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“Scientific examination of Cultural Heritage raises awareness in local communities”



PROJECT REPORT

Scientific Examination of Cultural Heritage Raises Awareness in Local Communities: The Case of the Newly Discovered Cycle of Mural Paintings in the Crucifix Chapel (Italy)

Antonino Cosentino
Cultural Heritage Science Open Source

This paper describes the scientific studies carried out on a cycle of mid-century wall paintings discovered in 2013 in a small Italian village. An international team of research institutes (USA, Denmark, Portugal, and Italy) were involved in the technical examination of the cycle. The results of these analyses, presented to the local community during a public conference, raised awareness of the value and significance of their unique cultural assets. This represents a successful model for civically engaged science that can bring scientific expertise to bear on a specific challenge to a local community.

Civically Engaged Science to Preserve Local Art and Archaeology
The preservation of cultural heritage is a critical civic responsibility. The range of the preservation of cultural treasures ranges from the renowned mega-cities of Rome, Florence, and Venice to almost every village. This rich distribution of material culture demands local civic

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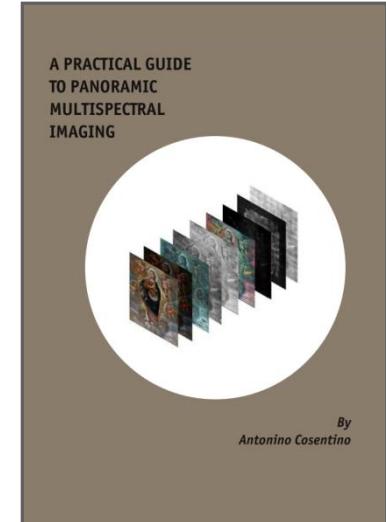
High Resolution Photography

“A practical guide to Panoramic Multispectral Imaging”



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High resolution documentation of large wall paintings



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3D modeling

“Innovative Imaging Techniques for Examination and Documentation of mural paintings and historical graffiti in the catacombs of San Giovanni, Syracuse”

Catacomb Syracuse More info ▾



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Photomodeling allows rapid and low-cost 3D modeling for the web

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INNOVATIVE IMAGING TECHNIQUES FOR EXAMINATION AND DOCUMENTATION OF MURAL PAINTINGS AND HISTORICAL GRAFFITI IN THE CATACOMBS OF SAN GIOVANNI, SYRACUSE

Antonino COSENTINO¹, Samantha STOUT², Carmelo SCANDURRA³

¹Cultural Heritage Science Open Source, Piazza Castellina 11, Acireale, Sicily, Italy; ²Materials Science and Engineering, and the Center for Interdisciplinary Sciences for Art, Architecture, and Archaeology, University of Southern California, Los Angeles, CA, 90089-0181, USA; ³Perito Commissione di Archeologia Sotterranea, via Augusto von Platen, 74, 96100 Siracusa, Italy

Abstract
This paper presents scientific and technical examination of two mural paintings and their historical graffiti located in the catacombs of San Giovanni in Syracuse, Sicily. Reference images were taken by Infrared Photogrammetry, 3D Photomodeling was used to obtain innovative imaging techniques used to capture significant details of the paintings, along with 3D reconstruction of the wall surfaces. The results show the potential of 3D Photomodeling for the analysis of the murals and the investigation of the Madonna. RTI technique was tested as a valid tool to examine the surface of the wall and the graffiti. The results show the potential of 3D Photomodeling for the examination of the murals, which are of high interest to scholars since they are useful to reconstruct the cultural history of the site. The results also show the potential of 3D Photomodeling as a rapid ability to document graffiti on deteriorated surfaces painted with earth pigments. 3D Photomodeling also proved to be a successful and handy tool to discover the position of graffiti on the wall. The results also show the potential of 3D Photomodeling for the examination of the graffiti associated with an analytical study of the polychromy with non-invasive IRF.

Keywords: Reflectance Transformation Imaging; Infrared photography; 3D Photomodeling; IRF; frescoes; catacombs; graffiti

Introduction
This paper presents the technical and scientific examination of two mural paintings and some of their historical graffiti in the catacombs of San Giovanni (St. John the Evangelist) in Syracuse, Sicily. RTI (Reflectance Transformation Imaging) was tested and applied in order to enhance the depth and the three-dimensional sense of the historical graffiti, among one of the paintings. Scholars have been interested in the study of historical graffiti [1-2]. They provide unique information on the uses and frequencies of the site over the centuries, and thus become documentation used to reconstruct the cultural history of these catacombs. Some of the graffiti of the catacombs of San Giovanni are contemporary with the epoch of the paintings that bear them. They mainly comprise funerary or devotional texts and symbols that

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Reflectance Transformation Imaging (RTI)

“Innovative Imaging Techniques for Examination and Documentation of mural paintings and historical graffiti in the catacombs of San Giovanni, Syracuse”



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Antonio COSENTINO¹, Samantha STOUT², Carmelo SCANDURA³

¹Cultural Heritage Science Open Source, Piazza Castellina 11, Acireale Antoni, 95025, Italy
²Marine Science and Engineering, and the Center for Interdisciplinary Sciences for Art, Architecture, and Archaeology, University of Southern California, 3500 Trousdale Parkway, Los Angeles, CA, 90089-0181, USA
³Politecnico di Siracusa, Via Augusto von Platen, 74, 96100, Siracusa, Italy

Abstract
This paper presents scientific and technical examination of two mural paintings and their historical graffiti located in the catacombs of San Giovanni in Syracuse, Sicily. Reflectance Transformation Imaging (RTI) and Infrared Photomodelling (IP) were used to examine and analyse the surface of the murals and the graffiti. RTI was used to reconstruct the surface of the murals and to document the graffiti. IP was used to document the surface of the murals, which are of high interest to scholars since they are used to reconstruct the original surface of the murals. RTI and IP were used to document the graffiti due to their high ability to document graffiti on deteriorated surfaces painted with earth pigments. IP modelling also proved to be a successful and handy tool to determine the position of graffiti on the surface of the murals. This paper presents the first scientific study of graffiti associated with an analytical study of the polychrome relief with non-invasive RTI.

