

## *The three-handed lady - X-rays*

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### **How do they work?**

X-rays are waves of energy, like light waves or radio waves. When they hit an object their energy will be absorbed to a greater or lesser extent, depending on what the object is made of. The remaining energy will be reflected back from the object. This reflected energy can be recorded on film, just like light energy reflected into a camera. X-rays are of even shorter wavelength than ultraviolet radiation and hence are able to penetrate materials that are opaque to both visible light and ultraviolet radiation. The x-rays are absorbed or pass through various materials depending on their density.

### **Why X-ray a painting?**

Radiography is a valuable tool in the examination of paintings and can be of use in revealing changes that may have occurred during the different stages of the painting's development.

The components of a painting examined by radiography will undergo varying absorption depending on their density, thickness and composition and the wavelengths of x-rays utilised. Pigments containing heavier metals such as lead based colours absorb x-rays more than other pigments, so they produce better results. X-rays don't produce these results if a painting was executed lightly in low density colours and then over painted with those of a heavier density, the first sketch would not be visible, although it does exist.

X-radiographs register all these differences and can sometimes reveal changes in the composition as well as losses of original paint. It will also reveal fine cracks, the 'craquelure', of a painting which vary in size, and are created over time due to varying tensions between the painted layer, the ground layer and the canvas or panel. It may be possible to see the brush-strokes of the priming layer in an x-radiograph. These can be characteristic of a particular artist and have been used to aid attribution in the case of Rembrandt.



**Portrait of Lady Penn by Benjamin West  
(1738-1820)**

The x-ray on the left reveals a significant change in composition by the artist.

The arm was once raised to the face showing the sitter holding a flower. In the present painting, the arm has been repositioned in the sitter's lap.

In addition, the dog is not present in the x-ray but has been added in the final composition.



Radiographs of wood panels can be diagnostic of the wood used, evidence of damage by insects and the position of nails and stretchers used in the construction of the painting.