AN INVESTIGATION OF THE STUCCO MURAL OF THE WHARTON ESHERICK MUSEUM SILO:

MATERIAL ANALYSIS AND CONSERVATION

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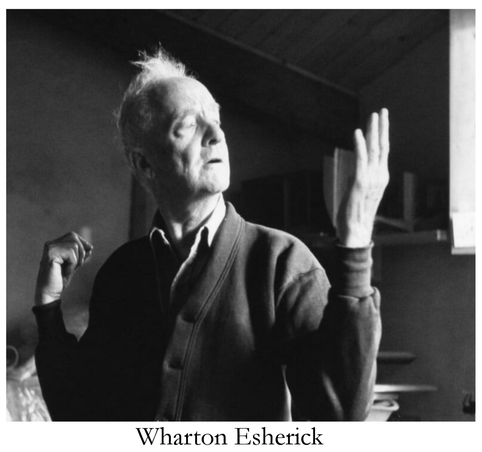
INTRODUCTION

In 1966, Wharton Esherick—pioneer of American modernist design—created a vibrant, site-specific stucco mural on the curved exterior of a concrete silo at his studio in Malvern, Pennsylvania. As his only outdoor mural and final architectural intervention, it represents the culmination of his lifelong pursuit of integrating sculpture, architecture, and color. Over time, however, the mural has experienced significant deterioration. Environmental exposure has led to pigment fading, surface erosion, cracking, and loss of cohesion in the cementitious layers. Previous conservation efforts have focused primarily on structural stability, leaving the mural's artistic surface vulnerable and undocumented. This project aims to investigate the mural's material composition, understand its mechanisms of decay, and propose conservation strategies. By combining archival research with scientific analysis, the study aims to inform future conservation efforts for this unique example of mid-century polychromatic stucco and contribute to the broader discourse on preserving modern architectural finishes.

