow on the *Dying Cleopatra*.
a.: bright field illumination, 200x;
b.: UV-fluorescence.

The painting was set-up on a conventional white ground. In paint cross sections, the ground material evidently contains fibrous, tabular and sometimes acicular splinters. This material was identified as calcium sulphate: gypsum (fig. 2) (table I).[16] These results would seem to be additional arguments for a geographical origin outside of the Netherlands. On Netherlandish or Flemish panels, rather a calcium carbonate ground is to be expected. In the Austrian areas gypsum was, and is, quite plentyfull.[17]

The shapes and forms of the image seem to have been sketched-in with thin washes directly on this ground: no intermediate priming layers were found. The body of Cleopatra lies on a red pillow and blue and white sheets in a brownish landscape. This landscape is done in one single layer of earth pigments over the white of the ground. Also the trees in the background show such a simple build-up. For the red pillow, the basic forms and shapes were first begun with a very thin (occasionally < 4 µm) layer of red lake and lead white, with very small amounts of azurite mixed in (fig. 3). On top of this dead colour, the deeper folds and recessions were painted with a dark organic red lake and a little bit of lead white; the strongest lights with almost pure lead white. Then, the

gradual transitions between the light and dark tones were made by blending the wet paints on the panel with the tip of a soft brush. The same approach can be seen in the blue drapery under Cleopatra. Single layers of azurite and lead white softly blended wet-in-wet. Cleopatra's hair is indicated with a slightly translucent wash of yellow ochre mixed with some burnt ochre. Here too, the white of the ground can be seen shimmering through. Trees and shrubbery in the background were done by applying a layer of very dark bluish green. Then, with the tip of a flattish, rather stiff bristled brush, the highlights of the leaves were given in relief with a lighter green mixed with a touch of lead white.

Only in the area with the least massive properties, i.e. the soft haziness of the background landscape, can completely opaque paints be found: mostly lead white mixed with a fine quality azurite. The sky was similarly done (fig. 4) in a single, rather thick (50-70 µm) paint layer of lead white with even quality (between 4-7 µm) azurite.

Although there is a similarity in type between Scorel's *Cleopatra* and Jacopo Palma's *Nymph*, there is no such correspondence in technical construction. During his stay in Rome the work of Michelangelo made a deep and lasting impression. It might have been this influence that made his *Cleopatra* so muscular. During his tenure as administrator of antiquities at the Belvedere Court for Pope Adrian VI, Scorel was also in charge of the famous antique statue of *Ariadne* at the fountain. Another, (derivative) source of inspiration may be found in a 1528 print *The Death of Cleopatra* by Agostino Veneziano.This print was based on a drawing of the Belvedère fountain that Rafael had made several years earlier. The position of Cleopatra on the painting is rather similar to the attitude of the Cleopatra on the print. Both are endowed with similar muscularity and the same stocky proportions.[18]

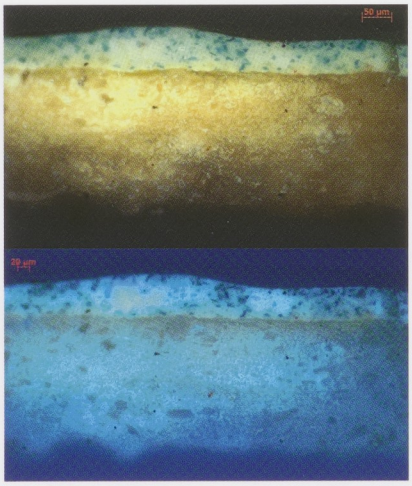

Fig. 4
Paint cross section (30/16) of paint for the sky on the *Dying Cleopatra*. a.: bright field illumination, 500x; b.: UV-fluorescence. A rather thick layer of lead white mixed with regular quality azurite.

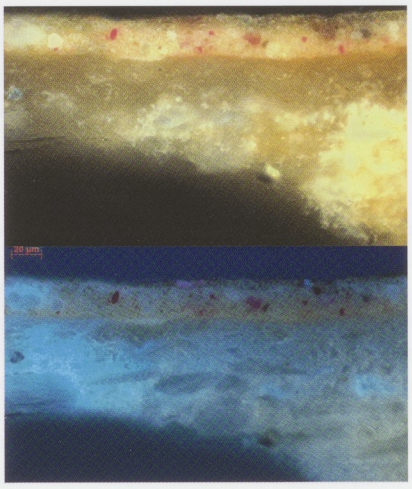

Fig. 5
Paint cross section (30/14) of paints for the brownish shadow side of the body of the *Dying Cleopatra*. a.: bright field illumination, 500x; b.: UV-fluorescence. Especially the UV image shows the peculiar splintery particles in the ground.

