ITI HiFunMat Master Internship Proposal

☒ M 1 ☒ M 2

Deciphering the R-body Extension-retraction Mechanism

Internship supervisor

Name, first name	Schmatko Tatiana, Kulic Igor
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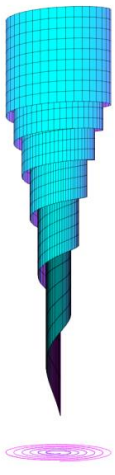
Laboratory	Institut Charles Sadron, Mcube team (soft matter and membranes)
Collaboration with a HiFunMat member (*please indicate their name*)	☐ No ☒ Yes : Laurent Pieuchot, Laurent.pieuchot@uha.fr

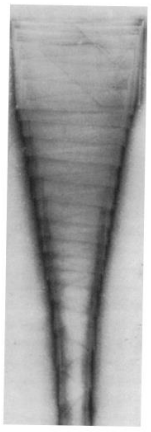
Student profile looked for

Master program (*more than one box can be ticked)*	☒ Material science and engineering ☒ Chemistry ☒ Physics
Other indications if necessary	The Institut Charles Sadron (ICS-Strasbourg. France) and the Institut de Sciences des Materiaux de Mulhouse (IS2M-Mulhouse France) are looking for a **motivated** master student in Experimental Physics, Material Physics or Biophysics with a **taste for interdisciplinarity**.

Internship description

R-bodies are unique molecular pistons produced by endosymbiotic bacteria that can switch in a fraction of second from enrolled 500nm ribbons to 20 microns membrane-perforating needles. Their extension is triggered by pH variation via a mechanism that remains unclear.
Within this internship the student will start deciphering R-bodies' extension-retraction cycle dynamics and mechanism by combining optical microscopy imaging, force spectroscopy methods and theoretical models.





The R-bodies will be produced in E.coli in Mulhouse by our ITI-HiFunMat partner. The student will immobilize R-bodies inside chambers allowing rapid buffer exchange. He will assess the influence of buffer viscosity on R-bodies dynamics and the force generated during extension using, micrometer beads, high speed optical microscopy imaging and optical tweezers.

The longer-term vision is to develop the first biophysical model integrating the experimental results on the thermodynamics and kinetics of the R-body phase transition and to ultimately tame this powerful and unique nano-machine for future applications.