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# Paint Media Analyses

John Mills and Raymond White

## Notes to the Table

1. These samples were examined by gas-chromatography only and although reported in [1], they are included here for completeness.
2. The use of two different oils, here, seems fairly certain in view of the pronounced difference in palmitate/stearate ratios.
3. Alkyd medium (an oil-modified alkyd), established in sample 1, is a synthetic medium and its use here corresponds with an area of paint from an added section to the painting. The presence of alkyd in this sample was established by the appearance of dimethyl phthalates ( $m/z = 194(M^+)$ ;  $m/z = 163(B^+)$ ) in the chromatogram, following the saponification and methylation. Sample 2 was taken from the interfacial region between the two and almost certainly represented retouching at the divide between the two areas.
4. The nonanedioic to octanedioic ester ratio of 2.73 in the white impasto (sample 1) would suggest the use of a heat-bodied linseed oil [2,3], whereas the yellow impasto gave no indication of such pre-polymerization. This may account for the noticeably differing behaviours whilst sampling. The white impasto yielded in a plastic manner, whereas the yellow impasto was hard and brittle, clearly bodied by a high proportion of pigment and did not show a low (C9/C8) dicarboxylic ester ratio.
5. Examined by gas-chromatography only and reported earlier [4], but included here for completeness.
6. Paint from the brown background (sample 2) exhibited an intermediate azelaic to palmitic ester ratio and would correspond to a mixture of drying oil and egg tempera. However, it is not entirely certain that some retouching from adjacent areas was not accidentally included during sampling.
7. Sample 2, of black background, was taken from an area which contained no visible retouching. Linseed oil was identified as well as a diterpenoid resin component. Somewhat unusual was the absence of dehydroabietic acid ester in the chromatogram, the main resin component having molecular ion of  $m/z = 312$  and base peak of  $m/z = 237$ , suggesting dehydrodehydroabietic ester. Nevertheless a conifer source is still indicated for the resin.
8. The sample of rich, white impasto (sample 1) sampled in a similar manner to that of the white impasto from No.6350, above. Again a C9/C8 dicarboxylic ester ratio of 2.69 may be indicative of heat pre-polymerization of the linseed oil. The red impasto (sample 2), however, sampled in a more brittle manner and the corresponding ratio gave no evidence for the use of heat-bodied linseed oil.
9. Examined by gas-chromatography only, but not previously reported other than in outline [5]. In view of the presence of both linseed and walnut oils in this work, the P/S ratio of 2.1 for sample 2 may represent linseed with some walnut oil added.
10. All samples from No.727, save paint from the pale blue sky alone, appear to consist of predominantly egg tempera mixed with a little drying oil. Interestingly, the somewhat richer-textured red paint of sample 4 was found to contain a greater proportion of drying oil than the other paints sampled in this work.
11. This work exhibited areas of pronounced blanching of the paint, particularly in the greens. It was possible to sample from one such area, and the result is recorded in the entry for sample 4. The P/S ratio of 1.4 and the azelate/palmitate (A/P) ratio of 1.1 is perfectly normal for a typical linseed oil medium. However, considering the sample size, it was clear that the paint has become very lean in medium. No resin, either di- or triterpenoid, was detected. It may well be that depletion of the organic medium between the mineral pigment particles has left voids, so enhancing light scattering. The reddish ground in this picture was also found to contain linseed oil, but seemed very lean in organic medium.

## References

1. MILLS, J.S. and WHITE, R., 'Analyses of Paint Media', *National Gallery Technical Bulletin*, **4** (1980), p.67.
2. MILLS, J.S. and WHITE, R., 'Organic Mass-Spectrometry of Art Materials: Work in Progress', *National Gallery Technical Bulletin*, **6** (1982), pp.3–18.
3. MILLS, J.S. and WHITE, R., 'Analyses of Paint Media', *National Gallery Technical Bulletin*, **7** (1983), p.67.
4. MILLS, J.S. and WHITE, R., 'Analyses of Paint Media', *National Gallery Technical Bulletin*, **1** (1977), p.57–9.
5. WHITE, R., 'Rembrandt's Paint Medium', in D. Bomford, C. Brown and A. Roy, *Art in the Making: Rembrandt*, National Gallery (London 1988), pp.26–9.