The desire to depict the body in well-defined spatial volumes had its consequences for the technique to accomplish this. The technique is geared towards anatomical fullness and muscular energy. Scorel began the shape of the Cleopatra in a thin layer of flesh tone with the darker areas of the body set out in semi-translucent shades primarily of dark earth pigments, ochres and vermilion. He then modelled the forms by blending his shades into one another while they were still wet. By blending the paints, hard edges are eliminated and soft, but clearly perceptible transitions between

the body tones are obtained. Tonal variation was obtained by the admixture of lighter coloured skin tones, the strongest highlights or the glazes reserved for the deepest shadows. The shadows appear rather brownish. Examination of a cross section (fig. 5: 30-14) showed that this brownish tone was obtained by mixing lead white with some reddish earth pigments and a mixture of vermilion, a trace of organic red lake, and a little bit of black. This was applied almost wet-in-wet over a paler tone of ochres with vermilion red lake with larger amounts of lead white. In the dead colour some indication of the lighter and darker areas were already given: the first layer near the highlight of her proper right thigh contains just a few vermilion particles and only a trace of black. The highlight itself is almost pure lead white. In painting her body Scorel brushed out his paints rather thinly. Usually the thickness of the paint layers for Cleopatra's body does not go beyond some 20 µm, only at those strongest highlights with thicker build-up of lead white could a thickness of 35 µm be measured. With a desaturated palette and the emphasis on light and shade in thinly applied paints, Scorel assured a uniform plasticity. *Rilievo* was the primary concern. The same approach, rather timidly applied for the Cleopatra, was in 1542 – much more forcefully – used in Scorels very muscular *St Sebastian*.[19] Both paintings essentially share a similar modelling of forms and organisation of light and shade. The only differences principally being in the amount of confidence with which the technique was put to use.

There is some documentary evidence describing the process. The mixtures for the paint of the body seem in perfect agreement with a description in an almost contemporary (1549) source: 'The colour for the body of a woman: The colour and its application for painting a female body should be used in accordance with the age and the characteristics of a subtle or coarse complexion, so that also the colour of a woman or a girl render something of their being. Lay in the body as you would do for the body of a child, provided that you should use more lead white than you would for painting a child, and shade the contours with a charred black (...)? In the following recipe the application of this black is further specified: 'Make the shadows for the female body with this. You may also use this black ground with a little hematite ochre or red chalk. This is a mild paint mixture to use for the tender forms of women. When then the body is set up in mixed lead white and brushed out, you may next shade with this black. But the cheeks, nose, hands and chin should have their reddishness (...) So if you would not aim to make contours and shades of such a body with this charred black, you may set it up and work it out like the body of a child, as seems fit. Always make highlights with lead white'.[20]

The method to paint the flesh tones for a child – and by extension for a young woman – are fairly straightforward. A middle tone consisting of some orangey red pigment like vermilion mixed with a trace of red lake and large amounts of lead white is applied. The shadows on this dead colour are then made with a mixture of vermilion and ochre. Some areas get stronger accents with red ochre darkened with a bit of lamp black. 'The paint mixture for a child; Take equal quantities of vermilion and red lead and mix this with a bit of red lake. Grind this all well with several parts of lead white. Mix this neither too reddish nor too pale. Is the mixture too red, so make it lighter with lead white. Next make shades on it with vermilion with a little burnt ochre or red lead mixed in. With this, shade the face and hand, and the whole kid. Touch up eyes, nose, hand and stern with red ochre to which a bit of soot has been added.'[21]

The landscape and sky were similarly done in subtle tonal gradations applied in a simple and efficient manner. Almost all paint appeared in two-layered mixtures. Superimposition of paint layers of different colours hardly ever occurs.

Reclining Venus

A *Reclining Venus* (fig. 6) in the collection of the Rijksmuseum is generally attributed to Lambert Sustris.[22] He was a student of Scorel and went to Rome in 1530. There he was in the company of other Scorel students, Herman Postma (Posthumus) en Maerten van Heemskerk. In the second half of the 1530s he went to Venice and became an assistant to Titian.

Initially Sustris's working methods were extremely similar to Scorels' practices. The Central Museum in Utrecht owns a painting that has always been persistently and convincingly attributed to Scorel.[23] After its acquisition in 1925 the most eminent art historians (Steinbart, 1925; Friedländer, 1924-37; Hoogewerff, 1947; Bruyn 1955; van Regteren Altena, 1955) gave it, either to Scorel himself, or to his most direct environment. Only in 1992, did Meijer succeed in conclusively demonstrating that the Utrecht painting is in fact by Sustris.

