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Imaging in the Infrared[1]

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Many common pigments are partially transparent to near infrared (IR) light, making it possible to use IR-sensitive imaging sensors to capture information from surfaces covered by several tens of micrometers of such pigments. Because of this, "IR reflectograms" have been made of paintings since the late 1960s, revealing important aspects of many works of art that are not observable in the visible. However, although a number of paintings have been studied this way, the high cost and specialized nature of available IR cameras have limited such work to a small fraction of the two- and three-dimensional works of art that could be usefully studied in the IR. After a brief introduction to IR reflectography, I will describe the characteristics of a high resolution imaging system based on a modified Canon EOS digital camera that operates over the wavelength range 830–1100 nm [1]. This camera and autofocus Canon 20 mm f/2.8 lens make it possible to obtain IR reflectograms of works of art "in situ" with standard museum lighting, resolving features finer than 0.35 mm on a 1.0×0.67 m painting. After describing its relevant imaging properties of sensitivity, resolution, noise and contrast, I will illustrate its capabilities with IR and visible images of various types of art in museums on three continents. IR reflectograms of one painting, in particular, have revealed important new information about the working practices of the 16th century artist Lorenzo Lotto who our previous work has shown used projected images as aids for producing some of the features in this painting [2].

[1] Charles M. Falco, Rev. Sci. Instrum. 80, 071301 (2009).
[2] see, for example, David Hockney and Charles M. Falco, Proc. of the SPIE 5666, 326 (2005).

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