# INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

# INTERNSHIP SUBJECT FORM

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| Name of the Host Laboratory | LadHyX |
| Website of the Host Laboratory | https://www.ladhyx.polytechnique.fr/fr/ |
| Research Group | |
| Internship Supervisor | Camille Duprat |
| Internship Subject | Elastocapillary effects in textiles |
| Student's level | ☐ Advanced Undergraduate Students (3rd or 4th year)<br>☒ Master's students (1st or 2nd year)<br>☒ PhD students |
| Proposed Duration | ☐ 3 months<br>☒ 4 months<br>☒ 5 months<br>☒ 6 months |
| Prerequisites | background in fluid mechanics and soft matter, a great interest in experimental work. |
| Internship description (max. 15 lines) | Textiles are versatile and highly functional materials; due to their efficiency in filtration, thermal insulation, or liquid adsorption, they are used in a large variety of domains. The interaction of fibrous materials with liquids (through adsorption, wetting, drying, imbibition) is a very common yet complex phenomenon which remains poorly understood. These phenomena involve a complex interplay of various physical mechanisms, including elasticity, capillarity, and geometry/topology. For example, the strength of a sheet of paper arises from the contacts between fibers that are established during the drying of the suspension of cellulosic fibers and are driven by capillary forces. A small amount of liquid between two fibers can locally deform the fibers, and indeed induce the collapse, or sticking, of adjacent fibers. At the scale of the textile, this *elastocapillary* effect can lead to a global shrinkage upon drying, or changes in the global mechanical response of the textile due to changes in the microstructure after wetting-drying cycles, as well as an increase of tenacity of yarns in wet conditions. We will study these effects experimentally in model systems. We will focus on the mechanical effects of liquid in twisted yarns and ropes, as well as their drying/wicking dynamics to study the role of torsion. Moreover we wish to investigate the effect of fiber elasticity, geometry and pore size/shape on the wicking/wetting/ drying dynamics. We will proceed by elaborating from model systems (from two parallel mono- filament fibers to bundles) to more realistic situations with natural fibers. Collaborations : Suzie Protière (Sorbonne Université), ENSAIT (Roubaix) |