Therefore a strong similarity in working methods, particularly for the depiction of a similar subject, a reclining nude, would seem again quite likely. This is not the case. Sustris may have been trained in the Scorel workshop; yet the execution of his *Reclining Venus* is distinctly different from Scorels *Dying Cleopatra*. Some of the materials are different, and so is their way of handling them. There is stronger correspondence in style and technique with Titian's *Venus of Urbino*. In fact, until 1945, the *Reclining Venus* was attributed to Titian.[24]

The glowing sunset on the *Reclining Venus* takes place within a hazy evening sky painted with natural ultramarine, rather than the azurite used for the background of the *Dying Cleopatra*.[25]

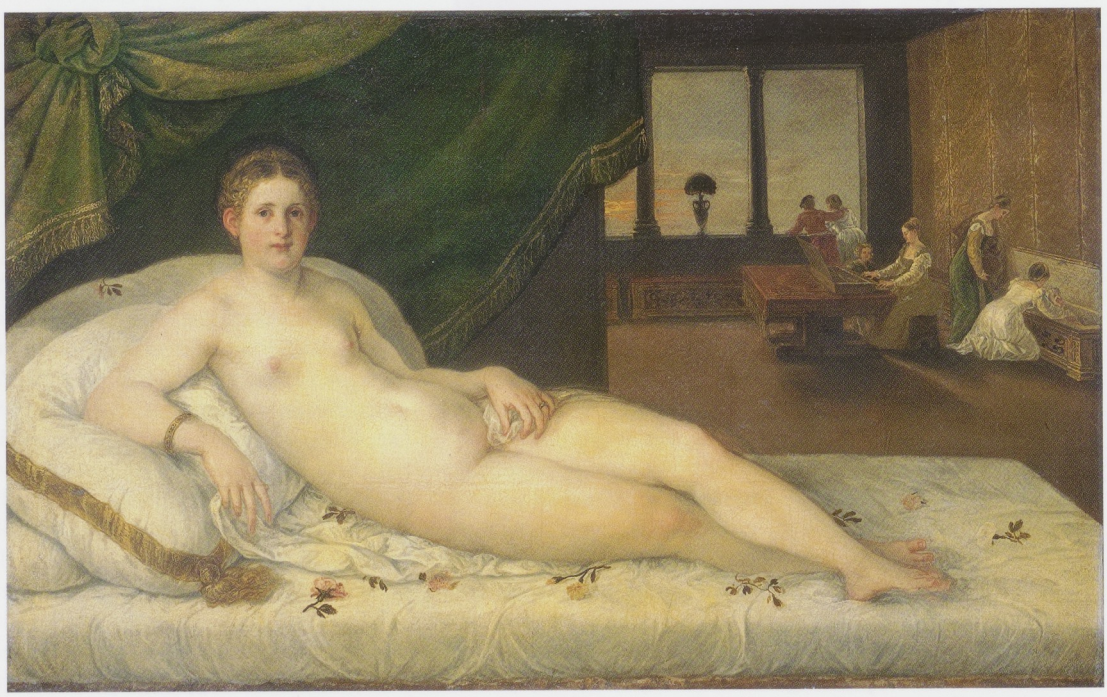

Fig. 6
LAMBERT SUSTRIS,
Reclining Venus.
Oil on canvas,
116 x 186 cm.
Rijksmuseum,
Amsterdam
(inv.no. SK-A-3479).

Shapes and figures on the *Dying Cleopatra* are well-defined, were created with great care and precision. They were constructed much more loosely and with more open brushwork on the *Reclining Venus*. In the *Dying Cleopatra* there is a strong emphasis on the convincing suggestion of volumes in space; in the *Reclining Venus* the emphasis is primarily on a wide chromatic range of rosy flesh tones. The paint layers are thicker, (easily reaching thicknesses of over 300 µm), more opaque and applied much less smoothly (fig. 7: 165-5). Very much more than in the *Cleopatra*, the emphasis in the *Reclining Venus* is on the intricate play of cool and warm flesh tints. Within the silhouette of the 'fair' body against the massive dark green curtain on the background, there is a large variation in colour. Paint mixtures vary from a warm, almost ivory white highlights on belly and chest, to a light rose pink on her right arm and hands, imperceptibly blended towards a more yellowish tone on the thigh, but also an emphatically cool grey on the left arm and shoulder, on the belly, and in the shadow along the lower side of the body. Especially on the belly this grey tone seems to have been bristled in the still-wet paint. The whole body is bristled in a (rulle) stiff, 'short' paint, in an open manner, occasionally allowing the grayish dark underlayer to shimmer through. (fig. 8: 165-6) This made those areas not just darker, but also considerably cooler, almost bluish in tone.[26]

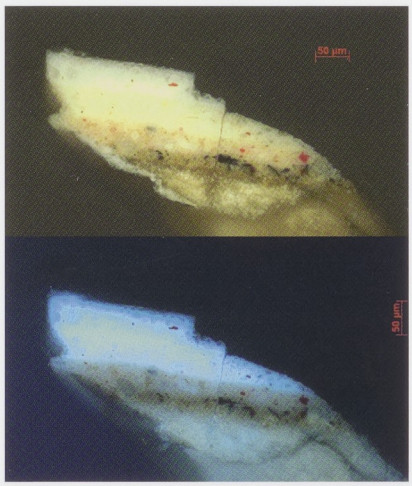

Fig. 7
Paint cross section (165/5) Shows the build-up of paints for the body of the *Reclining Venus*.
a.: bright field illumination, 200x;
b.: UV-fluorescence.