Keywords: Reflectance Transformation Imaging; Infrared photomodelling; 3D Photomodelling; KRF frescoes; catacombs; graffiti

Introduction
This paper presents the technical and scientific examination of two mural paintings and some of their historical graffiti in the catacombs of San Giovanni (St. John the Evangelist) in Syracuse, Sicily. RTI (Reflectance Transformation Imaging) was tested and applied in order to enhance the visual and interpretive value of some of the historical graffiti. One of the main goals of the scholars has been to keep intact the value of historical graffiti [1-2]. They provide unique information on the uses and frequencies of the site over the centuries, and thus become documentation used to reconstruct the cultural history of these catacombs. Some of the graffiti of the catacombs of San Giovanni are contemporary with the epoch of the paintings that bear them. They mainly comprise funerary or devotional texts and symbols that

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RTI (Reflectance Transformation Imaging) allows a high quality documentation of historical graffiti

Ultraviolet Fluorescence (UVF)



“Practical notes on ultraviolet technical photography for art examination”

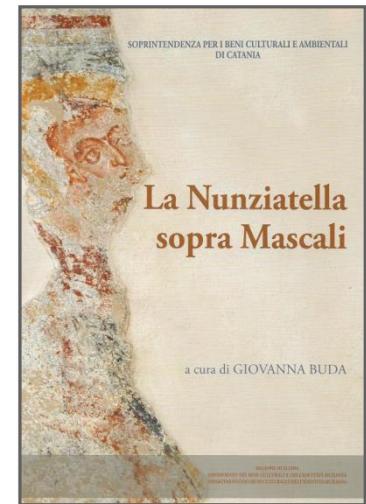
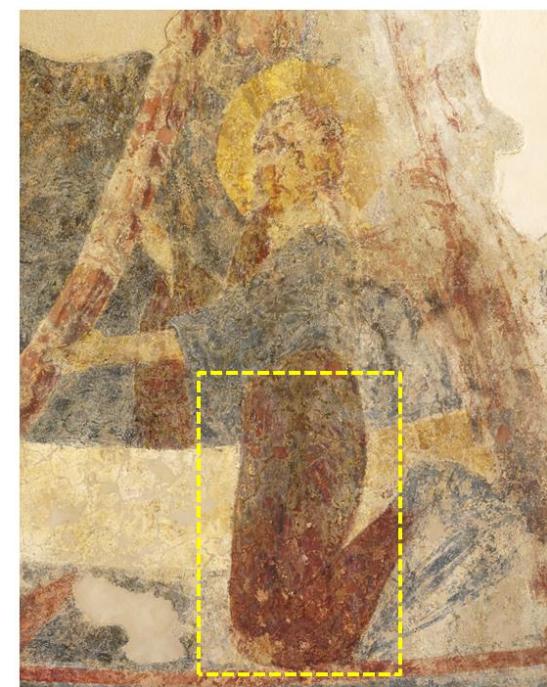


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Ultraviolet photography documents inpaints and organic materials , consolidants and binders.

Infrared photography (IR)

*“Indagine diagnostica
multispettrale sugli affreschi”*



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Infrared photography makes visible underdrawing and changes (*pentimenti*)

Infrared False Color (IRFC)



Photo



Infrared
False Color
(IRFC)

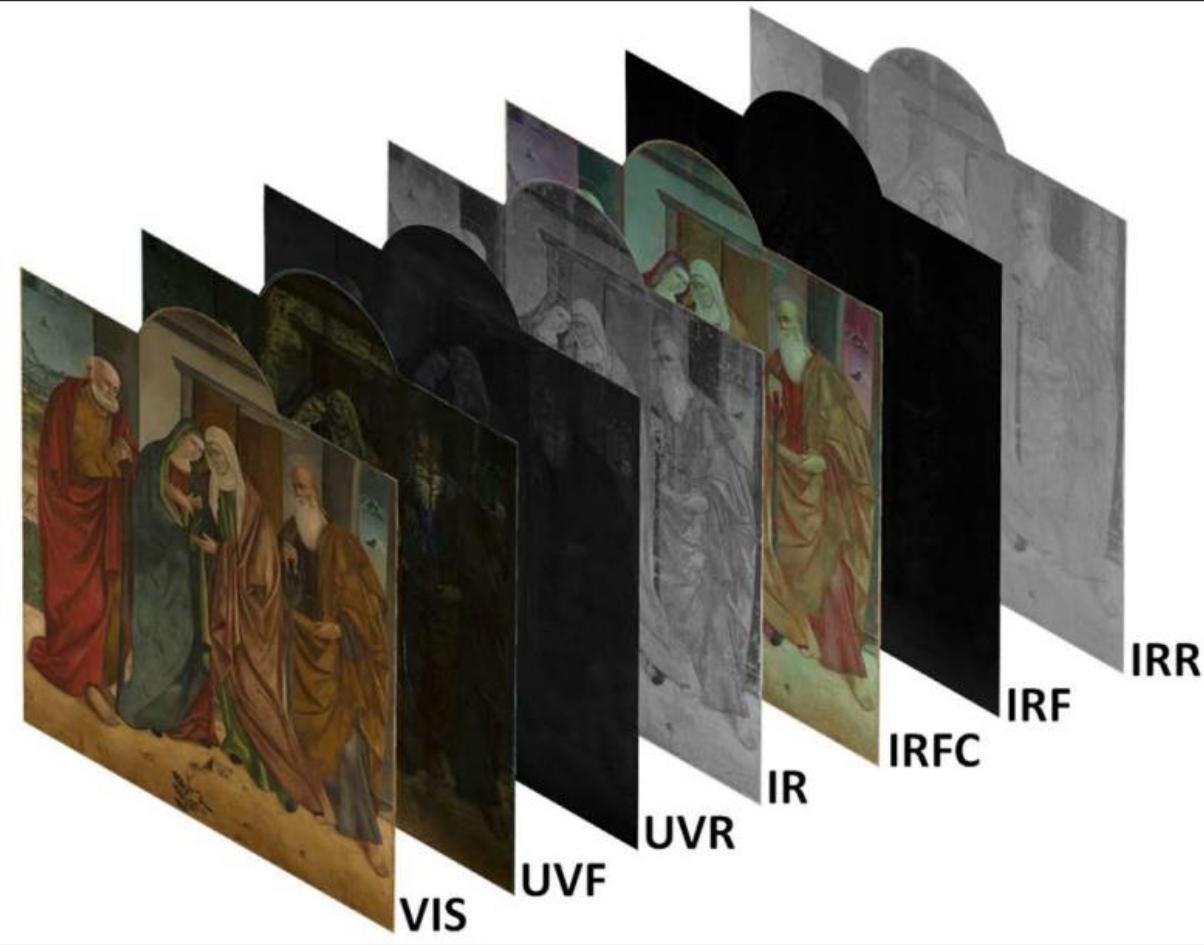
Infrared False Color photography locates inpaints with modern pigments