HISTORY

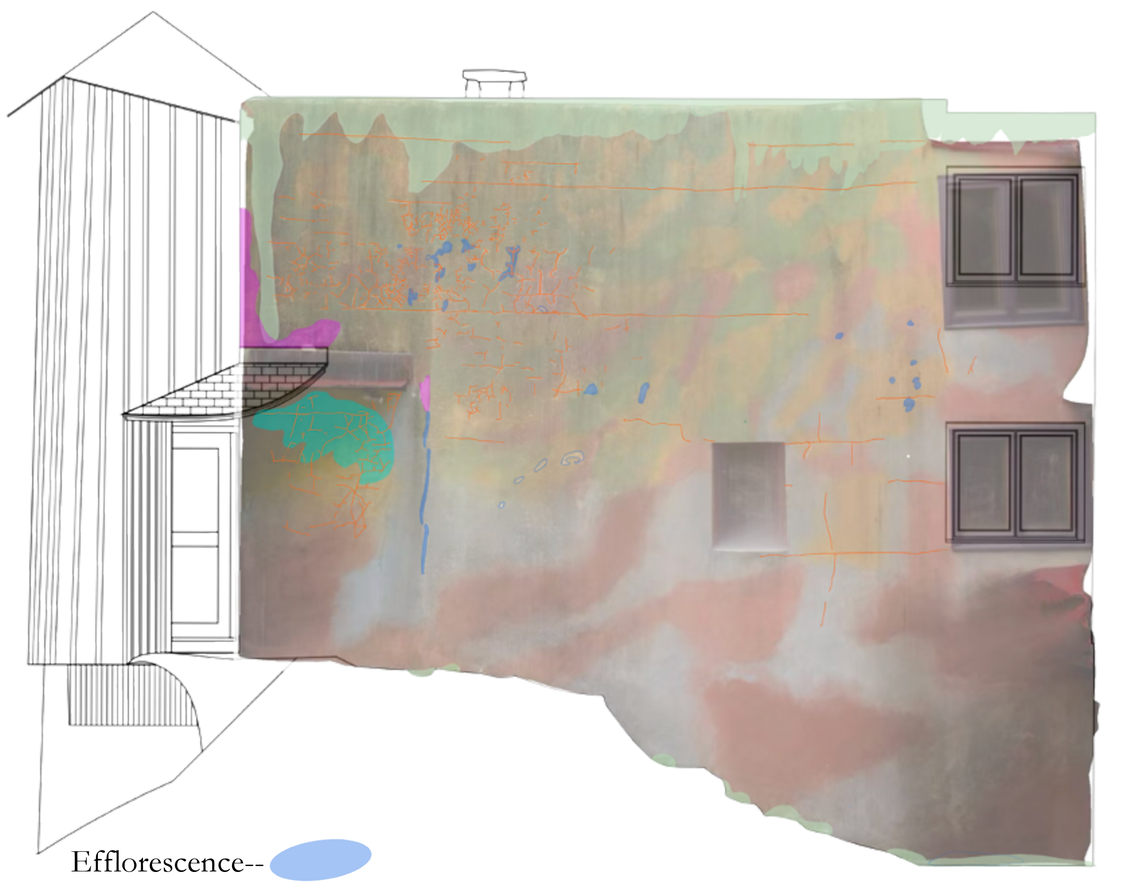

Wharton Esherick


South Elevation for the Silo

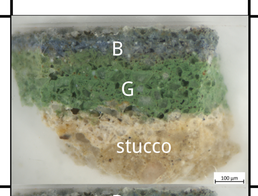
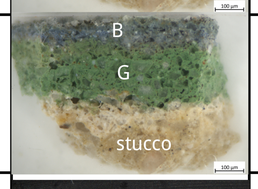
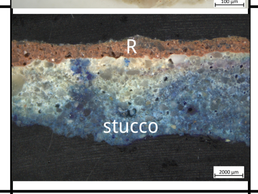
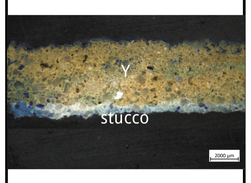
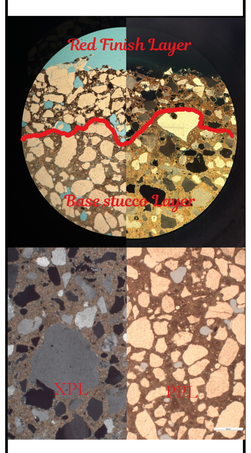
The silo mural, completed in 1966, marks the final architectural addition by Wharton Esherick (1887–1970) to his studio complex in Malvern, Pennsylvania. Esherick, known for blending sculpture, design, and architecture, envisioned the silo as both a functional space and a sculptural statement. Inspired by regional agricultural forms and modernist aesthetics, he worked closely with local craftsmen and his son-in-law, engineer Mansfield Bascom, to construct a uniquely curved form finished with hand-colored cementitious stucco.

This mural reflects Esherick's evolving artistic language —combining naturalistic themes, bold colors, and curving forms. It was created using custom-mixed pigments directly applied to fresh stucco, echoing fresco traditions. The work also draws on techniques developed in earlier projects, including his studio workshop co-designed with architect Louis Kahn and a series of domestic murals at his first home, Sunekrest.

CONDITION ASSESSMENT



MATERIAL ANALYSIS

Color	Samples	Analytical Evidence	Pigment/ Binder
Blue		- **Raman:** Peaks at ~548 & 258 cm^{-1} (ultramarine) - **XRF/SEM-EDS:** Na, Al, Si detected - **FTIR:** Si-O stretching, no organics	Ultramarine
Green		- **Raman: Peaks at** ~365, 543, 620 cm^{-1} - **XRF/SEM-EDS:** Strong Cr signal - **FTIR:** Broad metal oxide features	Chrome Green
Red		- **Raman:** Peaks at ~225, 293, 410 cm^{-1} (hematite) - **XRF/SEM-EDS:** High Fe content - **FTIR:** Fe–O and carbonate bands	Red Ochre
Yellow		- **Raman:** ~300–450 cm^{-1} (goethite) - **XRF/SEM-EDS:** Fe present, weaker than red - **FTIR:** OH bending, Fe–O consistent with iron hydroxide	Yellow Ochre
Binder		- **FTIR:** Calcite (1400, 870, 710 cm^{-1}), Si–O bands - **XRD:** Portlandite + calcite phases - **Petrography:** • Binder: Grey Cement (Relict of unhydrated cement grains)+Lime Lumps+Ash • Aggregate: Quartx +Plagioclase feldspar+Pyroxene+Chert+Calcite+Rock fragment with quartz/plagioclase/muscovite - **ICP-OES:** High Ca, Si, Mg; confirms Portland cement + dolomitic lime - **Volume ratios:** Cement:lime ≈ 1:1.3 to 1:0.77; Binder:sand ≈ 1:2 to 1:3	Lime–Portland cement

The exterior mural on the Wharton Esherick Silo shows advanced material degradation, primarily driven by prolonged environmental exposure and fluctuating moisture conditions. Field and visual assessments identified the following key deterioration patterns:

- **Surface Erosion:** Extensive pigment and binder loss along the mural's upper and western elevations, likely due to wind-driven rain and UV exposure.
- **Cracking:** Fine network cracks and larger horizontal fissures are concentrated along transition joints and beneath overhangs.
- **Efflorescence:** White crystalline deposits observed near the mural base and under the canopy suggest moisture infiltration and salt migration.
- **Tape Adhesion Testing (ASTM D3359):** Revealed poor cohesion in many areas, especially where finish layers have thinned or flaked, indicating active delamination.
- **RILEM Tube Water Permeability Testing:** Demonstrated high absorption rates in eroded and cracked zones, confirming compromised surface protection.
- **Infrared Thermography:** Detected uneven thermal behavior, with cooler zones near cracks and moisture-prone areas—indicating water retention within the substrate.
- **Soiling & Bio-growth:** Biological growth, particularly at junctions between the silo and studio, was observed prior to cleaning, often corresponding with damp or shaded areas.

CONCLUSION

This investigation reveals the complexity and vulnerability of Wharton Esherick's pigmented stucco mural, which merges modernist abstraction with handcrafted techniques. Material analysis identified a lime–Portland cement hybrid stucco and mineral-based pigments such as ultramarine blue and iron oxides. Field testing revealed surface erosion, poor cohesion, and high water permeability as primary concerns for deterioration. Future effective conservation approaches should consider material compatibility, surface integrity, and aesthetic preservation. By integrating scientific analysis with an understanding of Esherick's artistic intent, this research provides a foundation for the mural's long-term care and offers insight into the preservation of other experimental finishes from the mid-20th century.

Next Steps involve applying and evaluating selected consolidants—including nanolime, TEOS, waterglass, and ammonium oxalate—on mock-up samples, followed by in-situ testing on the mural. These trials will inform final treatment recommendations tailored to the mural's material behavior and visual character.

Acknowledgments

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