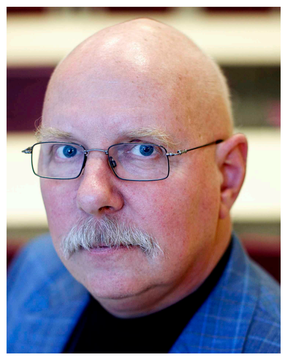

Investigating aged oil medium phase-separating and exuding as drips from a 1960's painting by Pierre Soulages

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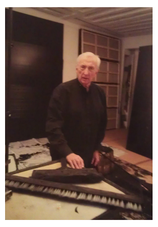
Condition of the painting

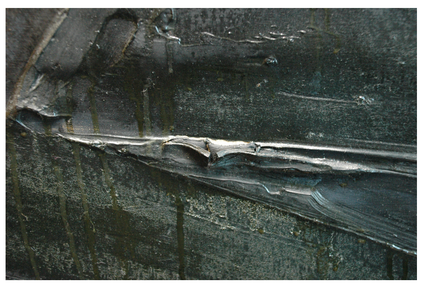


Pierre Soulages (born 1919) is a very prolific painter who is fascinated by the surface effects of black impasto paint on teal or red backgrounds.

He explored these painterly effects in hundreds of paintings.

The Art Institute of Chicago received a donation in 1965 of a painting made by Soulages in 1960. Unfortunately this painting now shows long drips of aged oil medium oozing from multiple spots in the thickly applied paint. First long drips were noticed in 1992 (length 4-50 cm).

We investigated the composition of paint and drip samples with MS, FTIR, Raman, SEM-EDX and micro-XRD to find out why this paint is failing and drips appear. Samples were taken in 2012 upon a reexamination of the painting.



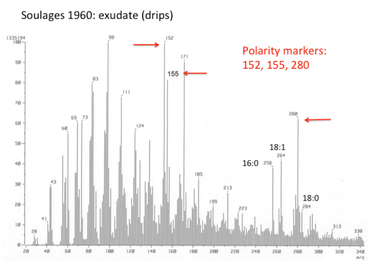
The Soulages research is part of a larger project of dried oil paintings that started to drip after a number of years. Other paintings studied are from his contemporaries J-P Riopelle, P. Borduas, G. Matthieu working in Paris in the 1950's and painters like Van Hemert, Walls, Meese and Tal-R who made works after 1990.

Softening paint is a major conservation issue since the paint surface often becomes sticky and attracts dust, fibers and other airborne particles. Thicker applied paints may accumulate so much unattached medium components that they start to ooze and form drips. Removal of these drips is not impossible but actually disturbs the outer surface shine leaving esthetically displeasing tracks.

Comparative studies

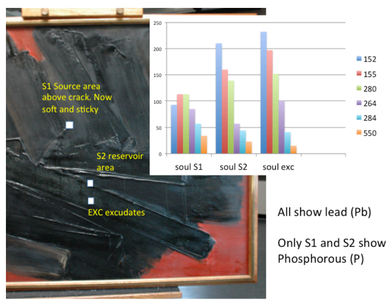
The DTMS fingerprint is very similar in many different dripping paintings. Here we present the drips of Soulages and compare those with paint and drips from a Riopelle painting from 1952

DTMS analysis of Soulages painting samples



DTMS shows the presence of polarity markers from midchain oxidised stearic acids (m/z 280, 155, 171) and azeleic acid (m/z 152). Relatively low palmitic (m/z 256) and stearic acids (m/z 284). Oleic acid (C18:1) m/z 264) is still present.

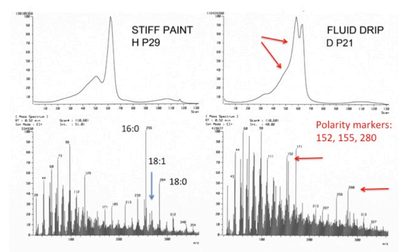
Drips have relatively higher amounts of polar fractions

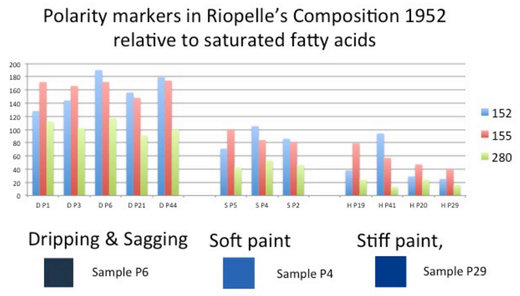


All show lead (Pb)

Only S1 and S2 show Phosphorous (P)

Riopelle's *Composition 1952*

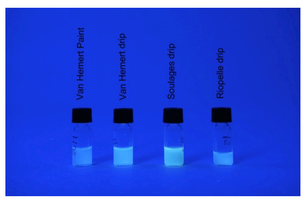




Softening paint and drips have relatively high contents of polar fractions. Their DTMS features are qualitatively similar. Further GCMS and ESIMS work support that.

It suggest the hypothesis that these fractions of the medium are mobile and not well anchored in the paint mass.

Other features:



Paints that drip are completely soluble in alcohol or acetone. The solutions are *fluorescent*.

