

## TECHNICAL ART HISTORY AND ARCHEOMETRY III: AN EXPLORATION OF REMBRANDT'S PAINTING AND DRAWING TECHNIQUES

Phoebe Dent Weil; and Sarah Belchetz-Swenson  
Northern Light Studio, L.L.C., St. Louis, MO,

### Introduction

This year will mark the 400<sup>th</sup> birthday of the great Dutch master Rembrandt van Rijn (b. July 15, 1606, Leiden—d. Oct. 4, 1669, Amsterdam). To date seventy-three events focusing on Rembrandt have been announced (1) including a major exhibition, “Rembrandt-Caravaggio” from 24 February-18 June 2006 at the Van Gogh Museum in Amsterdam (2) where these two remarkable and revolutionary artists “will confront each other face to face.”

Our exploration of Rembrandt's painting materials and techniques began with preparations for a workshop presented at the Museum of Fine Arts, Boston, and a lecture at the Chicago Art Institute in connection with the exhibition “Rembrandt's Journey” in 2004. The authors, a conservator (Weil) and a painter (Belchetz-Swenson) explored the technical and art historical literature and did reconstructions.

Though Rembrandt never went to Italy unlike many of his artist colleagues in Holland, he studied with Pieter Lastman who had spent five years in Italy and who was profoundly influenced by Caravaggio. Rembrandt's admiration for the Dutch “*Caravaggisti*” is evident as he absorbed much of their example into formulating his own style. Caravaggio's use of dramatic lighting effects, his ability to communicate profound emotion and moving human drama, as well as his technical inventiveness and use of a palette primarily of earth tones were all deeply influential on Rembrandt's formation as an artist.

### Resources for Rembrandt's technique

Recent and ongoing studies have provided us with an abundance of information about Rembrandt's working methods and materials. The Rembrandt Research Project, an ongoing effort to thoroughly document Rembrandt's *oeuvre* and to distinguish works by the master's hand from that of students, copyists and fakes, has resulted in the publication of three volumes (1982, 1986 and 1989) with others still in progress. (3) In addition, two publications in particular have provided invaluable information about Rembrandt's materials and working method: a catalog accompanying an exhibition at the National Gallery, London, with abundant documentation on all aspects of Rembrandt's painting techniques (4); and a well-illustrated and richly documented account of Rembrandt's painting materials and process by Ernst van de Wetering, *Rembrandt: the Painter at Work* (5).

Among the primary sources in the 17<sup>th</sup> century literature is an invaluable manuscript written by the Court Physician to Charles I, Theodore Turquet de Mayerne, whose curiosity about painter's working methods led him to look over the shoulders of such artists as Rubens, van Dyck and Orazio Gentileschi. We have very little from the master himself, though two of his students, Samuel van Hoogstraten and

Gerard de Lairese, wrote treatises that provide some insights into Rembrandt's working methods.

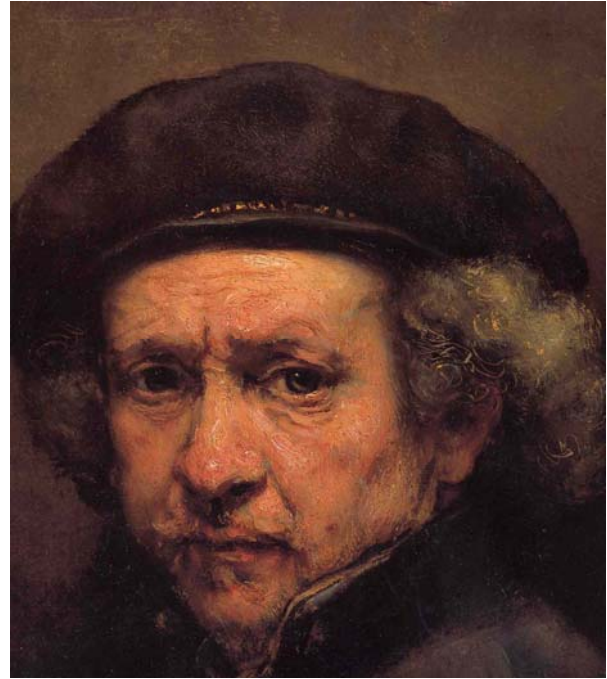


Fig.1 Rembrandt, *Self Portrait*, 1659, detail, National Gallery of Art, Washington, DC



Fig.2 Detail of Fig 1, showing marks made in the wet paint using the stick end of the brush.

