McCRONE ASSOCIATES. INC.
850 Pasquinelli Drive • Westmont, Illinois 60559-5539
630-887-7100 • Fax: 630-887-7417

17 January 2008

Subject: Analysis of Painting, *Watching the Shot*
Re: McCrone Associates Project MA45869

Dear Mr. Allan:

We have completed our analysis of your painting, *Watching the Shot,* which we received from you by hand on 21 August 2007. At that time, we also received a copy of the treatment report of 06/05/2007 from the New Orleans Conservation Guild, Inc., which had performed restorative treatments on the painting.

Analytical Request

This painting has been attributed to Winslow Homer, American artist, 1836–1910. You requested that we examine the materials and determine, insofar as possible, whether the materials present in this painting are consistent with availability during Homer's lifetime.

Examination

The painting is 53.5 cm (21 inches) high by 79.0 cm (31 ⅛ inches) wide, painted on canvas which has been relined and mounted onto a wooden stretcher (Figure 1A). There is an octagonal foam board attached to the wooden stretcher on the back (Figure 1B).

Inspection with ultraviolet fluorescence illumination revealed numerous areas of restoration, which appeared dark. These relate well to damage to the painting seen in a pre-restoration photograph that had been provided to us. The background fluorescence was a light blue-green.

Inspection with a stereomicroscope shows that craquelure is present and more or less uniform throughout the painting except in those areas that have been restored.

On the bottom right corner of the painting, there are paint strokes that suggest the possibility of a signature (Figure 1C).

X-radiography

The painting was x-rayed at a local hospital at 50 kV and 2 mA. The four separate images generated were assembled into a composite with Adobe Photoshop CS2™; the composite is included as Figure 1D. The x-radiography clearly shows the extent of the original damage to the painting; the early losses can be seen as black patches and lines.

Sampling

Small samples of paint from each of the relevant colors were taken with an extremely fine-pointed tungsten needle. The sampled locations are summarized in Table I.

A portion of each sample was mounted onto a glass microscope slide for polarized light microscopy (PLM) analysis, which provides information about the particulate constituents including color, morphology, and crystalline characteristics of the material.

A portion of each sample was also mounted onto a beryllium planchet for energy dispersive x-ray spectrometry (EDS) on the scanning electron microscope (SEM). SEM/EDS analysis is performed to identify the elements present in each sample. The spectra generated during these analyses are included as figures in this report.

Portions of several samples were also mounted onto a potassium bromide substrate for infrared spectroscopy analysis (IR) of the medium. Fractions were treated with phenol and other solvents in order to separate the medium materials from the pigments. In addition to providing insight into the nature of the binding medium, IR confirmed the presence of Prussian blue in several samples.

Discussion

Sample 1 consists of a lead white ground overpainted with green paint. The green paint contains both lead white and zinc white. An iron earth pigment, probably raw sienna, is present as well, but no blue pigments were identified in this sample. Copper was identified in the EDS spectrum, but no copper-containing pigments were identified by PLM. We suspect that the copper may be present as a contaminant resulting from framing, cleaning or one of the restorative treatments.

Several blue pigments were identified in this painting: synthetic ultramarine blue, Prussian blue, and cobalt blue. The cobalt blue, identified positively in Sample 4 (see Figure 5), has an unusually low refractive index for this material, making it difficult to distinguish from ultramarine blue, with which it shares a number of microscopical characteristics. Synthetic ultramarine blue was positively identified in Sample 2. The

EDS spectrum of Sample 9, blue, is dominated by the white pigments; the ultramarine blue and bone black were identified using PLM only.

Infrared Spectrographic Analysis

IR analysis of Samples 7, 8 and 9 (Figures 12A-14B), both "as is" and of extraction residues using the solvent phenol, confirmed the presence of Prussian blue and, when combined with other tests, suggests the presence of both a drying oil and a small amount of acrylic as non-pigment materials present in this painting.

Prussian blue has a prominent and highly distinctive absorption band at about 2090 cm^{-1}, and all three samples included this band in their spectra; it is especially prominent in Figure 14A.

