Master 2 Internship available at GlycoMEV - Univ Rouen Normandie – France
https://glycomev.univ-rouen.fr/

The internship will start on the 1st of February 2027 and end on the 31st of July 2027.

Title: Glycoengineering Trade-offs: Structural and functional consequences of human enzyme expression in model plants. In the frame of the funded ANR PRCI project GALIP (Impact of human β1,4-galactosylation in plant development) between GlycoMEV, Univ Rouen Normandie, France (ANR) and the University of Life Science, BOKU, Vienna, Austria (FWF), a 6 months internship is available.

Context of the Project
Plants are increasingly being used as sustainable "**green factories"** to produce medicines such as **therapeutic antibodies** and **other protein-based drugs**. To work properly, many of these medicines require specific sugar molecules, called glycans, which are attached to proteins and influence their stability and biological activity. Because plants naturally produce different glycans than humans, researchers have introduced human enzymes that enable **plants to produce proteins with more human-like glycans**.

Unexpectedly, this promising approach has revealed a **fundamental biological mystery**. Plants carrying one of these human enzymes often grow more slowly, develop abnormal leaves and flowers, and show defects in reproduction. Our preliminary results indicate that **the introduced enzyme not only modifies proteins intended for pharmaceutical use but also changes the glycans attached to the plant's own proteins**. As a result, it appears to interfere with the plant's natural system for building glycans, which are also essential for normal growth, cell wall formation, and communication between cells. **Why this happens and which biological processes are affected remain largely unknown.**

Goal of the project
This project will uncover how introducing a human enzyme **hGalT (β1,4-galactosyltransferase)** alters glycan formation in plants and why these changes disrupt development. Using the model plants ***Nicotiana benthamiana*** and ***Arabidopsis thaliana***, we will determine how these molecular changes influence plant growth and development and cell wall organization. By linking changes in glycans to visible developmental defects, **we aim to reveal fundamental mechanisms that control plant growth and development.**

The project brings together **complementary expertise from Austria and France** in plant glycobiology, glycoengineering, and cell wall biology, allowing us to investigate this question from the molecular to the whole-plant level. The results will provide new insights into the biological roles of glycans while supporting the development of improved plant production platforms for therapeutic proteins with human-like glycans. In the long term, this knowledge will contribute to more sustainable production of modern biopharmaceuticals and advance our understanding of how glycans shape life in plants.

Project Readiness: Several stable transgenic lines are already available and display moderate to severe phenotypes, providing an immediate starting point for downstream analysis.

Task of the candidate

This project is divided into 2 main tasks, allowing the candidate to develop a broad range of skills combining fine-tuned phenotypical and physiological characterization, advanced biochemistry and cutting-edge imaging.

Phenotypic Analysis:

Vegetative growth will be assessed by measuring plant height, leaf number and area using ImageJ, and root morphology and surface area using WinRHIZO, while biomass of above- and below-ground organs will be determined. **Reproductive development** will be analysed by recording flowering time and flower number, and by examining flower morphology macroscopically, followed by detailed structural investigations using scanning electron microscopy. **Pollen formation and maturation defects** will be assessed through anther cross-sections at multiple developmental stages, pollen counts per anther, and *in vitro* pollen germination assays. **Fruit and seed traits**, including size, weight, seed number, germination, and viability, will be quantified, and seed mucilage will be visualized by ruthenium red staining or immunolabeling. SEM of cut seeds will verify proper cellular compartmentation, including endosperm, cotyledons, hypocotyl, radicle, and seed coat.

Cell Wall Analysis:

To determine the **impact of hGALT on the cell wall composition**, galactosylation levels of *N. benthamiana* lines will be compared to wild-type by monosaccharide and linkage analyses **GC-MS and MALDI-TOF MS** after sequential extraction of cell wall polymers.

Cell wall polymers will be visualized by immunolabelling in different organs using a range of glycan-directed monoclonal antibodies, which will allow direct comparison of cell wall glycans in hGALT transgenic and wild-type plants. Imaging will be performed at the **cellular level** and, if required, at the **sub-cellular level** using transmission electron microscopy (TEM).

These analyses will be performed in **collaboration** with the UMS UAR High-tech Research infrastructures for Life Sciences (HeRacLeS), which includes PRIMACEN (cell imaging platform) part of the FBI (France BioImaging) and PISSARO (proteomic platform).

Qualifications of the applicant:

We are looking for candidate currently in Master 2 in cell imaging or plant biology with a strong interest for fundamental research, high motivation and the ability to work both independently and in collaboration with the project partners. The candidate should have skills in cell imaging and cell wall biochemistry and a strong knowledge in plant physiology.

A good level of English is required for interacting with the partners from Austria and to write publications. Following this internship, a PhD position may become available to the candidate.

Composition of the application file

1- CV + motivation letter.
2- Grades of the bachelor degree and the 1st year of Master
3- Diploma of Bachelor
4- Recommendation letter of the person in charge of the Master, indicating grades and ranking.
6- Any other recommendation letters, based on your professional background.

Deadline for the application: 14th of December 2026.

Stipend: at the mandatory rate (~660€/month)

Technical support

The intern will be trained by a research engineer in structural biochemistry, a study engineer in Plant culture and a technician in cell imaging.

Contact

Please send your application as a single pdf file to
Prof. Jean-Claude Mollet: jean-claude.mollet@univ-rouen.fr
And Dr. Amélie Morin: amelie.morin3@univ-rouen.fr