LAB: CNR-ISPC

NAME OF THE INSTRUMENT:

Digital camera Canon EOS 7D (18 Mpixel, CMOS sensor)
Digital camera Canon EOS 450D (12 Megapixel, CMOS sensor) modified by removing the internal filter.
Radiation Sources: two Flash Quantum mod. Qflash T5dR (150W/s) equipped with dedicated filters.
Filters on camera and flashes: Schneider Optic B+W 403 UV Black, Schneider Optics B+W Infrared IR 093, Schneider Optics B+W Infrared B+W 486 UV/IR blocking

GENERAL DESCRIPTION:

Multispectral imaging is a set of methods used to observe an object by employing wavelength ranges for image acquisition between 350 and 1100 nanometers that is, from the ultraviolet into the near infrared.

These techniques represent a powerful method to document collections, as they allow the visualization and spatial localization and sometimes the preliminary characterization of materials under different wavelengths of illumination.

MSI represents the preliminary step in a diagnostic campaign since offer, in a non-invasive and rapid way, a documentation of the state of conservation of a work by directing stop analyses or micro-samplings.

The procedures are based on readily accessible, inexpensive, broadband methods, which cover large sections within the wavelength range that can be observed using modified commercially available cameras. The object is illuminated by two radiation sources positioned symmetrically at 45 degrees to the focal axis of the camera. The incoming radiation interacts with the object. From this interaction, the re-emitted radiation travels from the object to the camera. A filter, or combination of filters, is placed in front of the camera lens to select the wavelength range of interest.

TECHNICAL DESCRIPTION:

The techniques that can be performed are:

Visible (VIS) images, which correspond to standard photography and record the reflected light in the visible region (400–700 nm) when the object is illuminated with visible light.

Ultraviolet-induced visible luminescence (UVL) images, which record the emission of light in the visible region (400–700 nm) when the object is illuminated by ultraviolet radiation. UVL images are used to investigate the distribution of luminescent materials as binders and colorants, such as lake pigments as well as varnishes, coatings, and adhesives.

Ultraviolet-reflected (UVR) images, which record the reflected radiation in the ultraviolet region (200–400 nm) when an object is illuminated with ultraviolet radiation. Combining the VIS and the UVR images ultraviolet-reflected false color (UVRFC) images are produced.

Infrared-reflected (IRR) images, which record the reflected radiation in the infrared region (700–1100 nm) under infrared illumination. By combining components of the VIS and the IRR images, infrared-reflected false color (IRRFC) images are produced. As certain pigments have a characteristic

appearance in false color, the IRRFC images can often be used for their identification.

Visible-induced infrared luminescence (VIL) images, which record the emission of luminescence in the infrared region (700–1100 nm) when the object is illuminated with visible light. Very few materials display this property, as Egyptian blue, Han blue and Han purple which appear bright white in VIL images.

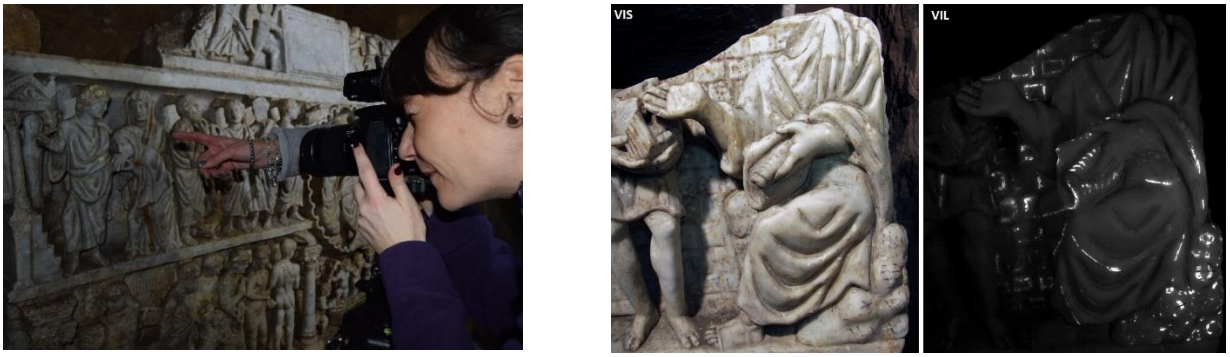

Figure: MSI survey in situ. Results of the VIL survey revealing the use of Egyptian blue

FURTHER INFORMATION:

Dyer, Joanne, Giovanni Verri, and John Cupitt. 2013. *Multispectral Imaging in Reflectance and Photo-Induced Luminescence Modes: A User Manual.* London: British Museum. https://research.britishmuseum.org/pdf/charisma-multispectral-imaging-manual-2013.pdf

Verri, Giovanni. 2009. "The Application of Visible-Induced Luminescence Imaging to the Examination of Museum Objects." *Proceedings SPIE 7391, O3A: Optics for Arts, Architecture, and Archaeology 2*: 739105–12. https://doi.org/10.1117/12.827331

Fischer, C., Kakoulli, J., (2006), Multispectral and Hyperspectral Imaging Technologies in Conservation: Current Research and Potential Applications, Reviews in Conservation 7, 3–16.

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