The binding medium was determined to be, most likely, a drying oil (such as linseed oil, for example), although there is also some evidence for the presence of a small amount of an acrylic, most likely the result of restorative treatments. The spectra included as Figures 12A, 13A and 14A all show a number of characteristics consistent with a drying oil (Figure 12D). Figures 13A and 14A also suggest the presence of zinc stearate (Figure 14B). Zinc stearate is a commonly encountered reaction product between a drying oil and the pigment zinc oxide, suggesting the presence of a drying oil. Furthermore, a microchemical test, the "foam test," was performed on portions of Samples 1 through 6, with vigorously positive results from Samples 1, 3, 4, and 6, and weaker reactions from Samples 2 and 5. (This test is most sensitive for drying oils, and less sensitive for egg yolk, casein and gums. Acrylic binders produce very little or no reaction.) This is consistent with the IR results, suggesting that this painting's binding medium is a drying oil.

The IR spectrum of the phenol extraction of Sample 8 (Figure 13B) is consistent with the spectrum of styrene/butadiene (Figure 14B); styrene is a common component of acrylic varnishes and binding media. The presence of a small amount of acrylic materials on an oil painting is consistent with a painting that has received extensive restoration, which this painting certainly has had.

Conclusions

All of the materials identified in this painting are consistent with Homer's lifetime and represent a typical palette of the late nineteenth through early twentieth centuries. Prussian blue was invented in the early eighteenth century, and zinc white was widely available by the early mid-nineteenth century, as was synthetic ultramarine. All other pigments identified in this painting have been available since ancient times. The binding

medium was identified as a drying oil. A small amount of other material, possibly an acrylic, was also tentatively identified; this is a modern material that is consistent with the painting undergoing restorative treatment.

Disposition of the Work

The painting was returned to you by hand on 21 August 2007. The samples taken from the painting will be retained in our files in the event you may require further analysis.

Thank you for consulting with McCrone Associates. If you have any questions concerning any portion of this report, or should you require further analysis, please do not hesitate to call.

Sincerely,

Joseph G. Barabe
Senior Research Microscopist
Director of Scientific Imaging

JGB:jc
Enclosures
Ref: MA45869; retainer

TABLE 1

Painting Constituents Identified in *Watching the Shot*

No.	Color & Item	Sample Locations		Constituents Identified	Figure Numbers
		Vertical	Horizontal		
1	White ground	25.5 cm from top	Right edge	Lead white	2A-2C
	Green overpaint			Lead white Zinc white Copper-containing material Raw sienna	
	Canvas			Bast fibers, probably flax	
2	Blue uniform	17.2 cm from top	13.8 cm from right	Zinc white (major) Lead white (minor) Ultramarine blue (synthetic) Iron earth	3A, 3B
3	White river foam	7.1 cm from bottom	10.8 cm from right	Lead white	4
4	Light blue sky	12.1 cm from bottom	4.1 cm from left	Lead white Cobalt blue Zinc white	5
5	Yellow foliage	13.4 cm from top	2.4 cm from left	Chrome yellow Lead white Zinc white Red lead (minor) Raw and/or burnt sienna	6
6	Bright green foliage	13.0 cm from top	2.3 cm from left	Lead white Chrome yellow Prussian blue Zinc white Barium sulfate	7
7	Dark brown tree trunk	18.8 cm from top	0.8 cm from left	Lead white Prussian blue Cobalt blue Zinc white Unidentified red organic	8
8	Dark green over brown foliage	13.5 cm from bottom	1.9 cm from left	Lead white Iron earths: yellow ochre, red ochre, burnt sienna, bone black Prussian blue Ultramarine blue (traces) Vermilion (traces)	9
9	Dark blue cap	30.0 cm from top	9.8 cm from left	Lead white Zinc white Ultramarine blue Yellow ochre Bone black	10
10	Black signature	3.3 cm from bottom	4.2 cm from right	Bone black Lead white Iron earth (traces) Zinc white (traces)	11