"Infrared Technical Photography for Art Examination"



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Technical Photography



Identification of pigments by multispectral imaging: a flowchart method

Abstract

The identification of pigments and understanding of their chemical properties are important for the study of ancient and modern pigments. This article presents a flowchart method for the identification of pigments based on the multispectral imaging of pigments. The flowchart starts with the selection of a sample, followed by the preparation of the sample, and then the acquisition of multispectral images. The images are then processed using a flowchart method to identify the pigments. The flowchart method is based on the analysis of the spectral characteristics of the pigments, such as color, texture, and shape. The flowchart method is designed to be user-friendly and can be used by anyone who has access to a computer and a camera.

Keywords

multispectral imaging, pigment, flowchart, identification, chemical properties

Introduction

In this article, we present a flowchart method for the identification of pigments based on multispectral imaging. The flowchart method is designed to be user-friendly and can be used by anyone who has access to a computer and a camera. The flowchart method is based on the analysis of the spectral characteristics of the pigments, such as color, texture, and shape. The flowchart method is designed to be user-friendly and can be used by anyone who has access to a computer and a camera.

Materials and methods

The materials used in this study include a digital camera, a computer, and a flowchart software. The digital camera is used to capture multispectral images of the pigments. The computer is used to process the images and perform the analysis. The flowchart software is used to guide the user through the process of identifying the pigments.

Results

The results show that the flowchart method is effective for the identification of pigments. The flowchart method correctly identified all the pigments in the sample set. The results also show that the flowchart method is faster and more accurate than traditional methods of pigment identification.

Conclusion

The flowchart method presented in this article is a simple and effective way to identify pigments. The flowchart method is based on the analysis of the spectral characteristics of the pigments, such as color, texture, and shape. The flowchart method is designed to be user-friendly and can be used by anyone who has access to a computer and a camera.

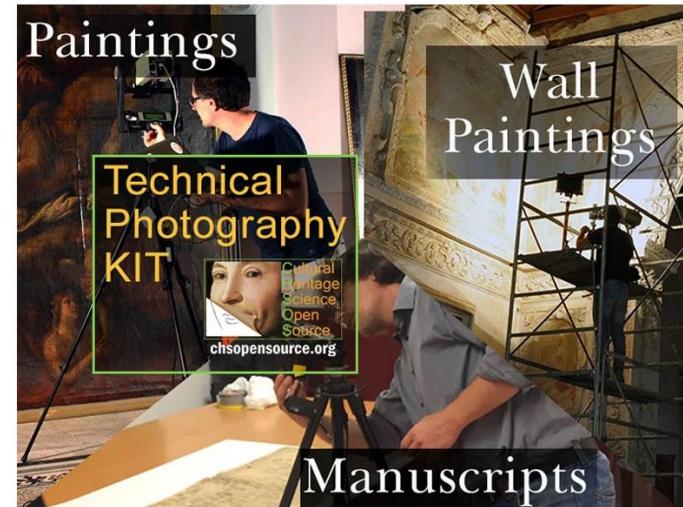
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A complete Technical Photography (TP) documentation allows a preliminary identification of pigments

