Materials in Art & Archaeology

Recent Activities:

We have developed a new X-ray technique to analyze and image the paint stratigraphy of Old Master paintings. The method is called Macro X-ray Fluorescence Spectrometry and allows for the elemental analysis of artwork as well as the visualization of hidden paint layers. Over the past year our method was used in major museums in the USA, the UK and the Netherlands. Our work has enabled the discovery of a new self-portrait by Rembrandt in the J. Paul Getty Museum in Los Angeles (see inset on the right). Other hidden paintings were discovered in the work of Goya (National Gallery, London), Jackson Pollock, Rene Magritte (Museum of Modern Art, NY, NY) Vincent van Gogh (Art Institute, Chicago, IL) and Gover Flinck (Rijksmuseum, Amsterdam, see inset on the left). Our work has been published in academic journals, both in art historical and scientific titles. In addition, our discoveries were featured in 4 museum exhibitions over the past year, which was publicized widely and received both national and international press attention.

Inset on the right:
The painting An Old Man in Military Costume in the J. Paul Getty Museum, by Rembrandt Harmensz van Rijn, was studied using two complementary, element-specific imaging techniques—neutron activation autoradiography (NAAR) and macro-X-ray fluorescence (MA-XRF) mapping—to reveal the second, hidden painting. NAAR provided a strong image of the face and cloak of the underlying figure, along with an indication of the chemical composition. The single-element distribution maps produced by MA-XRF mapping provided additional details into the shape of the underlying image and the composition of the pigments used. The underlying figure’s face is richer in mercury, indicative of the pigment vermilion, than the face of the figure on the surface. Likewise, the cloak of the underlying figure is richer in copper than the surface figure though the identity of the copper-containing pigment cannot be determined from these data. The use of iron earth pigments, specifically Si-rich umbers, is indicated through the complementary information provided by the NAAR and MA-XRF maps. These data are used to create a false color digital reconstruction, yielding the most detailed representation of the underlying painting to date.
Key publications:


Media Coverage:

Wall street Journal:  

LA Times:  

Volkskrant:  

museum exhibitions:

Rembrandt, Mauritshuis, Den Haag, 11 juni – 13 september 2015  

Vincent van Gogh, Art Institute Chicago, 6 januari – 10 mei 2016  

Van Gogh, Metropolitan Museum of Art, New York, 12 mei – 16 augustus 2015  

Goya, the National Gallery, 7 oktober – 10 januari 2016  