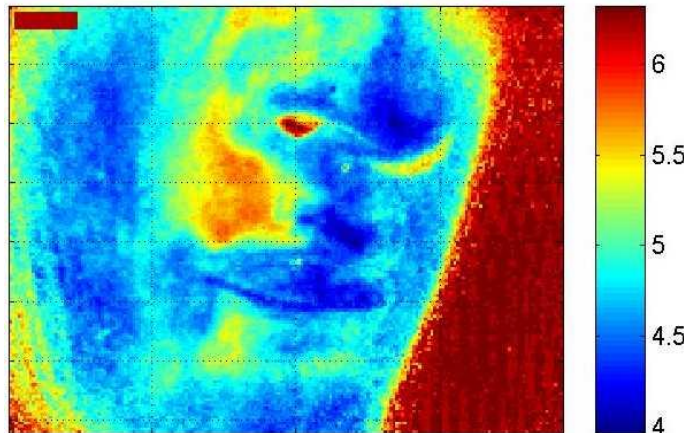


### RESEARCH

Development of portable instruments to study the fluorescence properties of artworks having historical and artistic interest. Among the systems developed it is worth mentioning a FLIM (Fluorescence Lifetime Imaging) device that can measure the 2D map of the fluorescence lifetime of a large area (diameter 50 cm - 1 m), with sub-nanosecond resolution. Such an instrument is particularly suitable to locate the presence of organic contaminants on stones (e.g. marble) and allows us to obtain a chemometric image of the surface under examination.

### FLUORESCENCE LIFETIME MAP OF THE FACE OF MICHELANGELO'S DAVID



FLUORESCENCE LIFETIME MAP (NS)

### ADVANTAGES

The FLIM analysis allows us to identify the areas of a surface where contaminants or degradation processes are present. In fact, the fluorescence lifetime indicates the nature of the material responsible for the emission, while the fluorescence amplitude correlates with the amount of material. In the case of stones (e.g. statues or mural paintings), FLIM analysis shows the map of contaminants (environmental degradation and restoration activities), allowing also to determine their nature. FLIM analysis is also a good indicator to select the points where microsampling should be carried out for further investigations.

### RESEARCH GROUP

#### MIDAr & CUSBO

<http://midar.chem.polimi.it>

<http://www.laserlabeuropa.net/partners/partners-cusbo>

#### Politecnico di Milano –Dept. of

Chemistry and Physics:

Daniela Comelli  
Rinaldo Cubeddu,  
Sara Goidanich  
Austin Nevin  
Lucia Toniolo,  
Gianluca Valentini

### APPLICATION PORTFOLIO

- Michelangelo's David , Florence
- Michelangelo's Pietà Rondanini, Milan
- Orsanmichele, Florence
- Filippo Lippi fresco paintings, Prato Cathedral
- Masolino da Panicale fresco paintings, Castiglione Olona (Italy)
- Madonna in Gloria, Mantegna, Milan
- Breton women, Vincent van Gogh, Milan

### RESEARCH ACTIVITIES

- Quantitative characterization of pigments present in painted surfaces. It is based on the combined use of the PIXE-alpha spectrometer, particularly suitable for surface analysis, and a portable XRD system useful for the identification of mineralogical phases.
- As an example, the analytical systems was used to determine the relative contribution of red ochre and cinnabar in Roman frescoes and the relationship between iron and manganese oxides in coatings covering prehistoric pottery.

### RESEARCH STAFF

**CNR- IBAM**  
**INFN – Lab. del SUD (LANDIS)**  
<http://www.ibam.cnr.it/>  
[www.lns.infn.it/index.php?option=om\\_content&view=article&id=298catid=129&Itemid=117](http://www.lns.infn.it/index.php?option=om_content&view=article&id=298catid=129&Itemid=117)  
Rizzo Francesca  
Pappalardo Lighea  
Francesco Paolo Romano

### QUANTITATIVE CHARACTERIZATION OF FRESCOES AND WALL PAINTING



PIXE-ALPHA SPECTROMETER DURING A MEASUREMENT  
OF A FRESCOES BELONGING TO THE NESTOR PALACE  
WALL PAINTINGS IN PYLOS (GREECE)

### MAIN RESULTS/PRODUCTS

The quantitative determination of mixtures of pigments is essential for studying technologies and manufacturing techniques in both the field of art-history and archeology.

### APPLICATIONS

- Roman frescoes in Catania
- Wall paintings at the Nestor Palace in Pylos (Greece)
- Pigments on the characteristic pottery from the Centuripe Area in Sicily
- Pigments in Attic pottery
- Pigments in Nasca pottery (Peru)
- Thin painted layer (velatura) in a paint attributed to Botticelli.