Other resources for learning about Rembrandt's technique come from the results of conservation treatment of nearly all of Rembrandt's major paintings during the past fifty years together with the accompanying technical examinations. The dark and murky appearance previously associated with

Rembrandt's work has been changed, usually dramatically, with the removal of discolored varnish layers, the most famous instance being Rembrandt's *Night Watch* that was transformed into a daytime scene when the old varnish was removed. Among the more unusual scientific studies of Rembrandt's work was the use of neutron activation autoradiography undertaken in the late 1970s enabling us to obtain in some cases a picture of the artist's underpainting sketch done in Cassel earth and umber, not normally detectable by any other means. (6)

### Rembrandt's drawing techniques

Unlike Caravaggio, Rembrandt was a prolific draftsman (Fig.3) producing drawings in silver point, red and black chalk (Figs. 4-5), and ink drawings done with quill, reed and brush using primarily iron gall ink commonly used throughout Europe since the late Middle Ages. When fresh, iron gall ink is a dark blue-black that would have been the original appearance of Rembrandt's drawings. Over time the ink turns brown and Rembrandt drawings made with iron gall ink now appear to have been drawn in brown ink, whereas they were originally black (7)(Fig.6)



**Fig. 3** Rembrandt, *Self-portrait drawing in his studio*, etching

### Rembrandt's painting technique: pigments

There is general agreement among scientific studies on Rembrandt's pigments, a simple palette consisting of lead white, vermilion (cinnabar), red and yellow lake pigments, lead-tin yellow, a range of earth pigments—ochers, siennas, and umbers—Cassel earth, smalt, azurite, malachite, bone black and charcoal black, with chalk used as a bulking agent and a means of producing glazes. (8)(Fig 8)



**Fig. 4** Rembrandt, drawing, black chalk on paper.



**Fig. 5** Natural black chalk, cut to fit into a chalk-holder (*tocha lapis*) for drawing



**Fig. 6** Rembrandt, quill and reed pens and brush with iron gall ink, originally black, now turned brown



**Fig. 7** Rembrandt, *Self Portrait*, detail, Museum of Fine Arts, Boston, c.1630



**Fig. 8** Pigments typically used by Rembrandt

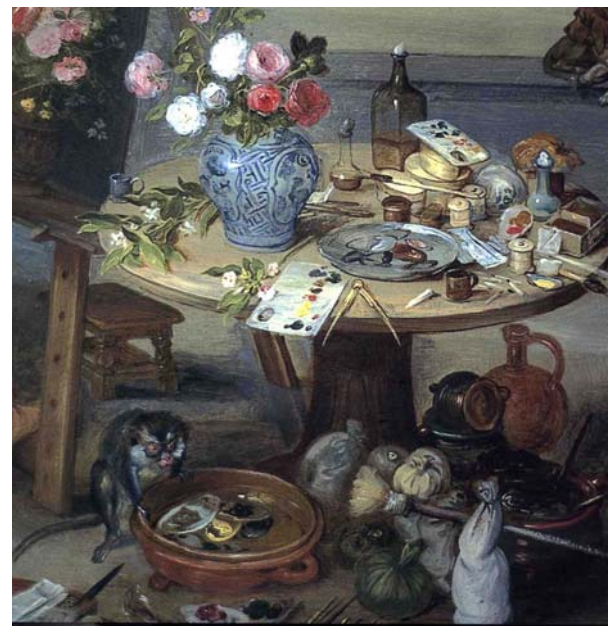
### Rembrandt's painting technique: process

The young painter, presumably Rembrandt, shown in his studio (Fig. 7) shows the artist standing in front of a large easel with a wood panel prepared for painting. He holds a small palette, brushes and mahlstick in his left hand and a brush in his right. Two other palettes hang on the wall. In the background are a worktable, jars perhaps holding linseed oil, and a boat-shaped grinding stone for preparing paint. An observer of the young Rembrandt and his studio companion, Jan Lievens, remarked on the special interest the young artists took in experimenting with their paints in order to achieve the textural effects that baffled their contemporaries who scorned their use of texture as a "rough manner".

