



Consiglio Nazionale
delle Ricerche

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Cultural Heritage Lab @ Perugia

c/o Department of Chemistry,
Biology and Biotechnology of UNIPG



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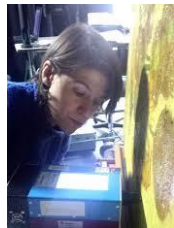
Dr. Laura Cartechini



Dr. Brenda Doherty



Dr. Francesca Rosi



Dr. Letizia Monico

Joint Research Unit with
the *Centre of Excellence SMAArt -UNIPG*



Prof. Aldo Romani
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ALS Lab @ Pisa



Dr. Vincenzo Palleschi



Dr. Giulia Lorenzetti



Dr. Beatrice Campanella



Dr. Stefano Legnaioli

Air Lab @ Potenza



Ing. Nicola Masini



Dr. Maria Sileo



Ing. Manuela Scavone



Dr. Nicodemo Abate



Dr. Antonio Minervino

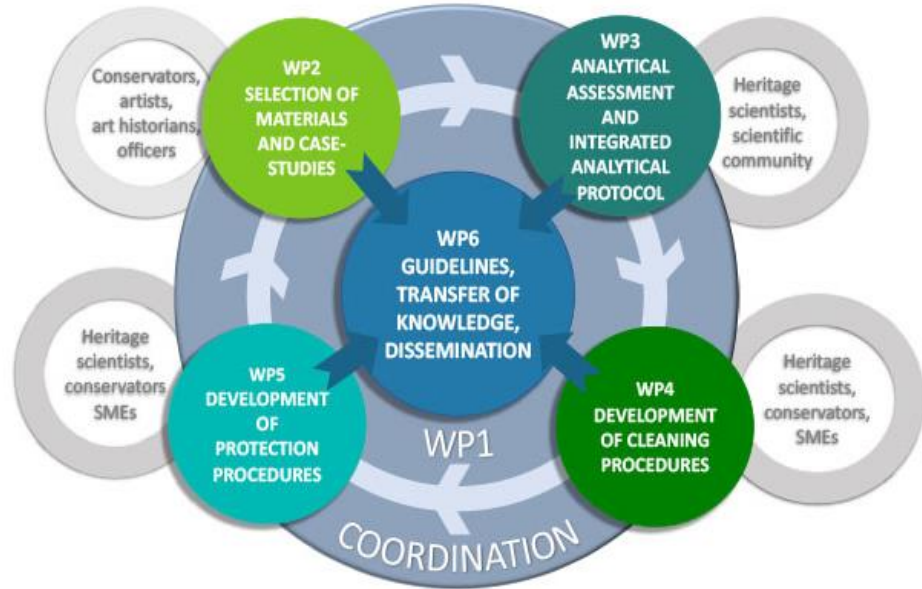


Dr. Valentino Vitale

Unit objectives

Responsible of WP3:

- Set-up and application of innovative non-invasive analytical methods (task 3.1).
- Integration of the analytical methods in a protocol targeted to the characterization of paint and coating materials, to the control of conservation treatments, and to the long-term monitoring of the state of conservation (task 3.3).



Facilities

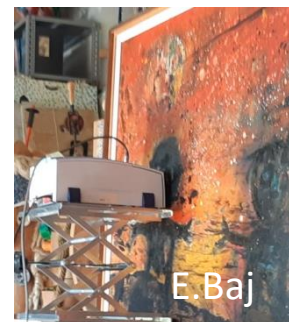
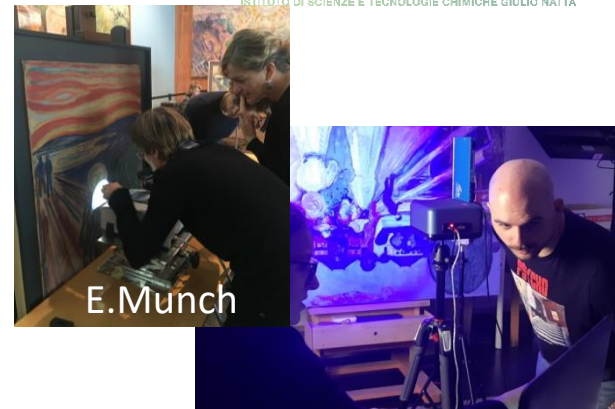


