The Consolidation of a Zinc-Damaged Contemporary Oil Painting: Methods and Ethics

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Introduction

- Zinc oxide in oil paint may form a very stiff, brittle paint layer
- Cross-linking on drying is inhibited and reduced, resulting in a much more brittle and fragile paint film (Rogala, 2010)
- Zinc soaps may be formed through reaction of zinc-containing pigment and the fatty acids in oil- paints
- Reaction is likely catalyzed by environmental conditions such as high RH, fluctuating temperatures (Osmond, 2014)

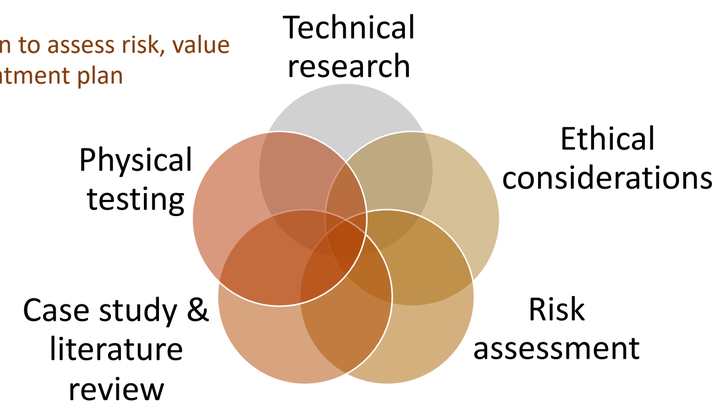
Case study: *Nu Féminin*

- Analysis and research completed on case study painting *Nu Féminin* (Barnes, 2014)
- Results hypothesized that the extensive delamination and cracking of the paint layer was the result of the zinc oxide content in the oil paint film
- Observation and characterization of the direction and form of the cracking and delamination

Objectives and Goals

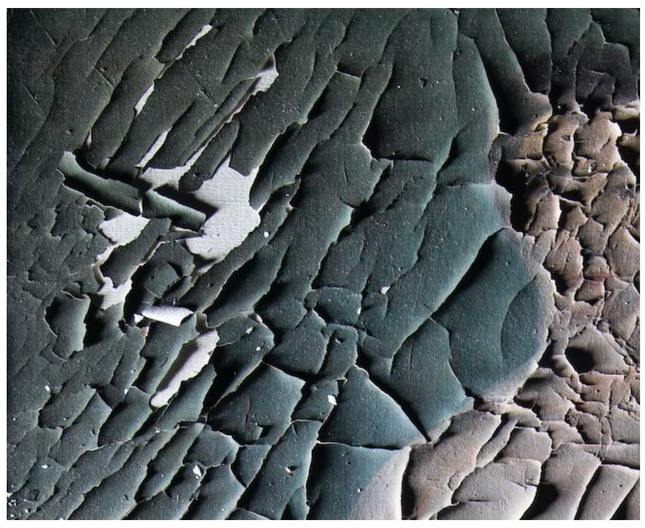
- Continued instrumental analysis of *Nu Féminin* to further investigate the presence of zinc soaps at delamination sites
- Interest in the relative concentrations of zinc soaps in different paint colours contributing to crack shapes and formation
- Investigation and discussion of ethical considerations of treatment
- Methodology for determining appropriate adhesives for use with zinc-rich oil paint film
- Flattening and consolidation of the paint layer for stability and legibility of image

Areas of investigation to assess risk, value and appropriate treatment plan



Case study: *Nu Féminin (*1967) oil painting on canvas with probable zinc embrittlement of paint film (BT, normal light)