Rembrandt used typically a plain weave, fairly rough canvas mounted, as was typical for the period, on to a strainer or fixed wooden support using strings, a technique apparently unique to Holland and akin to the method of attaching sails on a ship. The self-portrait by Aert de Gelder (Fig.10), one of Rembrandt's pupils, and a painting of an artist at work by Gerard Dou (Fig 11) demonstrate this method of mounting a canvas that allows the canvas to be tightened by simply pulling on the strings. The painter can also paint cleanly out to the edge of the canvas without the interference of the stretcher behind. De Gelder shows himself holding palette, mahlstick and brushes in his left hand while he scrapes his palette knife on a *klad pot* or holder of waste paint. This latter studio utensil served as a means of collecting excess paint that was often reused as ground or priming. A *klad pot* can be found in a detail of a painter's table on the far right in a painting by Jan Brueghel II. (Fig 9)

Pigments were ground daily and placed in mussel shells until they were put on the palette. A detail of a painting by Jan Brueghel, II (Fig. 9) shows ground pigments in mussel shells in a bowl of water under the table next to a curious monkey. Most ground pigments could be kept for several days if submerged in water to exclude oxygen.

A layer of rabbit skin glue size was then applied to the stretched linen, either by brush if warm or with a palette knife if in the gelled state. The size layer served to separate the paint layers from the linen fabric and thereby prevent the oil from oxidizing and rotting the canvas. The first ground, typically a dark red mixture of red ocher, yellow ocher, umber, lead white, and chalk ground in linseed oil was then applied using a grounding knife. When dry it was sanded and followed by the second, opaque ground, typically gray or beige.



**Fig. 9** Jan Brueghel II, *Lady Pictura Painting Flowers*, detail, table with painter's equipment, c. 1620.



**Fig.10** Aert de Gelder, *The Artist as Zeuxis Painting an Old Woman*, Frankfurt, Städelsches Kunstinstitut.



**Fig. 11** Gerard Dou (?), *A Painter at Work*, showing method of lacing the canvas to the strainer.

Rembrandt then began painting by making a rough monochromatic sketch with a brush on the gray ground using a mixture of Cassel earth and umber. He then proceeded to lay in the underpainting or “dead coloring” followed by the top layers, typically working from background to foreground and in discreet areas. Final touches consisted of scratched-in highlights (Fig.2) and impasto highlights in lead-tin yellow or lead white done in stiff paint that stood out from the surface of the painting and caught the light producing a sparkle and liveliness to the surfaces. Whereas Caravaggio’s scratching into the paint was done at an early stage of the painting to establish the composition and position of models, Rembrandt’s scratching was done at the end to pick out highlights and specific details such as hairs. The pastose paint used for highlights became more and more of a fascination for Rembrandt as his technique evolved, and where his contemporaries were more and more inclined towards eliminating all visible brush strokes, Rembrandt used heavy brush strokes increasingly in order to present a more lively and life-like illusion.

The making and use of this highly pastose paint has been a subject of intense curiosity by those observing his paintings, notably by artists such as van Gogh whose rough brush strokes were influenced directly by Rembrandt.

Sarah Belchetz-Swenson, who, as both painter and print maker, was familiar with “boiled plate oil” used by print-makers in making ink, proposed that Rembrandt would certainly have had burnt plate oil

conveniently nearby as he had both his print making studio and his painting studio in his house. It would then have been highly likely and that Rembrandt would have used the plate oil mixed with the addition of chalk to get a thick, buttery paint.