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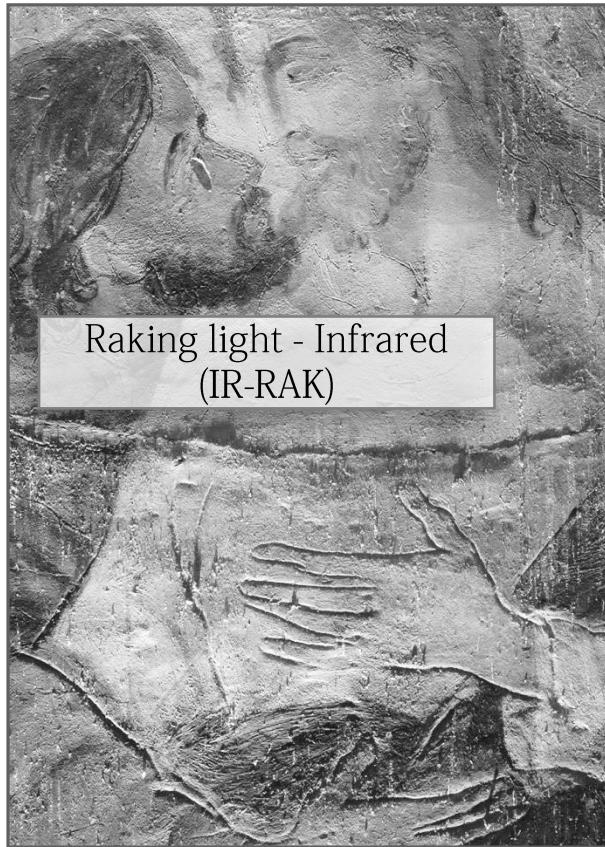
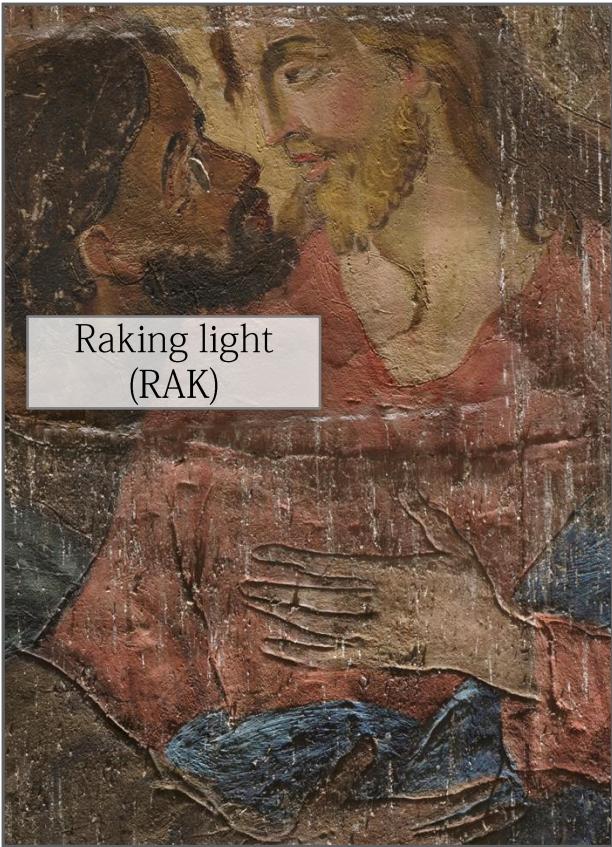
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“Technical Photography for mural paintings:”



Article / Article

Technical photography for mural paintings: the newly discovered frescoes in Aci Sant'Antonio (Sicily, Italy)

A. Cosentino^{a,*}
M. Gil^b
M. Ribeiro^b
R. Di Natale^c

^aCultural Heritage Services Open Science Platform, Centro di Studi Antropologici, 95025, Italy
^bUniversidade de Coimbra, Faculdade de Letras, Departamento de Arqueologia, 3004-506 Coimbra, Portugal
^cProfessional photographer (freelancer)
E-mail address: antoniacosentino@gmail.com

Abstract
A group of 18th century frescoes, depicting the last days of Christ on earth, were recently discovered in the town of Sant'Antonio (Cycli, Italy). The paintings, surviving along the course of an originally separate chapel that was altered in the early 20th century, acquired the current configuration after their restoration. This article presents the technical aspects of the investigation and the results obtained from the examination of the frescoes and illustrates the methodological challenges that were posed during their examination. Raking light photography, infrared photography, ultraviolet fluorescence and infrared false-color photography were used and painting techniques, Ultraviolet fluorescence and infrared false color photography were used to highlight the presence of organic materials and the presence of pigments. The results obtained are discussed, highlighting the characteristics of the technique and the information that can be obtained by using it. The results obtained are discussed, highlighting the characteristics of the technique and the information that can be obtained by using it. Only positive results clearly seen in all the sources thus indicating that in the larger panel areas, a model of effects and colors changes would have been used.

Keywords
Frescos
Photography
Infrared photography
Ultraviolet photography
Ultraviolet fluorescence
Infrared false color
Painting

Photografia técnica da pintura mural: os frescos redescobertos em Aci Sant'

Resumo
Um grupo de pinturas murais antigos, representando os últimos dias de Cristo, foram descobertos recentemente na vila de Sant'Antonio (Cycli, Itália). As pinturas, sobrevivendo ao longo do curso de uma capela originalmente separada que foi alterada no início do século XX, adquiriram a configuração atual depois da restauração. Este artigo apresenta as questões técnicas da investigação e os resultados obtidos da inspeção das frescas e ilustra os desafios metodológicos que surgiram durante a sua inspeção. A fotografia com raios de escorregamento, fotografia infravermelha, fluorescência ultravioleta e fotografia falsa cor infravermelha foram usadas e técnicas de pintura, fluorescência ultravioleta e fotografia falsa cor infravermelha foram usadas para destacar a presença de materiais orgânicos e a presença de pigmentos. Os resultados obtidos são discutidos, destacando as características da técnica e a informação que pode ser obtida por meio dela. Os resultados obtidos são discutidos, destacando as características da técnica e a informação que pode ser obtida por meio dela. Somente resultados positivos claramente vistos em todas as fontes indicam que, nas áreas maiores da panela, um modelo de efeitos e mudanças de cores teria sido usado.

Palavras-chave
Pinturas murais
Fotografia
Fotografia com raios de escorregamento
Fotografia infravermelha
Fluorescência ultravioleta
Fotografia de falsa cor infravermelha
Pintura

Conserve+Patrimônio 20 (2014) 23–33 | doi:10.14568/cp2013001
APR – Associação Profissional de Conservadores Restauradores de Portugal
http://dx.doi.org/10.14568/cp2013001

ISSN 2182-9942

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Raking Light photography documents incisions which are indicative of the painting techniques.

Multispectral Imaging



Pigments can be mapped with multispectral imaging to locate inpaints and differentiate among pigments with the same hue and tone but different chemical composition.

