Harvard University Art Museums
32 Quincy Street
Cambridge, MA 02138
www.artmuseums.harvard.edu

Artist: Cranach, Lucas (Elder, Younger, or workshop)
Nationality: German
Date: 16th Century
Title: Christ Blessing the Children.

Seventeen locations were examined by x-ray fluorescence (XRF) spectroscopy. Six samples were collected for examination by cross-section, and two (samples 1 and 2) of the cross-sections were examined by scanning electron microscopy (SEM-EDS). A portion of sample 2 was examined by polarized light microscopy (PLM). Two samples of the canvas support were sent away for Carbon-14 analysis. Full sized digital images of the cross-sections are supplied on the accompanying CD.

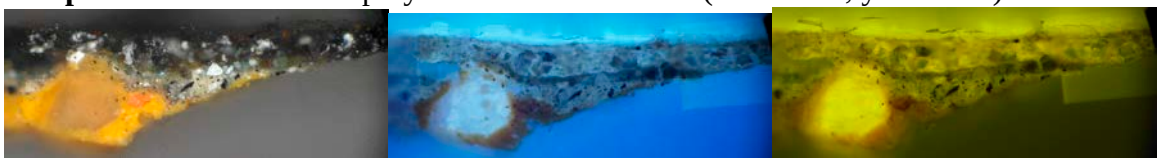
Note: All measurements use the lower left corner as the origin i.e. x=0mm, y=0mm. Cross-section were photographed at 200x using visible light, and UV light with DAPI (Blue) and FITC (yellow) filters.

Sample 1. From the yellow inscription above Christ's head (x=600mm, y=811mm)

The sample shows a double ground preparation. The lower ground is an orange layer made up of red earth pigments, quartz with lead white and/or red lead. The upper ground is grayish in colour made up of lead white, a copper containing blue (most likely azurite), calcite, red earth and charcoal. This double ground is seen in all the samples.

There is a black layer made up of a fine carbon based pigment. The yellow which makes up the inscription is the uppermost layer and made up of lead-tin yellow Type I. This pigment dropped from use after c. 1750 and was rediscovered in 1941. The large translucent formations on the yellow layer are lead soaps and indicative of oil as the binding medium.

Sample 2. From the drapery on Christ's shoulder. (x=471mm, y=575mm)



This sample has the double ground. There is a large lead soap formation in the orange ground indicating that the ground is oil based.

Over the ground is a blue/grey layer containing a copper based blue, most likely azurite. This layer also contains lead white, calcite and some charcoal.

The next layer is a black glassy material which turned out to be discoloured smalt. This is a very unusual discolouration for smalt, which usually starts off as a deep blue and becomes a washed out light grey as the blue fades. The smalt layer also contains vermilion, lead white and barium sulphate (barytes).

Sample 3. From the red dress of the shorter woman holding a child on the LHS of the painting. (x=281mm, y=80mm)

This sample again shows the double ground. Over this is a layer of fine black carbon based black. The red appears to be a mixture of madder and insect based red (lac and/or kermes) judging by the different fluorescences in this layer. The mixture of reds suggests that a possible source could be extracted dyes from fabric rags.

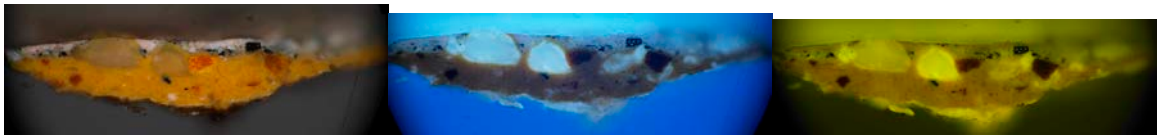
Sample 4. From the dark dress of the taller woman holding a child on the LHS of the painting. (x=334mm, y=504mm)

The double ground is clearly evident. The upper ground has a lead soap formation confirming that the upper ground is oil based. The dress is a fine particled black pigment.

Sample 5. From the yellow robe of the figure to the far left of the painting. (x=77mm, y=205mm)

Only the double ground was observed in this sample, with the possibility of a red earth pigment particle on the surface.

Sample 6. From the forehead of the child to the left of centre. (x=411mm, y=225mm)



The double ground is evident. The upper ground contains a particle of charcoal which has preserved the cell structure nicely. The flesh layer is made up of lead white, vermilion and some yellow earth.

Carbon-14 analyses

Two samples of canvas were sent to the center for applied isotope studies, University of Georgia for examination. The date for the first sample was returned as 1430±30 years. The second was 1270-1400AD. It was pointed out that there are some difficulties with the calibration curve around this age. The operator was also not confident of the workup for the canvas which can lead to samples appearing older than they genuinely are. In light of this, the carbon-14 can be seen as confirmation that this is not new canvas, and not impossible for the anticipated age of the painting.

Summary

The carbon-14 showed that the canvas is of an appropriate age for the painting. The pigments appear to be prepared in a manner consistent with pre-industrial revolution (late 18th century) methods. The painting is executed over a double ground. The first ground is orange and the second ground is grey. The medium is oil. The painting contains lead tin yellow which was not available after 1750. There is also the very unusual presence of smalt which now appears black. The XRF analysis shows two interesting features. The first is the presence of zinc in the green passages. This is attributable to the use of brass in the making of the copper based greens. The second is the presence of arsenic, which is presumably related to the presence of orpiment or realgar (emerald green in retouchings also has to be considered). Nothing observed was inconsistent with a painting completed around the time of the sixteenth century.

Dr. Narayan Khandekar
Senior Conservation Scientist
11 July 2006