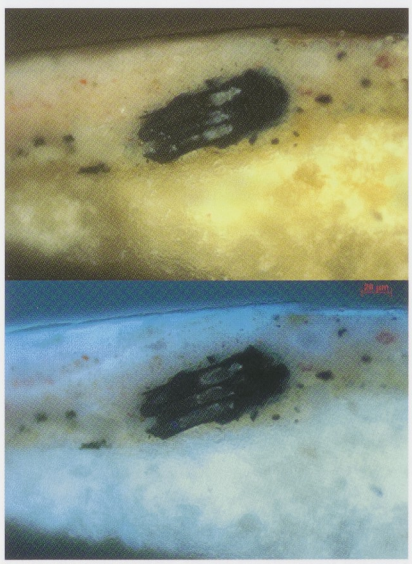

Fig. 8
Paint cross section (165/6) of paints for the body of the *Reclining Venus*, showing coarse charcoal black particles for the grey underlayer.
a.: bright field illumination, 500x;
b.: UV-fluorescence.

The figure seems to have been composed with brown earth pigments, vermilion and red lake, mixed in lead white. At completion here and there, the contours have been touched up. Fingers, ear shell and toes with a pure red ochre. The red on the knee and the blush on her cheeks are on the other hand done in vermilion instead.

Oil

Sustris very cunningly used the properties of his oil paint to create the downy soft undulations and transitions in the body of his Venus.[27] He made his colours flow and blended the various gradations of colour in gradual, and almost imperceptible transitions, by combining his pigments, lead white, with a little bit of vermilion, a touch of lead-tin yellow and a trace of

umber, in a rather slowly drying oil.

The Venetian oil painting techniques also demonstrated their values in another way. Sustris painted with skin. Oil paint, especially when it is a lead white-containing mixture, dries in a special way. It does not dry by vaporization like water colours, but by oxidation. A fresh drying oil can do this as it contains enough unsaturated (preferably di- or tri-unaturated) fatty acids. These acids are medium length-chained hydrocarbon molecules primarily consisting of often up to eighteen carbon atoms: linoleic (18: 2n-6), linolenic (18: 3n-3) acids. These molecules are hooked in shape as they are joined at one end by a triglyceride.[28] When the paint is applied these unsaturated molecules immediately begin to take up oxygen. The drying oil polymerises to form long fatty acid chains. The medium takes up the oxygen, increases in volume, and begins to form a thin flexible skin.

Then, the oxidized chains of fatty acid molecules gradually begin to form bonds between neighbouring molecules, resulting in a vast polymer network. Individual, randomly interlocking chains now fuse into a solid paint film, held together by nonpolar covalent bonds. The cross-linking network becomes increasingly intricate and tight, the paint layer increasingly dryer, more rigid and harder. Of course the network develops first at the surface of the paint layers, where the oil has the most intense contact with oxygen from the air. The oil film gradually gets thicker and more rigid, to the formation of the completely polymerised network of a leathery skin.

Pigment

A certain grittiness or grainy texture of the pigments, embedded in the paint skin plays a significant role in this painting. The sturdy, but still flexible paint that Sustris used for the body was bristled in with stiff bristles, creating a soft powdery texture, just like the soft downy dry skin of a young woman. The similarity between the texture of a paint skin and that of the human body could only be accomplished with a pigment like lead white. In the 16th century, lead white was made in a two-step process. It started by exposing sheets of metallic lead to the corrosive action of acetic acid vapor, leading to the formation of lead acetate [$Pb(CH_3COO)_2.3H_2O$], a colourless monoclinic crystalline efflorescent. In the sixteenth century this was still accomplished by the Dutch 'stack' process.[29] Strips of lead were rolled to cylinders or coils and placed in earthenware pots, at the bottom of which were separate compartments to contain vinegar. Thus, the metal would only be exposed to the vapor, not the liquid. A large number of these pots would then be carefully stacked and covered with warm decomposing horse manure. This released large quantities of carbon dioxide gas [CO_2]. It is generally assumed that in the presence of carbon dioxide the lead acetate transforms into basic lead carbonate [$2PbCO_3.Pb(OH)_2$], often also containing variable quantities of neutral lead carbonate [$PbCO_3$].[30] This beautiful lead white formed on the plates as thick curling crusts or scalloped flakes (fig. 9).[31] It was scraped from the plates and washed to free it from any traces of metallic lead or remnants of organic material used in the process.

There are differences in the time that the various crystals of this composition begin to grow on the lead strips. There are also differences in the relative speeds in which they do so. Sometimes certain crystals tend to cluster together, sometimes they don't. The process does not only allow for the formation of basic lead carbonate; neutral lead carbonate is almost always formed too. Sometimes there is still a remnant of the acetate; also some lead monoxide. And some lead

tetra-oxide will always be formed. All these components constantly occur in different relative amounts, and in different crystal modifications. Therefore, a real traditional Dutch 'stack-process' lead white is completely different from any modern uniformly synthesized 'flat', lead white. Ancient lead white is never harsh or 'dead', but rather creamy, sometimes even a bit warm-yellowish, or pearlescent. It does not come off the metal strips as a slick dull pigment with even particle size, but rather more often coagulated and grainy, or smooth as creamy butter.[32]