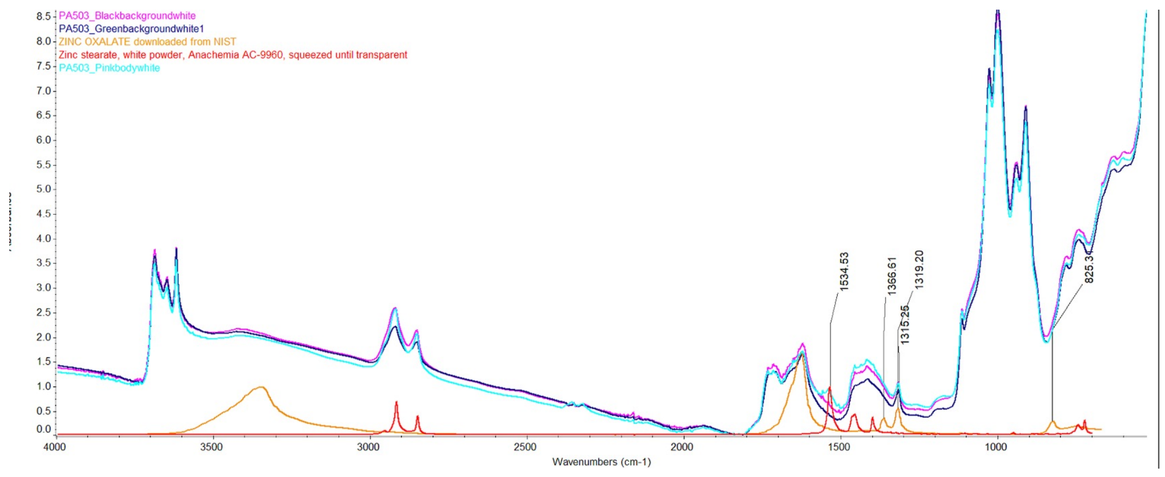
Crack pattern suggesting RH cycling resulting in expansion and contraction of canvas (BT, normal light)



Crack pattern suggesting shrinkage of canvas, resulting on local separation of ground and paint from canvas layer (BT, raking light left)

Experimental: Instrumental Analysis

Method of analysis	Goals	Results
ATR-FTIR	• Establish presence of zinc soaps at the delamination point	• Could not confirm the presence of zinc soaps or soap complexes
XRF	• Qualify and compare the zinc content of the different areas and colours of paint	• Large concentration of zinc on paint surface and on the bottom of the flake at delamination site
Glossmeter	• Ascertain base level of paint surface gloss pre-treatment	• Change in gloss, due to solvent interference with varnish layer (sacrificial)
Spectro-photometer	• Ascertain base level of paint surface colour pre-treatment	• No change in color after treatment



ATR-FTIR spectra depicting the delamination face of a paint chip from *Nu Féminin,* compared with the spectra of zinc soap complexes:

- Reverse side of paint chip, black background (lower left corner)
- Reverse side of paint chip, green background (upper right)
- Zinc oxalate downloaded from NIST
- Zinc stearate, white powder, Anachemia AC- 9960, squeezed until transparent
- Reverse side of paint chip, flesh area (middle left)

Experimental: Methods and Materials

Final treatment procedure

Adhesive application

- BEVA- 371 (1:1 v/v with xylenes) applied warm using a syringe
- Adhesive directed under the delaminated paint flake and onto the areas of bare canvas
- Small brush also used to distribute the adhesive evenly
- Adhesive dried for 24 hours