Artist	Picture	Date	Sample	Medium	P/S	Oil type	Note
Rembrandt	Portrait of an 83-year-old Woman No.775	1634	1. Light fawn background to left of sitter 2. Black paint of dress	Oil Oil	1.9 1.8	Linseed Linseed	1
	Saskia van Uylenburch in Arcadian Costume No.4930	1635	1. Grey-white of bottom of dress 2. Dark black/brown of foliage, top	Oil Oil	3.7 1.9	Walnut Linseed	2
	The Lamentation over the Dead Christ No.43	c.1635	1. Warm white impasto, R.H. edge 2. White cloud, by cross, upper L.H. edge 3. Mustard colour, by white shroud 4. Dark brown/black background, R.H. edge	Alkyd Oil Oil Oil	n.a. 5.6 1.8 1.3	Alkyd Poppyseed Linseed Linseed	3
	Belshazzar's Feast No.6350	1636/8	1. White impasto of robe 2. Yellow impasto of robe trimmings 3. L.H. woman's head-dress, shadow 4. Red dress of R.H. woman	Oil Oil Oil Oil	1.6 1.7 1.8 1.8	Linseed Linseed Linseed Linseed	4
	Self Portrait at the Age of 34 No.672	1640	1. Light brown parapet, R. H. side	Oil	3.3	Walnut	
	The Woman taken in Adultery No.45	1644	1. Black impasto, top of centre column 2. Pale orange-brown of R.H. column 3. Ground 4. Red drape, top R.H. edge	Oil Oil Oil Oil	1.6 1.8 1.4 1.9	Linseed Linseed Linseed Linseed	
	The Adoration of the Shepherds No.47	1646	1. Black background 2. Ground 3. Mustard highlight of roof beam, L.H. edge	Oil Oil Oil	1.1 1.6 1.1	Linseed Linseed Linseed	
	A Franciscan Friar No.166	c.1655	1. Brown habit 2. Pale buff paint, top edge 3. Grey-blue background	Oil Oil Oil	1.3 3.0 1.3	Linseed Walnut Linseed	
	Portrait of Hendrickje Stoffels No.6432	c.1656	1. White highlight of robe 2. Red background	Oil Oil	3.3 3.1	Walnut Walnut	5
	A Bearded Man in a Cap No.190	1657	1. Black coat 2. Ground	Oil Oil	2.7 3.5	Walnut Walnut	
	An Elderly Man as Saint Paul No.243	1659	1. Black sleeve of robe 2. Reddish brown, upper R.H. corner	Oil Oil	1.5 1.7	Linseed Linseed	

Artist	Picture	Date	Sample	Medium	P/S	Oil type	Note
	Portrait of Jacob Trip No.1674	1661	1. White scarf, right shoulder 2. Reddish brown, side of chair 3. Black, bottom of cane	Oil Oil Oil	3.2 1.2 1.8	Walnut Linseed Linseed	
	Portrait of Margaretha de Geer No.1675	1661	1. White ruff 2. Brown background 3. Ground	Oil Oil+egg? Oil	1.7 1.6	Linseed Linseed	6
	Portrait of Margaretha de Geer, Bust Length No.5282	1661	1. White impasto 2. Black background	Oil Oil+resin	1.4 1.5	Linseed Linseed	7
	Portrait of Frederik Rihel on Horseback No.6300	1663	1. White impasto, jacket trimmings 2. Red impasto, cuff trimmings	Oil Oil	1.8 1.7	Linseed Linseed	8
	Self Portrait at the Age of 63 No.221	1669	1. Dark brown, right sleeve 2. Olive-brown background at top edge 3. Ground	Oil Oil Oil	1.1 1.6 1.5	Linseed Linseed Linseed	
	Judas and the Thirty Pieces of Silver (Great Britain, private collection)	1629	1. Ground, upper layer 2. Ground, lower layer 3. Black of floor 4. Grey-green background	Oil Oil Oil Oil	1.4 2.1 1.8 2.3	Linseed Linseed? Linseed Walnut	9
<b>Pesellino</b>	Altarpiece: The Trinity with Saints No.727	1457	1. Pale blue sky, L.H. edge 2. Green of trees, L.H. edge 3. Warm white of bishop's smock 4. Bright red of R.H. Saint's crimson robe	Egg Egg+some oil Egg+some oil Egg+some oil			10
<b>Nicolas Poussin</b>	The Finding of Moses No.6519	1651	1. Pale blue sky, L.H. edge 2. Red ground 3. Bright red of female figure's cloak 4. Green, left sleeve of woman receiving Moses	Oil Oil Oil Oil	2.2 1.8 1.8 1.4	Walnut? Linseed Linseed Linseed	11
<b>Bernardo Cavallino</b>	Christ driving the Traders from the Temple No.4778	1645–50	1. Black of R.H. figure's robe 2. Brownish ground 3. Dark brown of ledge, architecture, L.H. side 4. Grey-brown, upper L.H. edge	Oil Oil Oil Oil	2.1 2.3 2.1 2.1	Walnut Walnut Walnut Walnut	