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ARTICLE

Multispectral imaging and the art expert

Antonio Casanova
Cultural Heritage Science Open Source, Chiosensoring, Ad Serrifontana, Italy. E-mail: awcasanova@gmail.com

Multispectral imaging (MSI) systems¹ are being used more and more often by art experts and conservators. They are used to map and determine the chemical composition of the materials of art objects. They are also used to measure the reflectance spectra of materials. These systems are becoming popular in archaeology, forensic science, medicine, architecture, lithography and small Sampling (NS). Reflectance spectra provide information about the chemical composition of pigments since the light that is reflected from a pigment is dependent on the wavelength of the light used to excite it. MSI for art conservation is performed with a monochromatic camera and a spectrometer. It is important to note, however, that, though, that is spreading in the field of art conservation, the use of a spectrometer to set up a monochromatic camera and a spectrometer to obtain the spectra of the objects to be examined and discuss the results obtained is not the best choice with a panoramic head to study large areas of objects. This method is slow as well as with much time to study such objects. However, this method can still even be used to the examination of very small areas of objects. It is also possible to use a microscope and also with a compacted panoramic head to examine a single grain of pigment.

It must be noted, however, that when pigments are examined with this method does not provide conclusive information about the chemical composition of the material. To obtain this type of use analytical examinations are necessary. However, MSI can provide useful and conclusive information. The use of MSI systems in art conservation is a very important advantage, putting to application the rapid and broad survey of large areas.

The spectral cube

A spectral cube is a cube where for each wavelength measured there is the intensity of the reflection spectrum of the material. This is based on taking up an appropriate number of spectra of the object of interest depending on the chemical composition of the material tested. The reflectance spectra of materials in the UV-VIS range are usually very similar, while those in the near infrared range are very different. This allows the use of various overviews and combination modes.

Figure 1 shows a spectral cube based on taking up an appropriate number of spectra of the object of interest during an examination, a reflectance spectra of a medieval panel painting (Fig. 2). Reflectance spectra images are acquired with a monochromatic, compacted panoramic head and a charge-coupled device (CCD) or a comple-

color: the rapid and broad survey of large areas.

The spectral cube

A spectral cube is a cube where for each wavelength measured there is the intensity of the reflection spectrum of the material. This is based on taking up an appropriate number of spectra of the object of interest depending on the chemical composition of the material tested. The reflectance spectra of materials in the UV-VIS range are usually very similar, while those in the near infrared range are very different. This allows the use of various overviews and combination modes.

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Figure 1. Spectral cube. The 12 spectra images are ordered in the spectral cube where the x and y axes represent a pixel on the image and the z axis shows the reflectance over each wavelength. The figure shows the reflectance spectra of a medieval panel painting (Fig. 2). The reflectance spectra of medieval, a historical and ancient (memory valid). The figure shows the reflectance spectra of a medieval panel painting (Fig. 2). The reflectance spectra of medieval, a historical and ancient (memory valid).

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Antonello – Multispectral Imaging system for Art

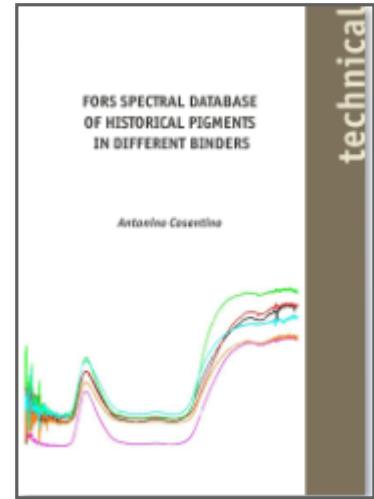
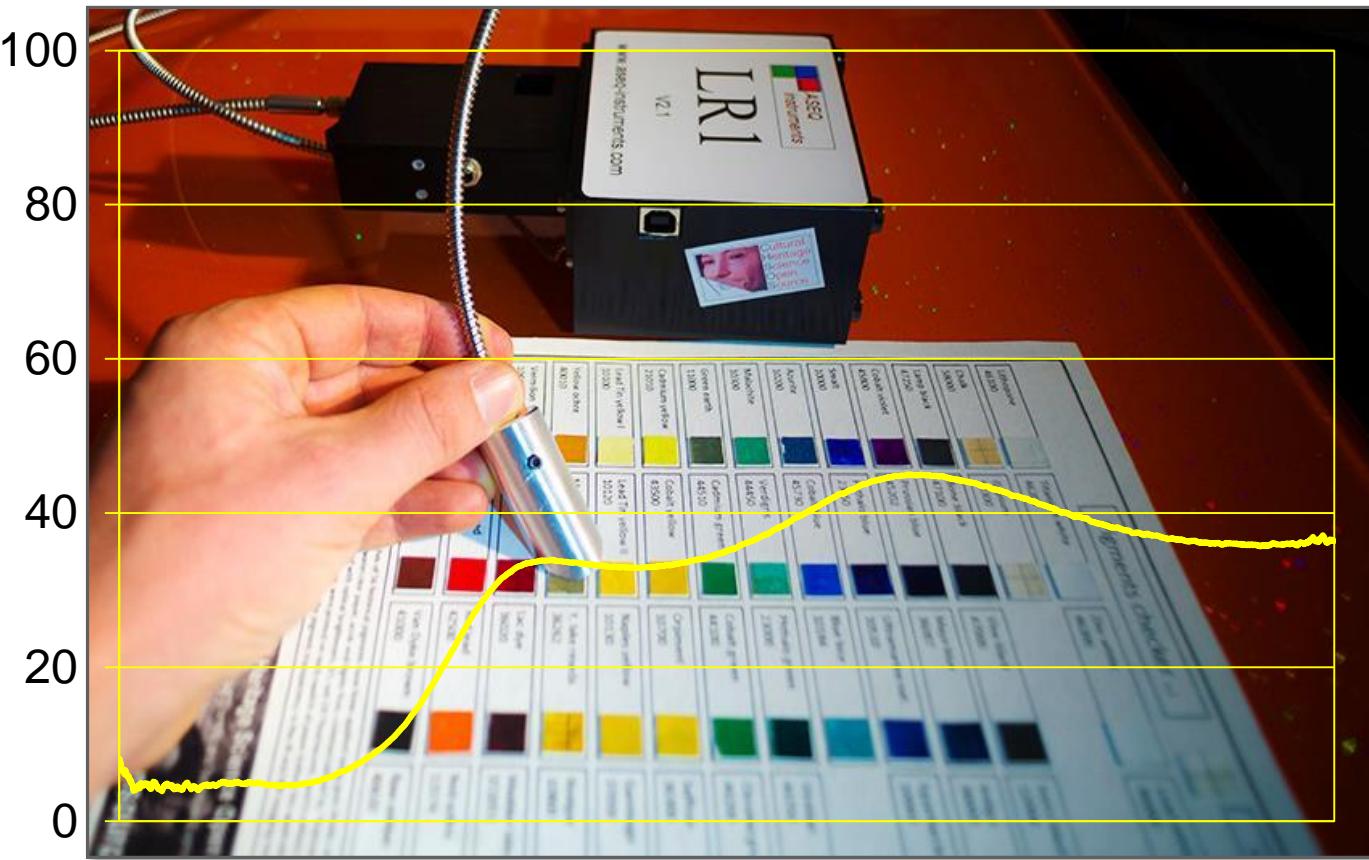
Antonello is a simple MSI system composed of 18 bandpass filters and a full spectrum DSLR camera, covering the 400-925 nm spectral range.

