

# Group Ecological Genetics

*Swiss Federal Institute for Forest, Snow and Landscape Research WSL*

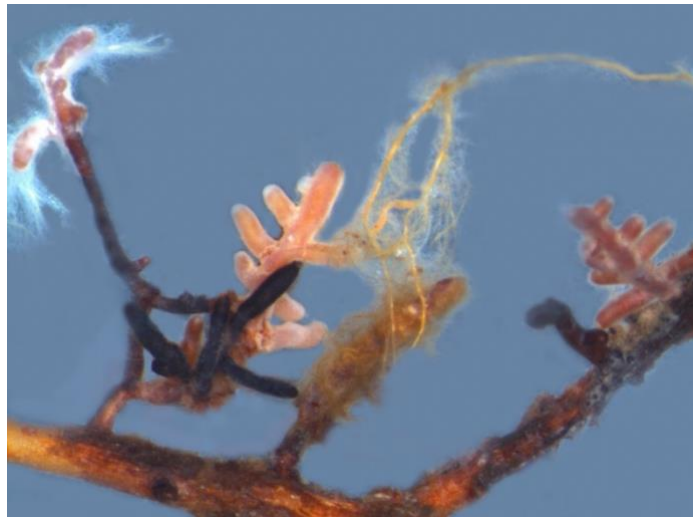
Research on mycorrhizal fungi and their ecological processes in the forest and laboratory

## Overview

Alongside plants and animals, fungi form their own kingdom, characterized by an enormous diversity of species and forms. Worldwide, there are approximately 160,000 described species, and many times that number of undescribed species. Fungi are found in virtually all habitats and are essential for a functioning ecosystem.

They play a central role as decomposers of plant material in nutrient cycles, as mycorrhizal symbionts of plants for more efficient nutrient and water uptake, as mutualistic endophytes of internal plant tissues (e.g., to defend against pathogens), as a food source for various mammals, insects, and orchids; as creators of microhabitats such as tree hollows; and, paradoxically, as plant parasites that contribute to a healthy and diverse ecosystem. Invasive fungi, known as neomycetes, such as the ash dieback pathogen *Hymenoscyphus fraxineus*, can, however, severely destabilize entire ecosystems.

**The Ecological Genetics Group at WSL**, led by Dr. Martina Peter, investigates ecological processes in populations of plants, mycorrhizal fungi, and animals using molecular genetic methods, supplemented by experiments. Martina Peter and several colleagues focus their research on various aspects of the symbiotic interaction between forest trees and mycorrhizal fungi and their role in forest ecosystems within a changing environment. As an interface between plants and soil, mycorrhizal fungi link above- and below-ground processes, forming extensive networks that connect trees within forests. These fungal networks are typically highly species-rich, with a single tree interacting with hundreds of mycorrhizal fungal species and individuals, which in turn interact with the roots of many other trees. The researchers aim to determine what role the diversity of mycorrhizal fungi, as well as the intraspecific diversity of certain fungal species, plays in forest functioning, and how mycorrhizal communities and populations are affected by and adapt to changing conditions such as climate-induced drought. To investigate these questions, the researchers conduct both field studies and experiments in greenhouses and under sterile conditions in climate chambers. To do so, they primarily use molecular methods to characterize the composition, functioning, and interactions of mycorrhizal fungi and their symbiotic partners. This often generates vast amounts of genomic data, which is subsequently analyzed using bioinformatics to extract the information contained within the genetic code.

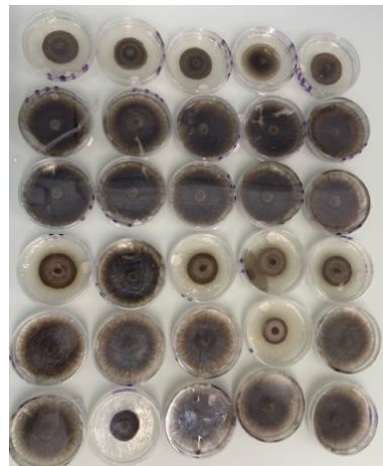


### **Collaboration with a Master's student from ZHdK**

The residency offers a framework for gaining a holistic understanding of the fungus as an organism within its scientific context, while engaging with a range of questions, processes, and stakeholders, as well as infrastructures and spaces on the WSL campus in Birmensdorf.

In this process, research in the “wet lab” (genetic and microbiological laboratory, experiments in the greenhouse/climate chambers) is intended to complement and inspire that of bioinformatic data analysis.

From the WSL's perspective, the interest lies in understanding natural processes but also in questioning its own approach. While the framework of scientific work may often be clearly defined, motivation stems from personal curiosity, and the scientific method always benefits from creative impulses. The encounter and collaboration between artists and scientists offers the ideal opportunity to embrace a shift in perspective on the one hand, and to jointly explore entirely new perspectives on the other. Working with bioinformatic data opens new avenues for researchers and artists to access the hidden structures of life. Genetic sequences and datasets can serve not only as scientific information but also as material for aesthetic, speculative, and conceptual explorations, enabling new forms of translation between science and art.



The fungus, as a model organism—growing, networking, and decomposing—offers many potential points of access and connection. They create space for personal and transdisciplinary exchange, for collective, yet naturally also individual, observation, analysis, and interpretation.

The interactions between computer code and genetic code represent a dimension that is both scientific and artistic, just waiting to be explored: these are fundamental languages that encode, transmit, and transform information — one shapes the living, the other models the world.

**Website Group Ecological Genetics**

<https://www.wsl.ch/de/ueber-die-wsl/organisation/forschungseinheiten/biodiversitaet-und-naturschutzbiologie/oekologische-genetik.html>

**Literature**

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