



University of Genova

Department of Earth, Environmental
and Life Sciences

Doctorate Course in Earth and
Environmental Science and
Technology

Earth Science Curriculum

Università degli Studi di Genova



Dottorato in Scienze e Tecnologie
per l'Ambiente e il Territorio

Research Theme n. 1

Titolo: Degrado di malte e intonaci dipinti in ambienti ipogei: approccio sperimentale integrato per lo studio dei processi di alterazione e lo sviluppo di strategie di conservazione e restauro

Title: Degradation of painted mortars and plasters in hypogeal environments: an integrated experimental approach to the study of alteration processes and the development of conservation and restoration strategies

Tutor: Pietro Marescotti

Co-tutors: Sara Iafrate (Laboratorio dipinti murali – Istituto Centrale per il Restauro (Ministero della Cultura))

Program description including the formation program abroad

Plasters and painted layers in hypogeal environments are exposed to environmental conditions characterized by near-saturation relative humidity, limited ventilation, and reduced thermal variability. In these environments, the type and extent of degradation depend on the characteristics of the plaster substrate, including binder type, aggregate composition, and binder–aggregate reactivity, as well as on finishing layers and pigments, whether organic, mineral, or synthetic in composition. Moreover, hypogeal environmental conditions promote the development of specialized microbial communities, inducing biodeterioration phenomena.

The project will be developed in several selected hypogeal sites, with particular reference to the rupestrian churches of Matera and Basilicata. These will also be compared with other sites already under study and conservation by the Istituto Centrale per il Restauro.

The aim of this project is to investigate the weathering processes affecting different types of painted plaster–mortar stratigraphic systems through an integrated, multianalytical, and multidisciplinary experimental approach, combining mineralogical–petrographic, physicochemical, and microbiological investigations applied to wall painting conservation and restoration.

The candidate will carry out in situ activities aimed at assessing the state of conservation and measuring the main environmental chemical, physical, and biological parameters. The sampling of stratigraphic cores will be designed and carried out following this phase, based both on the results obtained from the measurement activities and on experimental and conservation needs, while respecting the principles of minimum intervention, compatibility, and reversibility, thereby ensuring the highest level of protection of the cultural heritage involved.

Laboratory experimental activities will include: i) mineralogical–petrographic, chemical, and stratigraphic analyses of plaster and mortar samples; ii) characterization of pigments and binding media constituting the pictorial palette; iii) assessment of the degree of advancement of weathering processes; iv) microbiological investigations, with particular reference to microfungi, aimed at assessing taxonomic identity, morphological features, physiological and functional properties, and biochemical characteristics.

Laboratory experiments will also be conducted on artificially reproduced materials to simulate both weathering processes and restoration treatments, with particular focus on evaluating the most effective conservation strategies. This approach will allow: i) the identification of processes and conditions inducing alteration in different systems; ii) the determination of the type and extent of degradation; iii) the evaluation of geological–microbiological interactions, with particular reference to bioalteration, biocorrosion, and biomineralization pathways.

The results will contribute to constraining degradation processes of plasters, mortars, and pigments under the critical conditions of hypogeal environments.

The candidate is expected to spend a period of 3 to 6 months abroad at leading international research institutions (e.g., the research group Ciencia, Arte y Patrimonio – Universidad de Sevilla, and other European research centers), particularly to strengthen expertise in the biodeterioration of cultural heritage.

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Tutor's publications of the last 3 years

Gianoglio Fedra, Kubalíková Lucie, Marescotti Pietro (2026). Assessing Geosites for Sustainable Geotourism: A New Practical Tool Applied in the Beigua UNESCO Global Geopark (Italy). GEOHERITAGE, vol. 18, p. 1-22, ISSN: 1867-2485, doi: 10.1007/s12371-026-01335-1

Cavalletti B., Gianoglio F., Rocca M., & Marescotti, P. (2025). Economic Valuation of Geosystem Services in Agricultural Products: A Small-Sample Pilot Study on Rotella Apple and Moscatello Wine. LAND, vol. 14, p. 1, ISSN: 2073-445X, doi: 10.3390/land14091718

Laura Canonica, Grazia Cecchi, Sebastiano Comba, Simone Di Piazza, Fedra Gianoglio, Pietro Marescotti, Samuele Voyron, Mirca Zotti (2025). Fungi and Potentially Toxic Elements (PTEs): Exploring Mycobiota in Serpentinite Soils. SOIL SYSTEMS, vol. 9, p. 129-142, ISSN: 2571-8789, doi: 10.3390/soilsystems9040129

Giovanni Grieco, Alessandro Cavallo, Pietro Marescotti, Laura Crispini, Evangelos Tzamos, Micol Bussolesi (2023). The Formation of Magnesite Ores by Reactivation of Dunite Channels as a Key to Their Spatial Association to Chromite Ores in Ophiolites: An Example from Northern Evia, Greece. MINERALS, vol. 13, p. 159-177, ISSN: 2075-163X, doi: 10.3390/min13020159

Silvia Fornasaro, Paola Comodi, Laura Crispini, Sandro Zappatore, Azzurra Zucchini, Pietro Marescotti (2023). Trace and ultratrace elements in spinel subgroup minerals of ultramafic rocks from the Voltri Massif (NW Italy): the influence of microstructure and texture. EUROPEAN JOURNAL OF MINERALOGY, vol. 35, p. 1091-1109, ISSN: 1617-4011, doi: 10.5194/ejm-35-1091-2023