Conservators and art historians need non-invasive methodologies to identify and map pigments on works of art and archaeology. These tools allow them to select appropriate conservation procedures, acquire information on the workshop practices, distinguish original sections from inpaints and to enhance visualization of faded pigments and inks.



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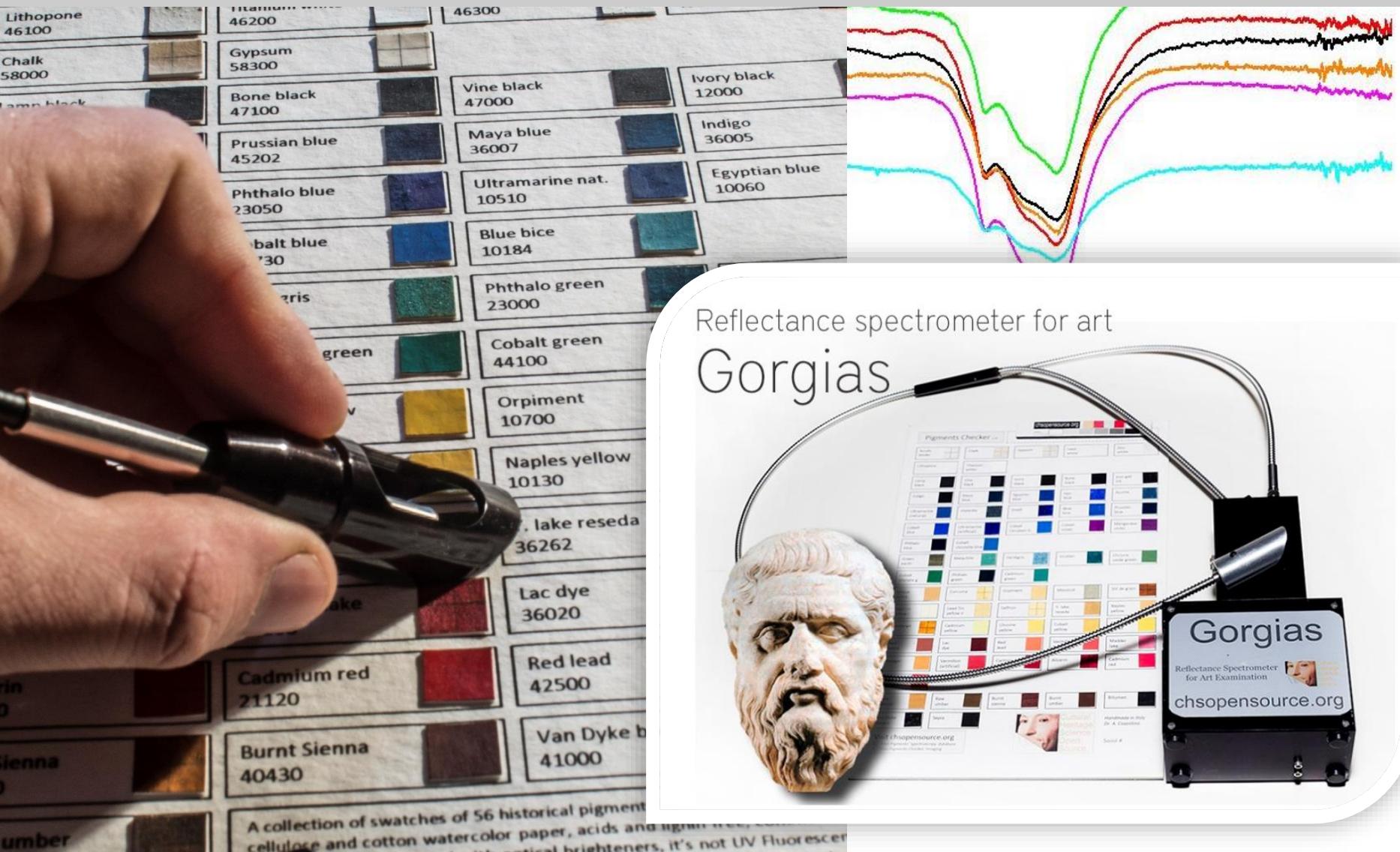
Reflectance Spectroscopy



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Pigments identification with onsite, non-invasive and non-destructive Reflectance Spectroscopy (RS).