✓ Portable non-invasive spectroscopies and hyperspectral techniques - MOLAB

✓ unmanned air vehicle platforms (UAV) equipped with hyperspectral camera in the visible up to 900 nm range, a multispectral imager in the visible range, and a thermal camera in the infrared region

Analytical tools to

- ✓ provide information on paint formulations (pigments, additives, fillers and synthetic polymers, etc.)
- ✓ evaluate conservation state (including deposits, alteration products, incrustations, biological patinas, paint detachments, infiltrations, capillary rise, salt deposits. etc.)
- ✓ monitor conservation treatments (cleaning and protective coatings)



MOLAB: the mobile laboratory for in situ non invasive analysis of CH objects by portable analytical instrumentation



Point analysis

- pXRF
- UV-vis absorption
- UV-vis emission
- UV-vis fluorescence time decay
- Raman (532, 785, 1064 nm)
- mid-FTIR
- near-FTIR
- Unilateral NMR-MOUSE

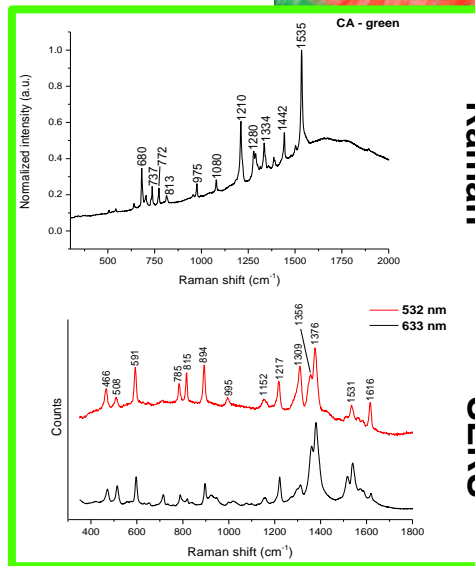
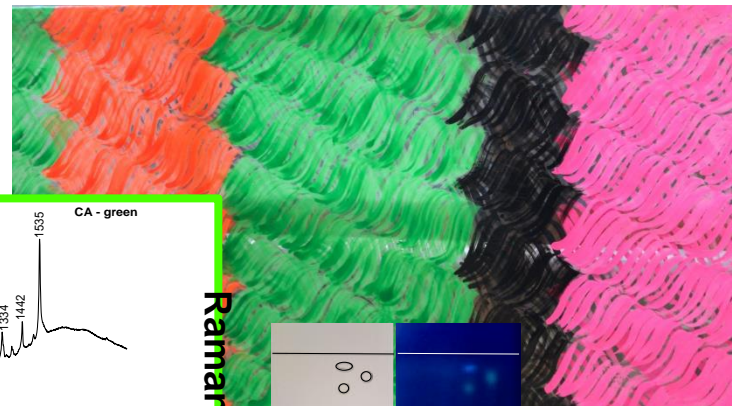
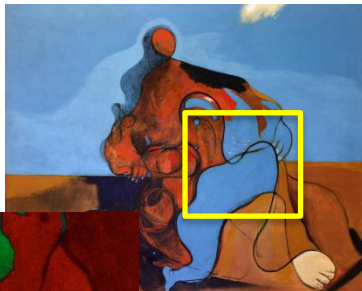
Hyperspectral Imaging

- CRONO X-ray scanner
- Vis NIR HI(400-1000 nm)
- NIR (1000-2500 nm)
- MIR HI FT-IR (4000-1000 cm^{-1})



Point analysis

- μ XRF
- UV-vis multispectral imaging
- μ Raman (785 nm)



