

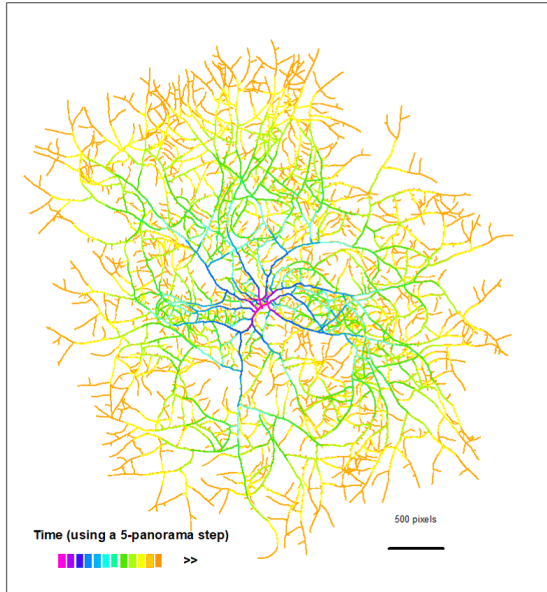
TIPS INTERACTIONS IN LIVING AND BRANCHING FUNGAL NETWORK

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P. anserina network after 24 hours of growth, initiated by a single spore.
Color codes age.

Hyphal network. The achievement of filamentous fungi in colonizing terrestrial ecosystems can be largely attributed to their flexible morphology, and more specifically to their ability to form an interconnected hyphal network, the mycelium, based upon some fundamental cellular processes, such as hyphal tip (or apex) growth, septation, hyphal orientation, branching and fusion (also known as anastomosis). This set of simple rules produces highly complex network (see Fig).

Based on images of the thallus at different ages, we reconstructed and labeled each of the events taking place during growth. In particular, branching, overlapping and anastomosis.

In this internship, we propose to exploit the data thus produced to explore tip/environment interactions.

Initially, we'll be looking at the interactions between tips and hyphae that are already present. Avoidance and attraction are known to occur. The aim will be to create collections of hyphae growing close to another hypha and to construct the right observable to characterize their interaction. Secondly, to identify the parameters leading from one behavior to the other. Finally, to reproduce the observed behavior by means of numerical modeling using the ingredients found, which will be inserted into the laws of non-interacting behavior already known.

A good knowledge of, or at least a taste for Python is required.

- Dikec *et al.* ; *Hyphal Network Whole Field Imaging Allows for Accurate Estimation of Anastomosis Rates and Branching Dynamics of the Filamentous Fungus Podospora Anserina*. Sci. Rep. (2020)
- Ledoux *et al.* ; *Prediction and Experimental Evidence of the Optimisation of the Angular Branching Process in the Thallus Growth of Podospora Anserina*. Sci. Rep.(2022)
- Ledoux *et al.* ; *Prediction and Experimental Evidence of Different Growth Phases of the Podospora Anserina Hyphal Network*. Sci. Rep. 2023.
- Chasserat *et al.* ; *Full Identification of a Growing and Branching Network's Spatio-Temporal Structures* ArXiv, 2024