DOCTORAL CANDIDATE:	Ella Thoen
DEGREE:	Philosophiae Doctor
FACULTY:	Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Department of Biosciences
AREA OF EXPERTISE:	Fungal ecology
SUPERVISORS:	Håvard Kauserud
	Inger Skrede
	Unni Vik
	Mike Koomey
DATE OF DISPUTATION:	5th of April 2019

DISSERTATION TITLE: *Functional versatility and diversity in the plant root mycobiome*

Fungi are crucial components in all ecosystems, as decomposers and recyclers of organic matter, as pathogens and as beneficial symbionts with plants. Several recent studies indicate that the borders between these ecological groups may be less clear than previously appreciated, and in her thesis, Ella Thoen investigate this further.

The studies in this thesis focus on fungi associated with plant roots, and their versatile ecological functions. The thesis show how different factors are important in structuring fungal communities at different spatial scales, and that empirical observations from field studies can be supported by *in vitro* laboratory experiments. In a comprehensive study, Ella Thoen and colleagues investigated fungal communities across a climatic gradient in western Norway and found that plant root-associated fungi were more strongly affected by climatic factors than soil fungi. The soil carbon content and fungal biomass were found to be lowest in the wettest end of the climatic gradient, indicating that the fungal communities and, subsequently, the potential for soils to store carbon in this region may be altered by the predicted warmer and wetter climate.

Among the most widespread fungi in the mentioned study was the assumed saprotrophic genus *Mycena*. There are now numerous reports of these fungi occupying healthy plant roots, indicating that they may act as biotrophic fungi as well. Ella Thoen and colleagues investigated this using growth experiments and fluorescent microscopy, documenting the physical interactions between species of *Mycena* and plant roots. They found that all *Mycena* species associated closely with living plant roots. Using radioactive isotopes, they showed that some *Mycena* species were able to transfer nutrients to the plant. Species within this genus may be more ecological versatile than previously believed and could occupy a transitional state between saprotrophy and biotrophy.

Due to the hidden lifestyle of fungi, very little is known about what structures fungal communities on very small scales. Ella Thoen and colleagues investigated the fine-scale spatial structure of fungi occupying the roots of a single *Bistorta vivipara* root system. A diverse and spatially structured root-associated fungal community was found even at this very fine scale.