Gorgias – Reflectance Spectrometer for Art

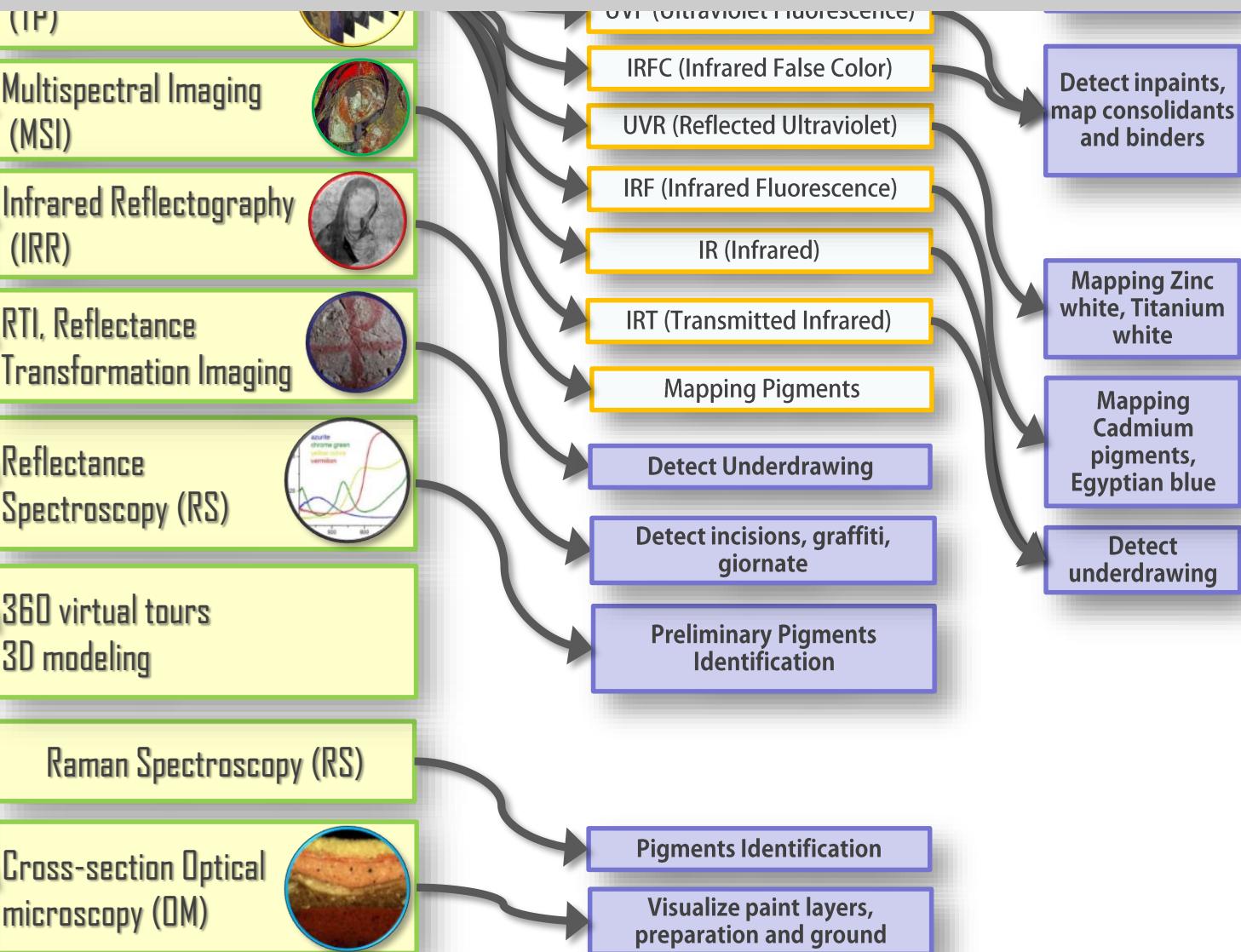


On-site

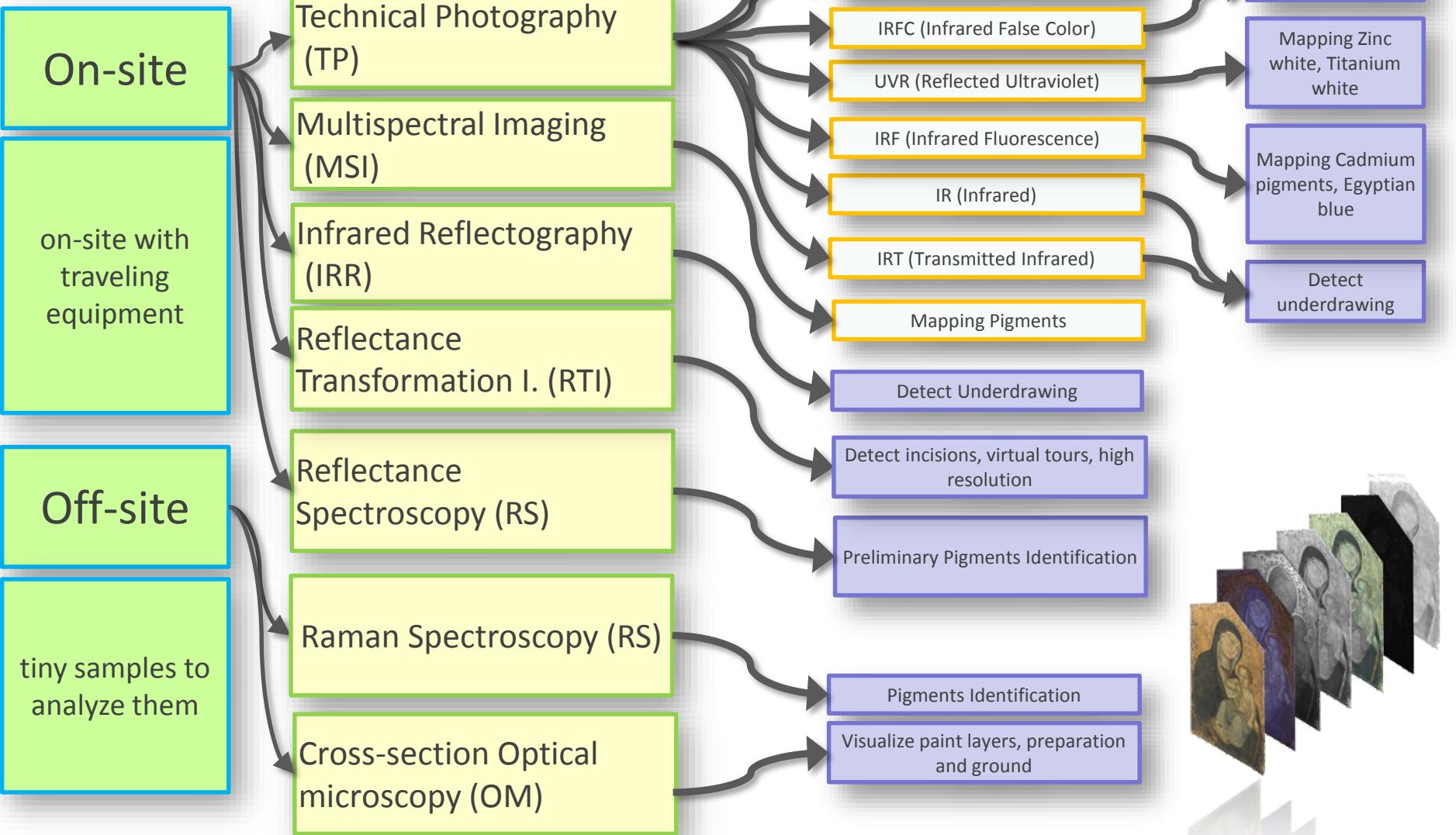
We provide these methods on-site with our traveling equipment