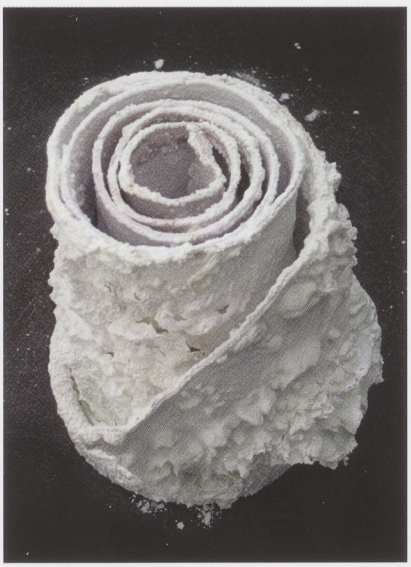

Fig. 9
Lead white made with the 'Dutch' stack process. Exfoliating crusts of granular pigment appear on coils of metallic lead. Reddish areas in the coil are caused by the simultaneous formation of tetra-oxides, on the lower areas yellow monoxides are visible.

Oil & Pigment

This creamy-white pigment teams up beautifully with the oils that hold it all together. Lead white takes the drying of oil another step further. During the oxidative degradation of unsaturated fatty acids, unstable hydroperoxides (ROOH), are formed.[33] These hydroperoxides affect the polymerized fatty acid chains, and cause the formation of a large variety of acids and of aldehyde groups in turn later transformed into carboxylic groups. These newly formed substances may react easily with lead, zinc, copper or iron compounds in the pigment, and create all sorts of coordination complexes or salts in the paint film.

The original ester bonds in the oil molecules undergo hydrolysis, releasing individual fatty acids. Carboxyl groups in the polymeric network lose a hydrogen ion, becoming negatively charged, and form complexes with metal cations present in the pigment, producing metal carboxylates. This process takes place with all pigments that release metals capable of forming organo-metallic complexes. Easily accessible copper ions from verdigris create rapidly drying paints, and the manganese in umber has the same capacity to trap free and mobile fatty acids. But especially lead from lead white, lead oxides and lead acetates reacts with the fatty acids to quick-drying complexes.[34] Gradually, the original polymer network with its randomly interlocking chains, based on nonpolar covalent bonds is replaced by an ionomeric structure, held together by ionic interactions. It leads to the formation of a rock-hard paint structure.

Tiny lumps of lead carbonates and other lead salts yield a paint with an irregular surface, in texture remarkably similar to the pores or the goose bumps on a human skin. The texture obtained from a cross linked network forming a skin with crumbly pigment lumps, is not only retained, but becomes solidified. The process of complexation 'freezes' it into place.

The paint transforms from an apolar polyester type monomer to a polymer system that is kept together by ionic forces like metal-carboxylate interaction to form an ionomeric structure.

Proper use of this phenomenon can make the paint dry faster and make it less flowing. Granular paints with coarsely ground, lumpy lead white, thus have a tendency to remain 'standing', and a crisp impasto formed with rather lean pigment-rich paint hardens

quickly before it gets the chance to flow out and lose its crispness.

Thus the reclining Venus's skin does not only look like skin; it also feels like it. This play between depicted reality and physical reality is only possible through a sensible, or rather sensuous, use of materials.

Scorels primary interest was in an efficient build-up to create flowing transitions between darker and lighter areas of the body. He strived for convincing volumes in space, suggested by a systematic, simple and remarkably efficient play of dark and light over the whole body.

Sustris did not really seem to care about 'chiaroscuro' or muscular volumes. On the contrary, his Venuses have relatively low contrast. His interest was more in subtle differences of colour, and in methods to create a concordance in colour and texture between the human skin and the skin of his paints. His manner of painting could be called 'superficial' in an almost literal sense. Hardly any interest in 'rilievo', but so much more for the paint surface.

The impact of Italian oil painting techniques on two Netherlandish painters with similar backgrounds appears to be remarkably different.

NOTES

1 P. Nuttall, *From Flanders to Florence: The Impact of Netherlandish Painting, 1400-1500*, Yale university Press, 2004.

2 *Sleeping Venus* (a.k.a. *Venere Marcello*), oil on canvas, 108.5 x 175 cm, Dresden Gemäldegalerie, and *Nymph in a Landscape*, oil on canvas, 112.5 x 186 cm, Dresden, Gemäldegalerie, inv.no. 190.

3 Francesco Colonna, *De droom van Poliphilus: Hypnerotomachia Poliphili*, Athenaeum Amsterdam, 2006, p. 73.

4 The social significance of this typical branch of Venetian industry is quite nicely demonstrated by a catalogue published in 1535, describing tariffs, qualities, specialties and names of the city's best courtesans: S. Ceccato (ed.), *Il catalogo di tutte le principale e piu honorate cortigiane di Venezia*, Venice 1984. Also see L. Lawner, *Lives of the Courtesans: portraits of the Renaissance*, New York, 1987.

