The Rupture of *Mont St. Hilaire*:

Instrumental Analysis to Discover the Causes of Deterioration

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Introduction

Mont St. Hilaire, a fiberglass-over-foam sculpture, was made by Jordi Bonet in 1971 for Queen's University. The sculpture remained outdoors on the Queen's campus for 22 years exposed to all weathers, until it was acquired by the Agnes Etherington Art Centre (AEAC) and relocated indoors due to its deteriorated state. The lower-right corner of the fiberglass coating had cracked and detached, exposing the inner foam core of the sculpture. A thorough analysis of the material composition of the paint and resin coatings, and foam core was completed using Fourier transform infrared (FTIR) spectroscopy, x-ray fluorescence (XRF), reflected light microscopy, and visual examination. Establishing the exact composition of the materials facilitated a recommendation for treatment and maintenance program for the sculpture.

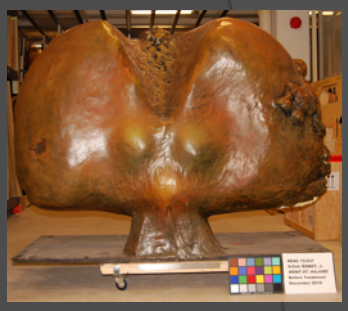

Fig 1. Mont St. Hilaire, Jordi Bonet, 1971

Experimental Methods

The experimental methods used:

- Visual examination: assessed the sculpture's physical condition
- Reflected light microscopy: investigated the paint layers composition
- Fourier transform infrared (FTIR) spectroscopy: determined resin and foam composition
- X-ray fluorescence (XRF): determined the elemental composition of the paint layer

Table 1. Samples collected for analysis

Type of Sample Collected	Experimental Method for Analysis
Paint and resin coating	Fourier transform infrared spectroscopy
Foam	Fourier transform infrared spectroscopy
Cross-sections	Reflected light microscopy
Detached piece 008	X-ray fluorescence

Fig 2. Detail of damaged area on sculpture

Results and Conclusions

Summary of results:

- Visual examination: unstable condition, flaking paint, abrasions, major area of detached resin coating
- Light microscopy: paint layer consists of two layers of paint over resin over a foam core
- FTIR: polyester styrene resin was used for the resin coating over a polyurethane foam
- XRF: paint layer is composed of mainly lead with traces of iron, chromium, cobalt, copper, and zinc

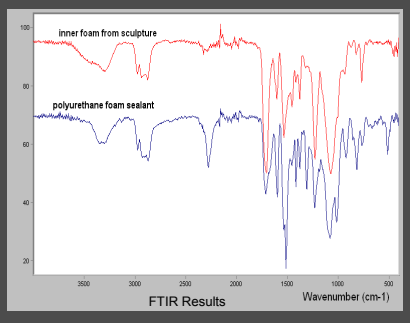

Fig 3. Foam from sculpture compared to a polyurethane foam.

Fig 4. Cross-section of paint layers and foam under reflected light microscopy revealing layers consisting of paint, resin, paint, resin, paint, and foam.

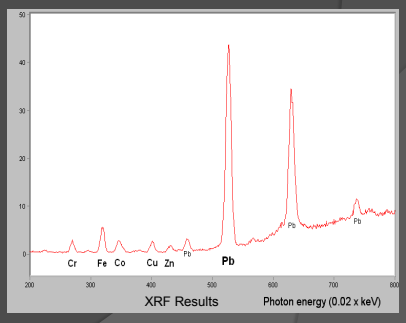

Fig 5. Paint layer contains high amounts of lead and trace amounts of chromium, iron, cobalt, copper, and zinc.

Visual examination and FTIR analysis concluded that absorption of water by the foam core had not caused the deterioration because the sculpture was composed of non-absorbent polyurethane foam. The cause of deterioration is likely the tendency for thinly-applied polyester resins to become brittle and form small cracks which allow moisture to penetrate and weaken the surface. It is recommended that the Agnes Etherington Art Centre monitor the deterioration of the sculpture as it is stable in its current environment, and that the sculpture not be returned to its previous outdoor environment. Should the sculpture undergo conservation treatment the area of loss and flaking paint should be stabilized. Possible materials which could be investigated further for eventual treatment are: polyester resin fixed over an inlay material, hide glue in Plextol D 540 in a 4:1 mixture with calcium carbonate, heating resin to reshape, and polyethylene ethafoam to replace missing polyurethane foam.

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