

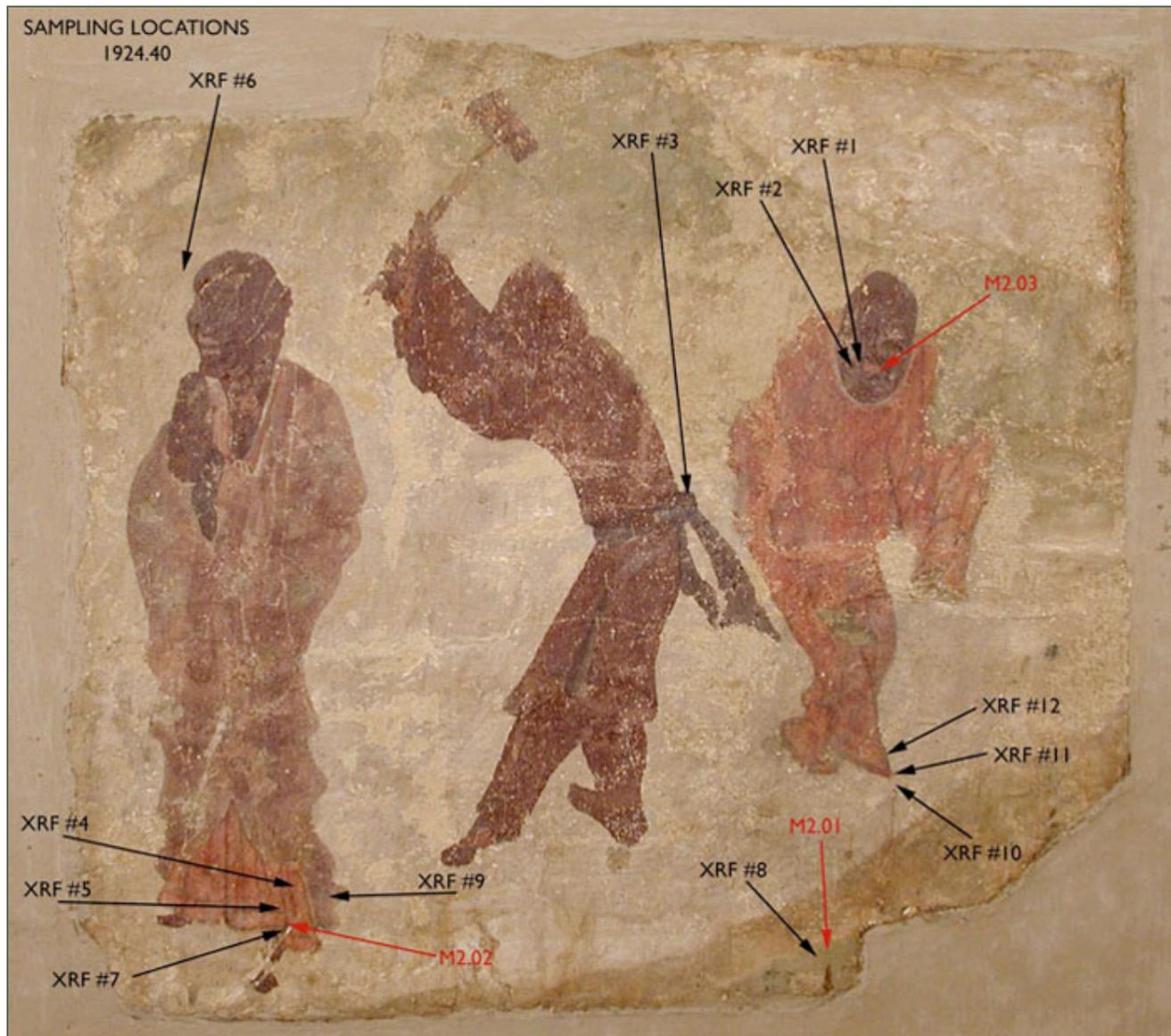
When Objects are Beyond Conservation: Recovering Visual Information from Damaged Artifacts

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Introduction

Conservators engage with legacies of the past; specifically, how artifacts were created, used, collected and conserved. Most museum collections contain historically significant objects that may never be displayed or studied because they were damaged by prior collecting or conservation processes. Damaged objects, however, are worthy of investigation because they evidence the moment of their creation, and more recent attempts to collect and conserve them.

This article summarizes recent analytical work on five Tang Dynasty period wall painting fragments from Dunhuang in the Harvard University Art Museums (HUAM) removed by Langdon Warner during the then Fogg Art Museum's First China Expedition in 1924 (1) [foot1]. Eight of the twelve wall painting fragments collected were so damaged from Warner's use of the *strappo* transfer technique that they were never exhibited. This project at the Straus Center for Conservation (SCC) at HUAM sought to understand both the original Tang dynasty materials visible in these fragments, and identify the modern materials applied to the fragments during their removal and subsequent conservation treatments (2) [foot2]. Our study also expanded earlier analytical work completed at the Fogg in the 1930s by chemist Dr. Rutherford Gettens (3) [foot3].