5 Exhib. cat. F. Pedrocco, 'Iconografia delle Cortigiane di Venezia', *Le Cortigiane di Venezia dal Trecento al Settecento*, Venice (Casinò Municipale, Ca'Vendramin) 1990, pp. 81-93, esp. p. 86; exhib. cat. F. Pedrocco, *Tiziano*, Velnice (Palazzo Ducale Venezia), 1990, p. 86; A.Wallert, *From Tempera to Oil Paint; Venetian paintings, 1460-1560*, Amsterdam / Zwolle 1998, pp. 45-48.

6 They share this feature with Giorgione's *Sleeping Venus*, and Titian's *Venus of Urbino*.

7 Oil on panel, 36 x 61 cm, Rijksmuseum, Amsterdam, inv.nr. SK-A-2843. M.A. Faries, *Jan van Scorel; His Style and its Historical Context*, PhD Diss., Bryn Mawr College, 1972, pp. 65, 111, cat. 22: Faries suggested that this painting may possibly not be made by Scorel. Her arguments were largely related to the fact that no underdrawing could be found with infrared reflectography. However, IRR only allows for the visualisation of underdrawings with black chalk, charcoal, or other carbon-black based materials. Underdrawings made with lead-, or silverpoint, iron gall ink or red chalk tend to remain invisible in infrared reflectograms. Furthermore, for Scorel these were years of intense experimentation with new styles and techniques; variations from one piece to the other could be expected.

8 Jan van Scorel, *The Drowning of Pharaoh's Army in the Red Sea*, oil on panel, 54 x 134 cm, Milan, private collection.

9 B.L. Brown, entry 141, in 'From Hell to Paradise: Landscape and Figure in Early Sixteenth-Century Venice', in: B. Aikema, B.L. Brown, and G. Nepi Scire (eds.), *Renaissance Venice and the North, Crosscurrents in the Time of Bellini, Durer, and Titian*, Palazzo Grassi Venice 1999, pp. 494-495.

10 Only occasionally walnut (*Juglans spp.*) would be used (primarily in the area around Milan), and sometimes, in the Venice area, one might find lime wood (*Tilia spp.*) for the support..

11 J.O. Hand, *German Paintings of the Fifteenth through Seventeenth Centuries*, Washington 1993, pp. 195-197.

12 This is consistent with the findings obtained from dendrochronology. The pattern of the 110 rings could be fitted in the chronology for beechwood between the years 1509 and 1400 for the *Central European region*. The youngest ring dates from 1509. Painting would have been possible only after a minimal 2 years of processing after the felling of the tree, so from 1511 onwards. Report Kl/a, by Dr. Peter Klein, Ordinariat für Holzbiologie, university of Hamburg, dated 17.XII.1998.

13 See note 17.

14 Polarized light microscopy (PLM) of pigment dispersions in transmitted light was done with the Leitz Orthoplan microscope. The mounting mediums for the microscope slides were Cargille melt mount (nD = 1.662), and Permount (nD = 1.539). The pigment was optically identified as azurite for its rather fine, highly birefringent, pale blue particles with anomalous extinction. N > 1.66, by PLM. This was confirmed with micro chemical analysis (MCA) with tests for copper and the carbonate radical.

15 Valentinus Boltz von Ruffach, *Illuminierbuch, Wie man allerlei Farben bereiten, mischen und auftragen soll*, nach der ersten Auflage von 1549, reprint Sandig Verlag, Liechtenstein 1982, p. 77.

16 The white pigment of the ground layer showed in PLM as very moderately birefringent rhombs with oblique extinction. The refractive indices were lower than that of our standard mounting medium (Cargille meltmount N = 1.662). The microscopy gave a reasonable match with our laboratory standard for gypsum: $CaSO_4.2H_2O$. This is confirmed by a match with the diffraction patterns for calcium sulphate dihydrate with PDF standard 33-311, and 36-0432. Other lines could be attributed to anhydrite patterns as given for a synthetic one in PDF 37-1496, and for a natural mineral from Hallstein near Salzburg: PDF 03-377. There are, however, a number of lines in the pattern that could not be accounted for. The ground layer therefore remains subject of further examination. X-ray deffraction (XRD) was done with 57.3mm Debye-Scherrer powder diffraction cameras with Gandolfi mounts, with the sample in cedar oil on the tip of a glass spindle. Exposures varied from 3-5 hours. CuKα radiation (λ = 1.542Å) was used at 40kV, with tube current of 30mA. All intensities were estimated visually.

17 There are very large deposits at Oberbuchach, a city near Obervellach in Carinthia, where Scorel made his altarpiece. (J. Mörtl, *Carinthia* II 192/112., (2002), pp. 329-330.) A still very active gypsum mine is at Moosegg near Salzburg.

18 This interest in anatomical features is reflected in the publication in 1522 of the first full-scale illustrated anatomy book *Commentaria super anatomia Mundini*, by Jacopo Berengario da Carpi, who in his second book, the *Isagogae breves* of 1523 recommended his woodcut illustrations to artists as an aid in the correct design of figures.