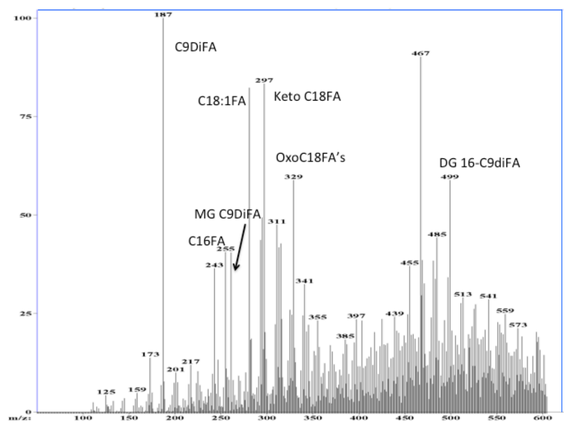
Drips and exudates on the painting are sticky and fluorescent !

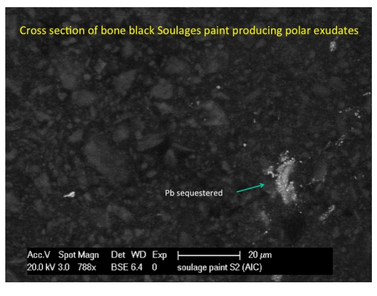
Negative ion ESIMS of Soulages drip material shows polar fractions

Diacids:
C6, C7, C8, **C9**, C10, C11

Fatty acids:
C16:0, **C18:1**, C18:0
Oxo-C18 (high intensity)
2x-oxo-C18
3x-oxo-C18

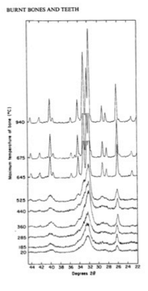
Acyl-glycerols
MG diC9 and MG diC9 –H2O
DG C16 & diC9FA,
DG C16 & diC8FA





SEM-BSE of bone black paint S1 taken from the Soulages painting. Lead appears to be sequestered in lead carbonate phases.

Micro-XRD studies reveal a poor crystallinity pointing to low manufacturing temperatures

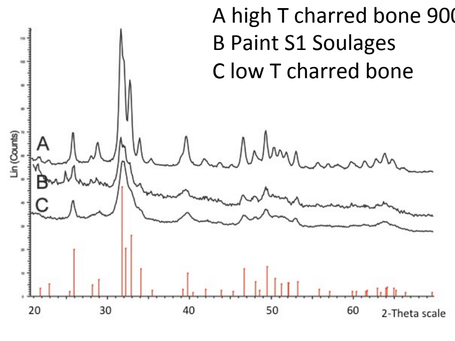


Bone anaerobically charred:

Sharper peaks for hydroxy-apatite at higher temperatures

Shipman et al (1984)
J. Archeol. Sci. 11, p.307-325

A high T charred bone 900 °
B Paint S1 Soulages
C low T charred bone



Low temperature charring leads to poor crystalinity which is evident in the Soulages paint

Observations:

1. Polar fractions exudate from the paint mass. The remaining paint mass is less polar.

2. Oleic acid is still a main compound pointing to a slow process oxidation of oxidation possibly due to high carbon content

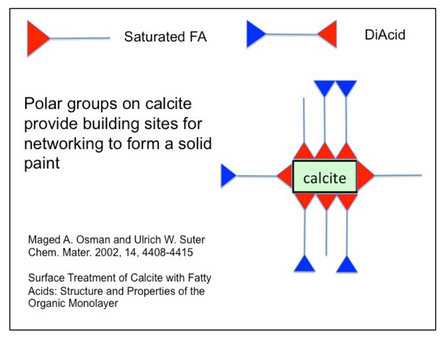
3. The paint is completely soluble in alcohol or acetone pointing to a presently non-consolidated oil paint. There is insufficient viscous cross linked material to form a solid hard oil paint.

4. The bone black is poorly crystalline pointing to a low charring temperature which may lead to carbon deposits on the crystal surfaces. This indicates a poor quality carbon black oil paint.

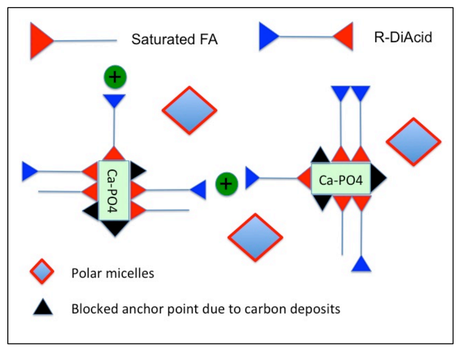
5. Lead that could bind the polar fractions appears to be sequestered in crystalline phases.

6. The polar fraction of the oxidising binding medium fails to anchor inside the paint mass due to blocked binding sites

Explanation model:



Inhibition of anchoring of acid groups prevents the stabilisation of aging oil paint and causes accumulation of binding medium fractions in polar micelles.



Conclusions:

Pierre Soulages must have used a poor quality bone black oil paint with insufficient lead drier to stabilise the oxised fractions developing in the drying paint. Additions of semi-drying oil either by himself or the paint manufacturer will have increased the fraction of non-cross linked oxidised material that failed to anchor

Acknowledgements: We thankfully acknowledge the assistance of Mark Verhoeven (AIC) for GCMS, Pedro Alves (U Lisbon) for (-)ion ESIMS, Dr Luc Megens (RCE, NL) for XRD. JB thanks Ida Bronken for collaborative work on paintings by Riopelle.