

REMOTE MULTISPECTRAL IMAGING OF PAINTINGS AND PIGMENT IDENTIFICATION

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PRISMS (Portable Remote Imaging System for Multispectral Scanning) is designed for *in situ* high resolution multispectral imaging of paintings at inaccessible heights from the ground level.¹ It can also be placed in the centre of a gallery and scan any painting in the room at high resolution without moving the imaging system. PRISMS currently operates in 10 spectral channels between 400 and 900 nm. Sub-millimetre resolutions of up to 25 pixels/mm are achievable for distances up to 25-m. The imaging system stays at ground level during operation. Future plans for PRISMS include hyperspectral imaging capabilities in the near infrared (0.9 – 1.7 μm). Application of PRISMS for multispectral imaging and spectral pigment identification will be demonstrated.

It has long been recognised that spectral reflectance can be used as a signature of a pigment to offer non-invasive identification of pigments.² For the last 10 years, multispectral imaging which offers an efficient measurement of spectral reflectance over a large area simultaneously has been used for spectral pigment identification.^{3,4} However, this non-invasive technique has not been met with enthusiasm in the conservation community partly because the identification of mixtures of pigments is unreliable and it cannot identify a pigment if it has deteriorated. The difference between spectral pigment identification and the examination of a sample under a microscope is that the latter offers not only colour but shape information whereas spectral pigment identification does not give any shape information on the pigment particles, but gives not only colour but also spectral information. We demonstrate how OCT can be used to assist spectral pigment identification by measuring the relative absorption and scattering properties of a paint.

1. Liang, H., Keita, K., Vajzovic, T. PRISMS: A portable multispectral imaging system for remote in situ examination of wall paintings. O3A: Optics for Arts, Architecture, and Archaeology, *Proceedings of SPIE*, 6618, 661815, (2007).
2. Baronti, S., Casini, A., Lotti, F., Porcinai, S., Multispectral imaging system for the mapping of pigments in works of art by use of principal-component analysis. *Applied Optics* 37, 1299 (1998).
3. Liang, H., Saunders, D., Cupitt, J. A new multispectral imaging system for examining paintings. *Journal of Imaging Science & Technology*, 49, 551 (2005).
4. R. S. Berns and F. H. Imai, "The use of multi-channel visible spectrum imaging for pigment identification", ICOM Committee for Conservation, 13th Triennial Meeting, (ICOM Committee for Conservation, Rio de Janeiro, Brazil, 2002), 217 (2002).
5. Delaney, J., Walmsley, E., Berrie, B., Fletcher, C., Multispectral imaging of paintings in the infrared to detect and map blue pigments. In *Sackler NAS Colloquium – Scientific Examination of Art: Modern Techniques in Conservation and Analysis*, 120, (2005).