19 Museum Boijmans Van Beuningen, Rotterdam, oil on panel, 155 x 115 cm, inv.nr. 2342. The figure is a variant of one of the figures in Michelangelo's *Last Judgement* in the Sistine Chapel.

20 Boltz von Ruffach, *op.cit.* (note 15), pp. 88-89:
'Frouwen lybfarb. Des wyblichen bildts farb und anmassung sol gebrucht werden nach gelegenheit der Johren und eigenschafft subtilicher oder grober complexion. Damit auch wyblicher und junkfröwlicher farb etwass dem wolstandt zugeben. Strych das corpus an wie kindlin farb ussgenommen, das du mehr ply wyss solt nemen dan zu den kindlin. Setz es ab mit liechtem papyr schwartz'.
'Schattier das wyblich corpus darmit. Du magst auch wohl papyr schwartz nemen, das mit ein wenig lapide Ematiten oder rötelstein angeriben ward. Diss ist ein gar milts ferblin uff die zarten wybliche bildung zebruchen. Dan wann das corpus mit dem plossen plywyss ist uff getragen on vermischt, so mag man darnach disem schwartzen daruff schattieren. Doch sollen backen, nasen hend, kien I rosinierung darzu haben (...) So es dir nun nit gelegen wer mit disem papyr schwartz ein solch corpus abzesetzen und verschattieren, So magstus machen mit ufftrag und absatz wie das corpus eins kindlins, nach dynem gut duncken. Erhöch alweg das corpus mit plywyss'.

21 Boltz von Ruffach, *op.cit.* (note 15), pp. 87-88:
'Kindlin farb; Nimm Zenober und Mynien, eins alss vyl alss das ander thu darunder ein klein wenig Paryss root. Dass alles ryb wol an mit mehrere theyl plywyss. Temperier es weder zu rot noch zu bleich. Ist die temperatur zu rodt, so machs liechter mit dem plywyss. Schattier daruff mit Zenober, darin ein wenig gebranter Oger oder Mynien under syg gemischt, damit schattier das antlit und die handt und das ganz kindlin. Rosier ougen, nasen, hend und antlit mit Brunrot, da ein wenig russ under vermischt syg. Den hof neben den sternen in ougen strych uss mit liecht spongrien darunder ein wenig endich vermischet ist.'

22 Lambert Sustris, *Reclining Venus*, oil on canvas, 116 x 186 cm, Rijksmuseum, Amsterdam, inv.no. SK-A-3479. Sustris produced other similarly large and equally sensuous nudes: a *Venus*, ca. 1550, oil on canvas, ca. 110 x 190 cm, State Hermitage Museum, St Petersburg (prince G.A. Potemkin, 1789), and a *Venus and Cupid*, ca. 1560, oil on canvas, 132 x 184 cm, Musée du Louvre, Paris. He even made a *Dying Cleopatra*, (ca. 1560,

Gemäldegalerie, Staatliche Kunstsammlung, Schloß Wilhelmshöhe, Kassel, 504).

23 Centraal Museum Utrecht, *St John the Baptist preaching*, oil on panel, 110 x 151 cm. This painting was made on a panel of poplar (communication Dr. P. Klein, dd. 5.V.1998), which would strongly suggest an indication of an Italian origin. L.M. Helmus, '*De prediking van Johannes de Doper* door Lambert Sustris 1530-1535', Stichting Victor III, *Restauratie en Natuurwetenschappelijk Onderzoek in het Centraal Museum, Stichting Victor*, Centraal Museum Utrecht 2007, pp. 38-49.

24 B.W. Meijer, entry 156, in 'Titian and the North', in Aikema, *et al., op.cit.* (noot 9), pp. 532-533.

25 Natural ultramarine identified with PLM: isotropic particles with conchoidal fracture. N << 1.66, a nice red under the Chelsea filter. MCA indicated that the pigment was sulphidic.

26 A. Wallert, 'Het schilderen van lucht: reflectie, Rayleigh verstrooiing en Tyndall effect', *kM Kunstenaarsmaterialen* 61 (2007), pp. 21-23. This effect is often – confusingly – referred to as the turbid medium effect.

27 The oil medium for both paintings was first estimated with rather crude, but fairly effective microchemical tests, a saponification test and a test on glycerol by its conversion into acrolein upon the action of potassium hydrogen sulphate ($KHSO_4$). H.P. Schramm and B. Hering, *Historische Malmaterialien und ihre Identifizierung*, Graz 1988, pp. 198-199. An estimate of their distribution was obtained with a series of staining tests on paint cross sections. Proteinaceous media were stained with fluorescein-isothiocyanate (FITC) in water-free acetone, and with a solution in acetic acid of the sodium salt of Ponceau S. For the oils the sections were stained with 2,7,-dichlorofluorescein (DCF) in ethanol, and also stained with Rhodamine B in ethanol. S. Schaefer, 'Fluorescent Staining techniques for the characterisation of binding media with paint cross sections and digiytal image processing for the quantification of staining results', *Early Italian Painting Techniques and Analysis*, Symposium, Maastricht, 9-10 October 1996. More information on the composition of the binding medium of the *Reclining Venus* was obtained in the summer of 1998 with a more instrumental method. See note 34.

