



NON DESTRUCTIVE TECHNIQUES FOR CULTURAL HERITAGE  
BUENOS AIRES, OCTOBER 12 2018

# Scientific study of the sketch of Murillo's painting "Moses and the water from the rock of Horeb "

Miguel Ángel Respaldiza<sup>[1,2]</sup>, Francisco J. Ager<sup>[1,3]</sup>, Claudia Caliri<sup>[4,5]</sup>, Francesco Paolo Romano<sup>[4,6]</sup>, Anabelle Kriznar<sup>[1,7]</sup>, María Auxiliadora Gómez-Morón<sup>[8]</sup>, Rocío Magdaleno<sup>[8]</sup>.

[1] Centro Nacional de Aceleradores, (Universidad de Sevilla-CSIC-Junta de Andalucía), C/ Thomas A. Edison 7, 41092, Seville, Spain. (email: [respaldiza@us.es](mailto:respaldiza@us.es))

[2] Departamento de Física Atómica, Molecular y Nuclear. Universidad de Sevilla, Av. de Reina Mercedes s/n, 41012 Seville, Spain.

[3] Departamento de Física Aplicada I. Universidad de Sevilla, C/ Virgen de Africa 7, 41011 Seville, Spain.

[4] INFN, Laboratori Nazionali del Sud, Via Santa Sofia 62, 95123, Catania, Italy.

[5] Università di Catania, Dipartimento di Fisica e Astronomia, Via A. Doria 6, 95123, Catania, Italy.

[6] CNR, Istituto per i Beni Archeologici e Monumentali, Via Biblioteca 4, 95124 Catania, Italy.

[7] Departamento de Escultura e Historia de las Artes Plásticas, Facultad de Bellas Artes, Universidad de Sevilla, C/ Laraña 3. 41003 Seville. Spain.

[8] Instituto Andaluz del Patrimonio Histórico (IAPH), Camino de los Descubrimientos, s/n. 41092 Seville, Spain.

With occasion of the “Murillo’s year” (5<sup>th</sup> centenary of his birth), the “Instituto Andaluz del Patrimonio Histórico (IAPH)” received the request from a private collector for the restoration and authentication of a sketch of the Murillo’s painting entitled “Moses and the water from the rock of Horeb”. During the intervention, several studies about the materials employed were carried out. After a detailed general inspection using multispectral techniques (visible, UV, IRR) some “pentimenti” were discovered. In addition, Macro X-ray fluorescence (MA-XRF) scanning technique was performed complemented by point XRF and stratigraphic analyses, in order to characterize the different elements of the paintings (ground layer, pigments and binders).

The methods used during the study will be described in this work, with particular attention to the mobile MA-XRF device [1], which provides real-time elemental imaging of the paintings. The results show that the ground layers were prepared in the usual fashion of the artist, using earths, calcium carbonate, iron oxide pigments and white lead. The polychromy is composed of lead white mixed with various pigments compatibles with those of the period. MA-XRF mapping allowed determining the spatial distribution and the combination of these pigments along the surface of the painting.

[1] F.P. Romano, C. Caliri, P. Nicotra, S. Di Martino, L. Pappalardo, F. Rizzo, H.C. Santos, *Anal. At. Spectrom.* (32), 2017, 773.