Raman

SERS

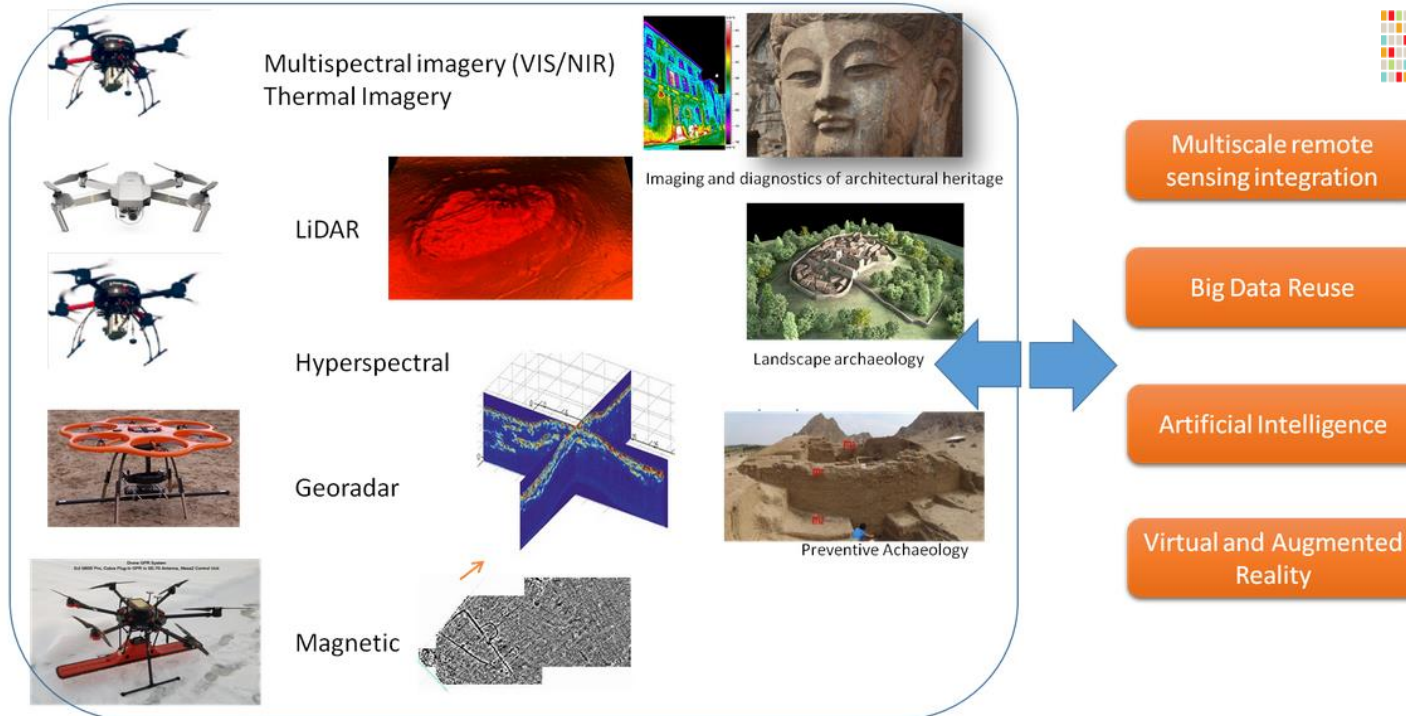


LAB analysis

- μ LIBS
- μ Raman/SERS (532, 633, 785 nm)

AirLAB: UAV platforms for the acquisition of remote sensing data using active and passive sensors

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Publications

La Nasa, J., Doherty, B., Rosi, F., Braccini, C., Broers, F. T., Degano, I., ... & Cartechini, L. (2021). An integrated analytical study of crayons from the original art materials collection of the MUNCH museum in Oslo. *Scientific reports*, 11(1), 1-13. : <https://doi.org/10.1038/s41598-021-86031-6>

Rosi, F., Miliani, C., Gardner, P., Chieli, A., Romani, A., Ciabatta, M., ... & Cartechini, L. (2021). Unveiling the composition of historical plastics through non-invasive reflection FT-IR spectroscopy in the extended near-and mid-infrared spectral range. *Analytica Chimica Acta*, 1169, 338602. <https://doi.org/10.1016/j.aca.2021.338602>

