



INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM



Name of the Host Laboratory	Hydrodynamics Laboratory (LadHyX)
Website of the Host Laboratory	https://www.ladhyx.polytechnique.fr/
Research Group	Plant morphogenesis
Internship Supervisor	Arezki BOUDAUD
Internship Subject	Plant morphogenesis in controlled, stable/fluctuating environment
Student's level	<input checked="" type="checkbox"/> Advanced Undergraduate Students (3 rd or 4 th year) <input checked="" type="checkbox"/> Master's students (1 st or 2 nd year) <input checked="" type="checkbox"/> PhD students
Proposed Duration	<input checked="" type="checkbox"/> 3 months <input checked="" type="checkbox"/> 4 months <input checked="" type="checkbox"/> 5 months <input checked="" type="checkbox"/> 6 months
Prerequisites	Physicist/engineer with interest in biological systems OR Biologist with training in quantitative sciences
Internship description (max. 15 lines)	<p>Plant growth is an intricate process at the crossroad of mechanical and biochemical regulations. Cell expansion results from the competition of internal hydrodynamic pressure pushing outwards and cell wall stiffness resisting deformation. The addition of new material to the cell wall relaxes the resulting tension and allows for cell growth. Whereas the role of the cell wall has received considerable attention, the role of hydrodynamic pressure and of water fluxes in morphogenesis has been largely overlooked.</p> <p>During this internship we propose to investigate the role of water fluxes in the growth of <i>Marchantia polymorpha</i>, a nearly flat non-vascular plant from the liverwort family. During its vegetative reproductive cycle, <i>Marchantia</i> produces large numbers of genetically identical seedlings. These seedlings are a few hundred μm in size and grow mostly in 2 dimensions, which makes them especially suited for microscopic observation of early development. Using a microfluidic chip, the development of several gemmae can be observed in a controlled environment. The project will involve fabrication of microfluidic chips, experiments coupling microscopy and microfluidics, and the use of mutant plants to understand the role of aquaporins, the proteins that enable water movement through membranes. Simple hydro-mechanical models might also be used to help analyzing experimental results. The project will be framed according to the interests and abilities of the student.</p>

The boxes marked with cross implies eligible