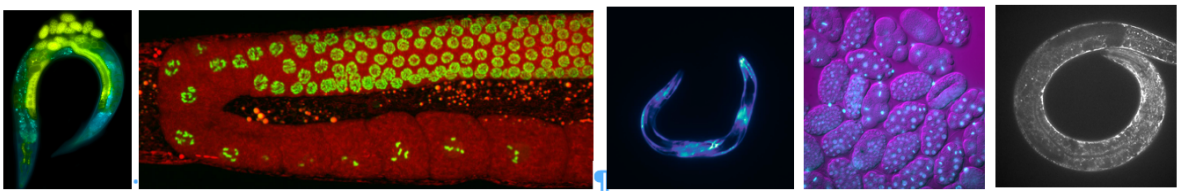
I am looking for a motivated master student to support me with my project about ***hox* genes and their role in cell proliferation**.

The **Hajnal lab** is a genetics and developmental biology lab in the Department of Molecular Life Sciences on Irchel Campus. We use the model organism *C.elegans* to study genetic alterations and cellular processes in development and disease.
Official group website: https://www.mls.uzh.ch/en/research/hajnal.html



Background:
In mammals tissue homeostasis and cell replacement relies on adult somatic stem cells (SCs), which are capable of self-renewal and proliferation to replenish damaged tissues when activated. In ***C. elegans***, **somatic cells** divide according to a fixed lineage pattern during the embryonic and larval stages, but no mitotic activity is observed in the soma of adult animals (Kipreos, 2005). Understanding why adult somatic cells irreversibly exit the cell cycle and cannot regenerate is one of the unsolved mysteries in *C. elegans* biology. Interestingly, the expression of its six *hox* genes is confined largely to the embryonic and larval development. Further, **exit from the cell cycle** is accompanied by drastic downregulation of *hox* expression to a low level. The loss of *hox* gene expression in terminally differentiated cells could be the underlying cause for the permanent cell cycle exit and the lack of regenerative capacity in *C. elegans* soma (Roiz et al., 2016).

In my project I am looking at ***lin-39,*** which is a *hox* gene responsible for the differentiation and proliferation of the vulval precursor cells (VPCs) during larval development. We recently found that over-expression of *lin-39* or *mab-5* is sufficient to cause the continuous proliferation of post-mitotic cells such as the uterine anchor cell (AC) or the sex myoblasts (SMs) (Heinze et al., 2023). These findings have raised the possibility that prolonged expression of *lin-39* and other hox genes could maintain the **proliferative potential of somatic cells** until adulthood. Through a genetic mutagenesis screen using custom made microfluidic devices we identified two mutant strains showing increased AC proliferation in the first day of adulthood.

Here are some **project ideas** that can be discussed:

- You will investigate the heterochronic pathway in a *lin-39* sensitive background to see if and how cell proliferation is affected in different tissues.

- You will develop an extraction method to isolate proliferating cells from different tissues and find suitable markers for cell sorting in order to do RNA sequencing and generate the very first *C.elegans* cell line.

- You will continue with preliminary results to test the proliferative potential of other *hox* genes in the worm and might identify a common pattern.

- You will do a mini RNAi-screen of cell cycle specific regulators and/or use the AID system to find candidates that push cell proliferation and elucidate the underlying mechanism.

If you are interested in doing your Master thesis with the Hajnal lab, please send your application via e-mail to: stefanie.engleitner@mls.uzh.ch