Traces of the Tang Dynasty: Recent Analysis

Five painting fragments from Caves 321, 323 and 335 were examined under magnification, and elemental analysis on seven differently colored areas was performed using x-ray fluorescence (XRF). Destructive sampling techniques such as x-ray diffraction for pigment identification, and cross-sectional analysis for stratigraphic study, were used sparingly.

Analysis revealed that the limited palette used within different caves was very similar, and that Dunhuang painters achieved a remarkable variety of colors and tones by using complex mixtures and layers of mineral and organic-lake pigments. Using magnification and cross-section examination, it was clear that colors were modulated by using different grinding sizes of pigments, painting in overlapping pigment layers or overlaying thin washes of color.

The reds and oranges show the greatest variation in colors. Red iron oxide is generally present as a base color, which is then mixed with vermilion, red lead or organic colorants for brighter red-orange colors. Vermilion is consistently seen as the main component in the bright red areas in the wall painting fragments, though it is also used with iron oxide to produce darker red browns.

Browns are a base color of iron oxide combined with lead white, chalk, red lead and copper colorants such as azurite or malachite. Some areas which are currently brown were originally intended to appear red or orange, since both red lead and vermilion can darken with light exposure. In cross-section, these areas show an extremely thin homogenous dark layer over thick orange red pigment layers. Ochre colors were made by mixing fine grindings of copper colorants with iron oxides, or by overlaying them with iron oxide toning layers. It is unknown how yellows were achieved, though one fragment from Cave 335 shows a pale yellow organic colorant cast on a chalk and iron oxide layer.

Blues and greens are copper colorants — azurite and malachite, respectively — and differences in their hues result from mixing the two pigments, and the use of iron oxide toning layers. In addition, finer grinding sizes of both pigments resulted in more diffuse, lighter colors, while coarsely ground pigment layers produced brighter and more saturated colors. Cross-sections taken from a fragment from Cave 335 showed that dark blues consist of several layers of pigments; red lead was laid over a white ground, and followed with a layer of coarse azurite and finished with a thin blue wash, possibly indigo.

Chalk appears to be the most commonly used white. Whites are rarely seen as individual colors, but rather exist as a priming layer, or as a base upon which thin washes of iron oxides, red lead or organic colorants were added to create flesh or mauve tones. Carbon black was mixed with iron oxides, red lead and malachite to create various dark tones.

Traces of the Twentieth Century: Recent Analysis

Since Warner never identified the materials he used to strip the paintings from their original locations, the Dunhuang literature contains numerous inaccuracies about his actual removal technique. Therefore, it was essential to analyze pieces of the original cloth facing Warner used to remove the fragments (4) [footnote 4]. Fourier Transform Infrared Spectroscopy (FTIR) analysis revealed that Warner used gum Arabic, and rabbit skin glue or Nikawa (an animal glue), to consolidate the wall surfaces and attach the cloth facing layers, respectively. Cellulose nitrate and polyvinyl acetate, which were applied during conservation treatments at the Fogg Art Museum laboratory in the 1920's and 1930's were also identified on the facing. The extensive use of polyvinyl acetate as a consolidant on the fragments has unfortunate consequences for the investigation of Tang Dynasty materials; the organic colorants which fluoresce under ultraviolet light cannot be seen because of they are coated with polyvinyl acetate, which also fluoresces. A thick coating of beeswax, identified by FTIR on one fragment from Cave 335, also obscures such details.

Conclusion

Despite the unfortunate condition of some of the Dunhuang fragments, they provide significant artistic and technical information about the materials and methods of the Tang Dynasty era painters. In the course of this study, we broadened Rutherford Gettens' original work by examining fragments he did not study, and by exploring further the variations in color produced by the extensive use of mixtures of pigments and the practice of layering paint colors. We also identified the modern materials applied to the fragments, thus clarifying the misinformation about Warner's and the Fogg's attempts at conserving

development and failure of materials used in our own field. These fragments remind us of the elusiveness of 'reversibility' in conservation, and also exhort us to document our work and our decision-making processes.

Notes

(1) [#note1] For an in-depth discussion of the removal and conservation of the wall painting fragments, see *Object Lessons: The Politics of Preservation and Museum Building in Western China in the Early Twentieth Century*. *The International Journal of Cultural Property*, Vol. 14, Issue 1, February 2007: pp1-32.

(2) [#note2] We are grateful for additional analysis completed by Dr. Narayan Khandekar of the SCC, and data provided by Getty Conservation Institute conservators Francesca Pique and Lisa Shekede.

(3) [#note3] Gettens' unpublished analysis on Dunhuang pigments was completed in 1936.

(4) [#note4] Many thanks to Dr. Francesca Bewer for bringing these fragments to our attention.