

Paint Analysis

Consumer/Home/Recreation

The Painting Conservation Laboratory of The Cleveland Museum of Art (CMA), Cleveland, Ohio is responsible for the preservation and restoration of the museum's internationally renowned collection of paintings, some of which date to the 13th century. The laboratory often conducts technical research to analyze an artist's technique or to produce other information important to conservators and art historians; on occasion, analysis provides vital clues where there is a question of authenticity.

For artworks with multiple, complex layers of paint, the laboratory conducts "cross-sectional analysis," which involves microscopic scanning of a cross-section of a paint chip for study of the various layers prior to undertaking a restoration or maintenance treatment — for example, in deciding whether a particular paint layer is original or a prior restoration.

A cross-section provides a chronology of the artist's working method. Seemingly a flat coating on a canvas, a painting is actually a complex three-dimensional structure, created as the artist builds up layers of paint to develop subtle effects of tone, color and surface texture. Through cross-section viewing at high magnification under a variety of lighting conditions, conservators can distinguish original from restoration layers, determine the composition of individual layers, and acquire other information pertinent to conservation processes.

A problem relative to cross-sectional analysis is the method of preparing the sample, traditionally an extremely time-consuming manual process that often produces unsatisfactory samples. Samples are rarely flat enough for proper viewing at higher magnifications; surfaces are frequently marked by scratches; and the resulting cross-sections are unlikely to be of a quality suitable for publishable photography.

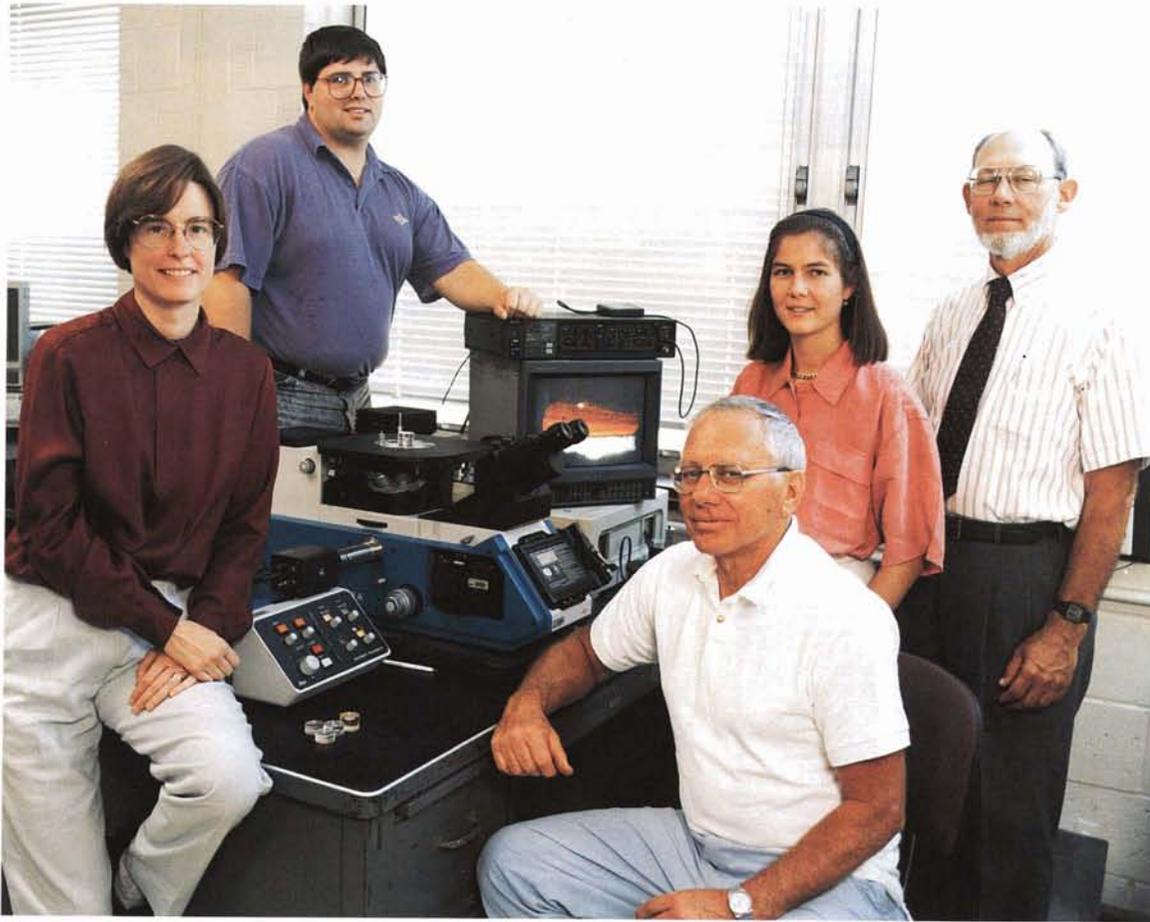
Looking for a better way, CMA and Lewis Research Center collaborated on a research project in which the NASA center's expertise and technology were applied to development of a new method of preparing cross-sectional samples.

The research was conducted by Lewis' Metallography Laboratory, which was provided paint sample particles from a 19th century portrait. After a number of experiments, the laboratory devised a two-step automated method that produces intact, perfectly flat, polished paint cross-sections, for photomicrography or for use in analysis techniques such as electron microscope scanning and biological staining. Lewis used a sophisti-

cated, microprocessor-controlled grinding and polishing machine normally employed in preparation of exotic samples for aerospace research, but the technique is readily adaptable to use with less sophisticated grinding and polishing equipment.

In the **upper photo** is a highly-magnified cross section of a paint chip prepared by the traditional method, with the layers poorly defined. In the **bottom photo** is the same cross section photographed after grinding and polishing by the Lewis-developed method; the sample is perfectly flat and its layers are clearly defined.





Above are the Lewis/CMA participants in the research project, from left, Marcia Steele, CMA; Todd Leonhardt, a Lewis metallographer who devised the automated sample preparation process; William J. Waters, Lewis; Christina Currie, CMA; and Anthony Ratajczak, Technology Transfer Officer at Lewis Research Center. In the same photo, on the black tray atop the desk, is a small cylinder containing an encapsulated paint chip, its profile visible on the console screen; technicians use this equipment to identify and photograph specific segments of the sample for analysis.

At right, researchers are examining the composition of individual paint layers; Lewis' James Smith (at the console) is flanked by CMA's Steele and Currie. The equipment pictured, normally used for qualitative evaluation of aerospace metals and ceramics, provides very high magnifications for investigation of the microstructure of a material.

The automated sample preparation process has been used successfully on a wide range of CMA paintings. The museum and Lewis Research Center are exploring other avenues wherein NASA technology might be employed to the advantage of art museums.

