

Assessing the potential of OCT for the non-invasive examination of varnish layers; a survey of paintings in the National Gallery London

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Optical coherence tomography (OCT) has shown the potential to be a useful technique for the non-invasive examination of the surface and subsurface structure of cultural heritage objects.^{1,2} On paintings it can provide ‘virtual’ cross-section images anywhere on the surface that give information on the paint and varnish layer structure. It offers the possibility of contributing to examinations carried out in support of conservation treatments, and could be particularly effective in extending knowledge of the structure when used in conjunction with what is known from real paint cross-sections.

Much work is underway on further developments in OCT instrumentation, tailoring the specifications of various systems so that they are suitable for a variety of cultural heritage applications.³ Also very important is parallel work investigating how the materials on cultural heritage objects behave when examined with this relatively new emerging technique. Studies have already been carried out on the properties of reference samples with different pigments and binding media,⁴ and a limited number of case studies on individual works of art have been published.⁵

This talk will describe the observations made during a much broader survey with OCT of paintings in the National Gallery, London, chosen because they had a well recorded conservation history, with multiple layers of varnish applied over a very long period of time. In some cases the paintings were undergoing conservation treatment and so real paint cross-sections taken to support treatment decisions were available for correlation with the OCT cross-sections. An adapted commercial instrument was used, operating at a wavelength of 930 nm, an axial resolution of 6 μm , transverse resolution of 9 μm and depth range of 1.6 mm, capable of automatically scanning a 15 cm x 15 cm area. The instrument is small and portable, operating at a safe distance of around 1.5 cm from the paint surface. The study gave an overview of the behaviour of many different naturally aged varnishes on real paintings when examined by OCT, useful information for the design of the specifications of future OCT instruments, especially in terms of desirable depth resolution, and also provided further insight into how OCT can be used as one of the tools for examination of paintings during conservation treatment.

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