Flattening

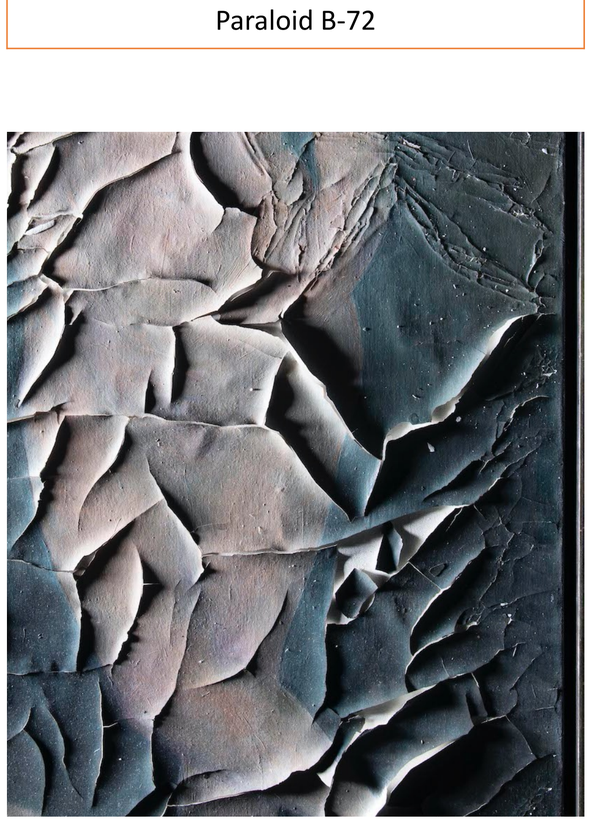
- To reactivate adhesive and soften paint film: Heat from below at 75°C
- Slow massaging of the cupping flake with a small curved wax carving tool, also at 75°C, through silicon Mylar film; Movement from the base of the cup flattening towards tip
- Small weight applied to Mylar film while adhesive cools and sets

Experimental: Methods and Materials

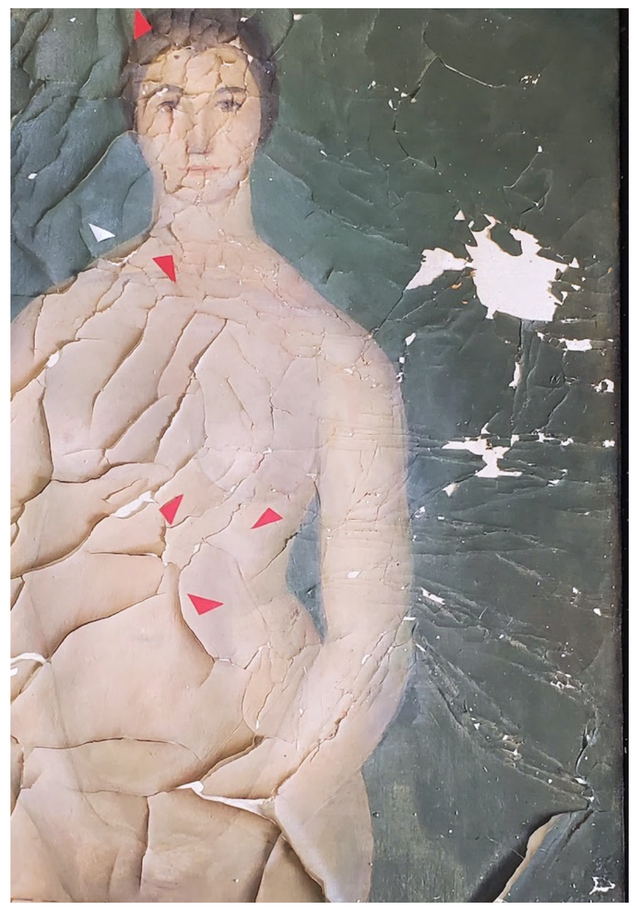
Flattening and consolidation trials

Flattening Methods
Hot-air pen
Tacking iron/wax carving tool
Heat table
Heat lamp
Hot plate
Adhesives
BEVA-371
BEVA film
AYAA
AYAF
Paraloid B-72

Flattening of cupping paint using wax carving tool and silicon-coated mylar (DT, normal light)



Crack pattern (BT, raking light left)



Section of consolidated paint layer (DT, normal light)

Conclusions and Discussion

- Although zinc soaps could not be conclusively identified, the treatment of *Nu Féminin* proceeded as if this were the case
- Treatment was partially successful. Some damage caused to the paint, especially during initial testing phases. The edges of the flakes were especially prone to crumbling
- Established and accomplished goals:
  - Stabilized paint
  - Protected and restored image
  - Developed and used method to avoid exacerbating zinc soap formation
  - Discussed ethical considerations and risk evaluation
- Research potential value still upheld: Tracking of aging qualities of treatment decisions
- Future considerations: Continued treatment and ongoing analysis

Selected References

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