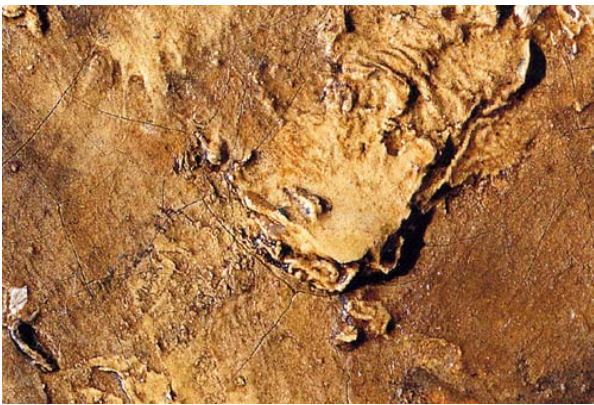
Since we found that there was some disagreement between the British research results and the results of the scientific studies in Holland we decided to try to reconstruct Rembrandt’s paint by making our own burnt plate oil. The research group at the National Gallery had concluded on the basis of their studies that Rembrandt used a simple mixture of linseed oil, sometimes walnut oil, sometimes heat-bodied and a significant addition of chalk to produce pastose paint. The research in Holland concluded that Rembrandt produced an emulsion with linseed oil, glue and egg yolk to achieve the same effect. Our reconstruction work supports the National Gallery findings. We made our own burnt plate oil according to a recipe found in Abraham Bosse’s print making treatise of 1645, *Traicté des Manières de Graver...*, and comparable more recent recipes that were in general agreement. We heated linseed oil until it reached the stage of spontaneous combustion (about 400°C.) whereupon the mixture became thick and viscous and could be pulled out in strings of twelve inches or more. We were able to reproduce all of the various dots, loops and swirls as well as the thick, buttery brush strokes of impasto that are the signature of Rembrandt’s mature work by varying the amount of plate oil and chalk added to the pigments during grinding. (9) (Figs. 12-15) In the late paintings Rembrandt’s mastery of the use of pastose paint can be seen in the exceptional example of the detail in Fig. 16.



**Fig. 12** Burnt plate oil--Linseed oil that has been heated to ignition (400°C.) and has become thick and viscous.



**Fig. 13** Rembrandt, *The Jewish Bride*, Amsterdam, Rijksmuseum



**Fig. 14** Details of Fig. 13, sleeve of the bridegroom



**Fig. 15** Reconstruction of Rembrandt's paint by adding burnt plate oil and chalk to pigments ground in linseed oil.



**Fig. 16** Rembrandt, detail of *Self-portrait* in the National Gallery, Washington, DC, showing Rembrandt's unique use of pastose paint and use of the gray ground in the half tones (to the right of the eye).

### Conclusions

Through reconstruction work on Rembrandt's medium, the authors were able to lend support to technical findings that Rembrandt used simple mixtures in his paint simply applied. Other demonstrations, such as the fabrication of iron gall ink clearly show that drawings now appearing as (and often mis-described as) brown ink were originally a cool blue black. Demonstrations of original techniques, materials and reconstruction are an exceptionally useful teaching tool for all ages.

### References

- (1) These events are listed on the CODART website [http://www.codart.nl/rembrandt\\_2006/](http://www.codart.nl/rembrandt_2006/)
- (2) The exhibition website is: <http://www.rembrandt-caravaggio.nl>
- (3) Bruyn, J., B. Haak, S.H. Levie, P.J.J. van Thiel and Ernst van de Wetering, *A Corpus of Rembrandt Paintings* (The Hague, Boston and London: Stichting Foundation Rembrandt Research Project) vol. 1 (1982), vol. 2 (1986), and vol. 3 (1989).
- (4) Bomford, David, C. Brown and A. Roy, *Art in the Making: Rembrandt* (London: National Gallery Publications, Ltd.) 1988.
- (5) Van de Wetering, Ernst, *Rembrandt: the Painter at Work* (Amsterdam: Amsterdam University Press) 1997.
- (6) The Metropolitan Museum of Art, *Art and Autoradiography: Insights into the Genesis of Paintings by Rembrandt, Van Dyck, and Vermeer* (New York: The Metropolitan Museum of Art) 1982.
- (7) See the Iron Gall Ink web site: <http://www.knaw.nl/ecpa/ink/>
- (8) See the authors' website: <http://www.northernlightstudio.com> for a "Rembrandt's Pigments List" with brief descriptions of each, and a "Rembrandt's Pigments bibliography" with resources for further exploration of the pigments. A general Rembrandt bibliography with special reference to technical matters can also be found on the website.

(9) See the authors' publication, "Rembrandt and Burnt Plate Oil: New Observations and Proposals on Rembrandt's Paint", in *Approaching the Art of the Past: Sources and Reconstructions*, Art Technological Sources Research Group, Stijnman, Ad, et. al. (London: Archetype) 2005. See also our website: <http://www.northernlightstudio.com> , under "Rembrandt and Burnt Plate Oil."

**Authors' E-mails**

[phoebe@northernlightstudio.com](mailto:phoebe@northernlightstudio.com)

[sarah@northernlightstudio.com](mailto:sarah@northernlightstudio.com)

<http://www.northernlightstudio.com>