Off-site

We take tiny samples to analyze them in our Studio



CHSOS – art examination methods



Any questions?

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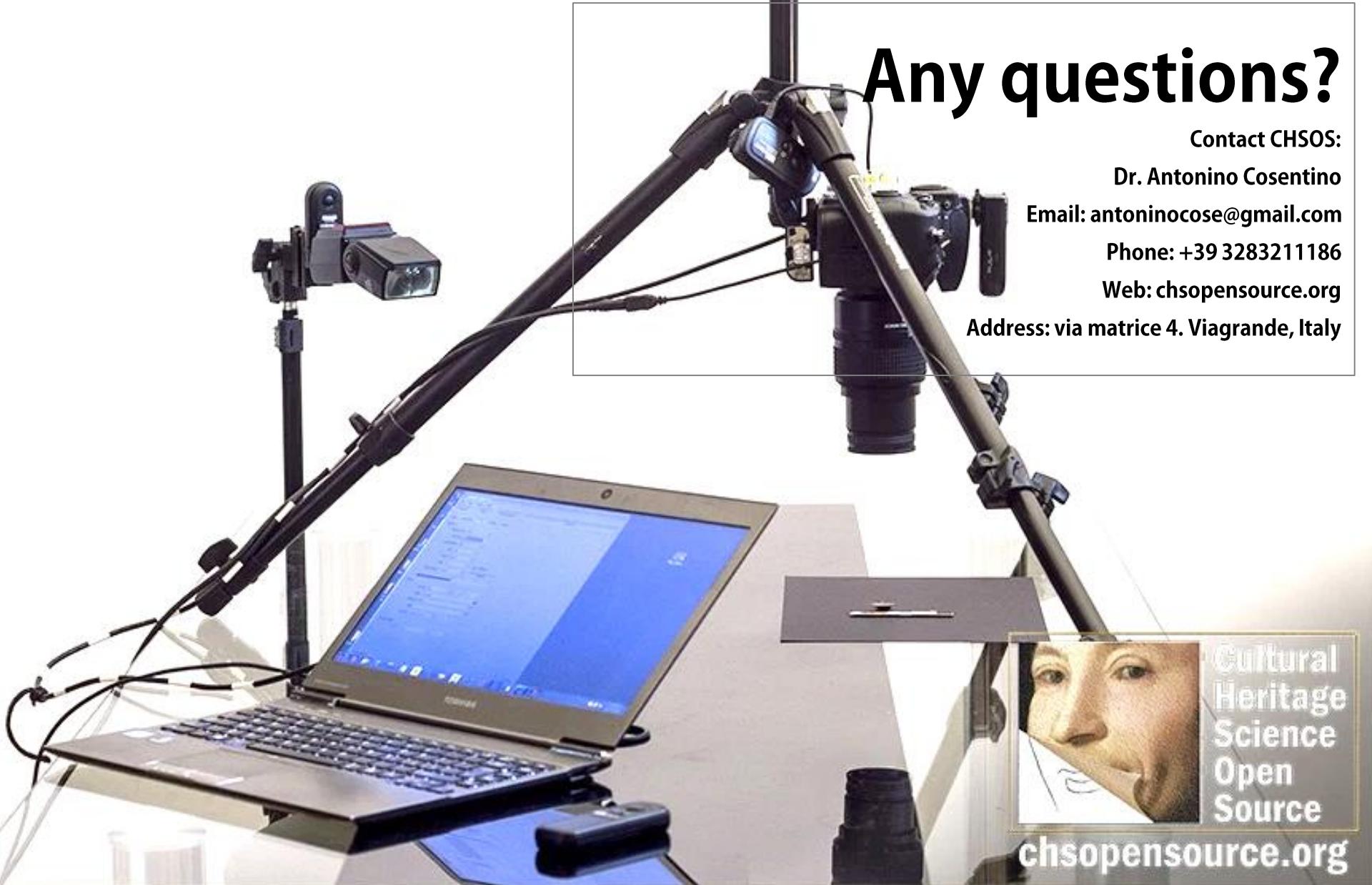
Dr. Antonino Cosentino

Email: antoninocose@gmail.com

Phone: +39 3283211186

Web: chopensource.org

Address: via matrice 4. Viagrande, Italy



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