



University of Genova

Department of Earth, Environmental  
and Life Sciences

Doctorate Course in Earth and  
Environmental Science and  
Technology

Università degli Studi di Genova



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

## Curriculum in biology applied to agriculture and the environment

Research Theme n. 9

**Titolo (Italiano):** Relazioni tra tratti funzionali lichenici, microclima, e funzioni ecosistemiche: strumenti per lo studio del global change.

**Title (inglese):** Relationships between lichen functional traits, microclimate, and ecosystem functions: tools for studying global change.

**Tutor (name and email) and eventual co-tutor:** Paolo Giordani, [giordani@difar.unige.it](mailto:giordani@difar.unige.it)

**Program description including the formation program abroad (Inglese):**

It has been shown that the study of landscape-level heterogeneity of the microclimate will be crucial for understanding how organisms respond to climatic variations and for assessing the impacts of climate change on biodiversity and ecosystems. This PhD project aims to study the relationships between macroclimate, microclimate and functional traits in model organisms, such as lichens. This knowledge will provide an organism-centered perspective for studying the interactions between species and environmental factors, allowing more reliable predictions of ecosystem responses to global changes.

In particular, one aspect of interest in the project will be to develop quantitative measures of functional traits of lichens that can help estimate their contribution to ecosystem functionality. Among the various contexts of application, particular attention will be paid to the effect of lichens on water balance in Mediterranean forest ecosystems.

The project may be multidisciplinary, including ecological, ecophysiological, ecohydrological and spectrophotometric approaches to quantify functional traits and ecosystem functions performed by lichens at the microscale and upscaled to landscape level. According to modalities to be agreed upon, the PhD project will include mobility periods abroad in institutions at the forefront of the study of lichen ecology with which our laboratory regularly collaborates.

**Financial support:** The running costs of this PhD project will be financed within the departmental research funds of Prof. Paolo Giordani

**Tutor's publications (max 3)**

Ellis, C. J., Asplund, J., Benesperi, R., Branquinho, C., Di Nuzzo, L., Hurtado, P., Martínez, I., Matos, P., Nascimbene, J., Pinho, P., Prieto, M., Rocha, B., Rodríguez-Arribas, C., Thüs, H., & Giordani, P. (2021). Functional Traits in Lichen Ecology: A Review of Challenge and Opportunity. *Microorganisms*, 9(4), 766. <https://doi.org/10.3390/microorganisms9040766>

Giordani, P., Malaspina, P., Benesperi, R., Incerti, G., & Nascimbene, J. (2019). Functional over-redundancy and vulnerability of lichen communities decouple across spatial scales and environmental severity. *Science of The Total Environment*, 666, 22–30. <https://doi.org/10.1016/j.scitotenv.2019.02.187>

Porada, P., & Giordani, P. (2021). Bark Water Storage Plays Key Role for Growth of Mediterranean Epiphytic Lichens. *Frontiers in Forests and Global Change*, 4. <https://doi.org/10.3389/ffgc.2021.668682>