28 J.D.J van den Berg, *Analytical chemical studies on traditional linseed oil paints*, Amsterdam 2002, pp. 10-13.

29 Recipe in a manuscript in the Wellcome Medical Library: 'nem dunne lemmelen van lode of van tinne die wat doet gaet siin, ende hancse bouen alte scarpen edic of kinder vrin in een pot wel bestopt, ende setse in perdemisse, 18 daghe of langer, dan scaue dair of alte witte blomen, ende setse weder als van eersten thent die lemmelen verteert siin?.

30 The process may develop as: $3\,Pb + 4C_2H_4O_2 + H_2O \rightarrow 2Pb(C_2H_3O_2).2Pb(OH)_2$, or: $3PbO + 4C_2H_4O_2 \rightarrow 2Pb(C_2O_3H_2).2Pb(OH)_2 + H_2O$, followed by $2Pb(C_2H_3O_2).2Pb(OH)_2 + 2CO_2 + 2H_2O \rightarrow 2PbCO_3Pb(OH)_2 + 4C_2H_4O_2$. Oxidative processes may also play a role in the formation of the final product: $Pb + 2AcH + {}^1/_2O_2 \rightarrow Pb(Ac)_2 + H_2O$., followed by: $Pb(C_2H_3O_2)_2 + 4O_2 \rightarrow PbCO_3 + 3H_2O + 3CO_2$. For the historical development of the process see: J.A.P. Meere, *Het Schildersambacht* deel I, Brink Uitgeversmij. Meppel, s.d., 13-21.

31 T. Goedings, and K. Groen, 'A seventeenth-century explanation of the word "schulpwit"', *Bulletin of the Hamilton Kerr Institute* 2 (1994), pp. 85-87.

32 For an instructive read on historical pigments vs modern homogenised synthetic ones, see: 'The Devil in the Tube', in: A. Albus, *The Art of Arts: Rediscovering Painting*, Los Angels, 2000, pp. 63-74.

33 Van den Berg, *op.cit.* (note 28), pp. 18-23.

34 Direct temperature resolved mass spectrometry (DTMS) showed a decrease of fatty acids C16 and C18 (palimtic and strearic acids) and significant increase at m/z 358, which can be taken as the diacid lead complex: lead azeleic acid (PbdiC9). Lead palmitates and lead stearates were also present. These measurements were done in 1998 by J. van der Horst of Amolf (FOM). This was done on a JEOL SX 102A double focusing mass spectrometer with a B/E geometry. Samples were homogenised in ethanol and placed on a Pt/Rh (9:1) wire, which was resistantly heated (05A/min). The temperature was increased in 2 minutes from room temperature to approximately 800 C. Desorbed material was ionised by 16eV electron impact ionisation, with the mass spectrometer scanning each second over a m/z 20-1000 range. Methods and possibilities of this technique are amply described in J.J. Boon, 'Analytical pyrolysis mass spectrometry: new vistas opened by temperature resolved in-source PYMS', *International Journal of Mass Spectrometry and Ion Processes*, 118/119 (1992), pp. 755-787.

TABLE I

	FILM :								
	#	30/15		KV	mA	hours	NiFilter	HeFlush	Comments
	l = 1. 5418			40	30	4:30	yes	no	
		Scorel, Cleopatra, ground sample 30/15				gypsum (dihydate) PDF 33-311			anhydrite PDF 03-377 Hallein, Salzburg, Austria
I/I*	4 Q	Q	d		I/I	dA		I/I	dA
50	23,120	5,780	7,655		100	7.630			
50	41,440	10,360	4,287		100	4.283		25	4.240
95	51,600	12,900	3,453					100	3.480
100	59,500	14,875	3,003		75	3.065		50	3.160
95	63,600	15,900	2,814					75	2.830
6	66,380	16,595	2,699		35	2.685			
35	84,860	21,215	2,130		25	2.086		50	2.170
6	87,100	21,775	2,078		15	2.074		25	2.100
10	95,620	23,905	1,902		16	1.899			
98	98,420	24,605	1,852					75	1.860
5	105,520	26,380	1,735					75	1.750
9	110,580	27,645	1,661		6	1.664		75	1.640
3	113,680	28,420	1,620		9	1.620			
4	125,720	31,430	1,478					50	1.490
3	128,860	32,215	1,446		5	1.439			
7	138,160	34,540	1,360		5	1.365			
25	145,000	36,250	1,304					50	1.320
12	150,160	37,540	1,265					25	1.280
10	152,840	38,210	1,246					50	1.220
7	157,920	39,480	1,212					25	1.200

Table I:
Lines in the x-ray diffraction pattern from the ground of Scorel's *Dying Cleopatra*, that match with patterns of dehydrate and anhydrite calcium sulphates