Moretti, P., Rosi, F., Miliani, C., Daugherty, M., van den Berg, K. J., & Cartechini, L. (2020). Non-invasive reflection FT-IR spectroscopy for on-site detection of cleaning system residues on polychrome surfaces. *Microchemical Journal*, 157, 105033. <https://doi.org/10.1016/j.microc.2020.105033>

La Nasa, J., Campanella, B., Sabatini, F., Rava, A., Shank, W., Lucero-Gomez, P., De Luca, D., Legnaioli, S., Palleschi, V., Colombini, M.P., Degano, I., Modugno, F. (2021) 60 years of street art: A comparative study of the artists' materials through spectroscopic and mass spectrometric approaches *Journal of Cultural Heritage*, 48, pp. 129-140. [10.1016/j.culher.2020.11.016](https://doi.org/10.1016/j.culher.2020.11.016)

Zuena, M., Buemi, L.P., Stringari, L., Legnaioli, S., Lorenzetti, G., Palleschi, V., Nodari, L., Tomasin, P. (2020) . An integrated diagnostic approach to Max Ernst's painting materials in his Attirement of the Bride *Journal of Cultural Heritage*, 43, pp. 329-337. [10.1016/j.culher.2019.10.010](https://doi.org/10.1016/j.culher.2019.10.010)

Campanella, B., Botti, J., Cavaleri, T., Cicogna, F., Legnaioli, S., Pagnotta, S., Poggialini, F., Poli, T., Scalalone, D., Palleschi, V. (2020) The shining brightness of daylight fluorescent pigments: Raman and SERS study of a modern class of painting materials *Microchemical Journal*, 152, art. no. 104292, DOI: [10.1016/j.microc.2019.104292](https://doi.org/10.1016/j.microc.2019.104292) .

M. Sileo, F. T. Gizzi, A. Donvito, R. Lasaponara, F. Fiore, N. Masini (2020) . Multi-Scale Monitoring of Rupestrian Heritage: Methodological Approach and Application to a Case Study , "International Journal of Architectural Heritage". <https://doi.org/10.1080/15583058.2020.1799261>

M. Danese, M. Sileo, N. Masini (2018). Geophysical Methods and Spatial Information for the Analysis of Decaying Frescoes. "Survey in Geophysics". Vol.39(6), pp. 1149-1166. DOI: [10.1007/s10712-018-9484-0](https://doi.org/10.1007/s10712-018-9484-0)

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Previous Projects

- **2020-2023** – Integrated Platform for the European Research Infrastructure-IPERION-HS (H2020-INFRAIA-2019-1, GA No. 871034).
- **2021-2023** – IXI – Indagini per Immagini (FSC 2020-2024).
- **2020-2022** – Space-to-Tree: Earth Observation based monitoring of Natural and historical Park. European Space Agency – Avviso ARTES IAP-5G for L'ART Demonstration Projects
- **2020-2021** – H-WITHIN| HERITAGE WITHIN. Programma Cross Sectoral Strand Action INNOVLAB – Bridging culture and audiovisual content through digital. Grant agreement ID: 614719
- **2019-2021** – PON SHINE-Strengthening of the national hub of E-RHIS - European Research Infrastructure for Heritage (PON Ricerca e Innovazione 2014-2020 Finanziamenti finalizzati al potenziamento di infrastrutture di ricerca).
- **2019-2021** – INDACO (POR FSE 2014-2020).
- **2016-2020** – Monitoraggio, consolidamento, conservazione e protezione dei Beni Culturali (PRIN 2015-MIUR).
- **2015-2019** – Integrated Platform for the European Research Infrastructure ON Cultural Heritage - IPERION-CH (H2020-INFRAIA).
- **2013-2016** – FUTURAHMA - From FUTurism to Classicism, Research, Art History and Material Analysis (MIUR Futuro in ricerca FIRB 2012).
- **2013-2016** – SICH - Sustainability in Cultural Heritage (PRIN 2010-2011 - MIUR).

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