

Article

Post-Processing of VIS, NIR, and SWIR Multispectral Images of Paintings. New Discovery on the *The Drunkenness of Noah*, Painted by Andrea Sacchi, Stored at Palazzo Chigi (Ariccia, Rome)

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Abstract: IR Reflectography applied to the identification of hidden details of paintings is extremely useful for authentication purposes and for revealing technical hidden features. Recently, multispectral imaging has replaced traditional imaging techniques thanks to the possibility to select specific spectral ranges bringing out interesting details of the paintings. VIS–NIR–SWIR images of one of the *The Drunkenness of Noah* versions painted by Andrea Sacchi, acquired with a modified reflex and InGaAs cameras, are presented in this research. Starting from multispectral images we performed post-processing analysis, using visible and infrared false-color images and principal component analysis (PCA) in order to highlight *pentimenti* and underdrawings. Radiography was performed in some areas to better investigate the inner pictorial layers. This study represents the first published scientific investigation of *The Drunkenness of Noah*'s artistic production, painted by Andrea Sacchi.

Keywords: paintings; Andrea Sacchi; multispectral imaging; radiography; reflectography; false-color image; PCA

1. Introduction

Infrared reflectography has been widely employed as preliminary investigation of paintings to evaluate the state of conservation, reveal underdrawings and provide similar and/or complementary information to the radiography [1,2]. The possibility to visualize the underlying drawing is related to the fact that many pigments result to be transparent to IR radiation in the infrared region of the electromagnetic spectrum. For this reason, a high contrast between the materials used for the drawing, like carbon black or black bone, and the preparation layer, consisting of chalk or white lead, is obtained. In some cases, infrared reflectography does not show underdrawings, but pictorial spreads that belong to a previous idea of the painting composition. These pictorial layers and changings in the drawing, which is concealed under the final pictorial layer, are hidden to an external observer and could be