ITI HiFunMat Master Internship Proposal

☒ M 1 ☒ M 2

Title: Artificial active biomimetic cell compartments

Internship supervisor

Name, first name	Stocco Antonio
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Laboratory	Institut Charles Sadron UPR22, Strasbourg
Collaboration with a HiFunMat member (*please indicate their name*)	☒ No ☐ Yes :

Student profile looked for

Master program (*more than one box can be ticked)*	☒ Material science and engineering ☒ Chemistry ☒ Physics

Internship description

Recently, we have experimentally investigated the interaction between active microparticles and empty cells made of lipid membranes. Several physical and chemical aspects of this interaction are important in processes such as viral infections, drug delivery and toxicity from nanomaterials. Lipid membranes can deform and wrap solid particles as a result of a delicate balance between adhesion, particle activity and membrane properties (tension, bending and charge).[1,2,3]

Now, we aim at studying giant unilamellar vesicles (GUV), which are not empty but filled with self-propelled particles. This internship is dedicated to the fabrication of such biomimetic cell systems able to show active motion and dynamics such as giant fluctuations, cell division and tube formations.

Phospholipids and microparticles (made of silica, copper and gold) will be investigated to fabricate giant vesicles containing microparticles, which are able to self-propel and impart forces on lipid membranes. Bright-field and fluorescence microscopy will be used. Particle tracking and image treatment will be used for analysis.

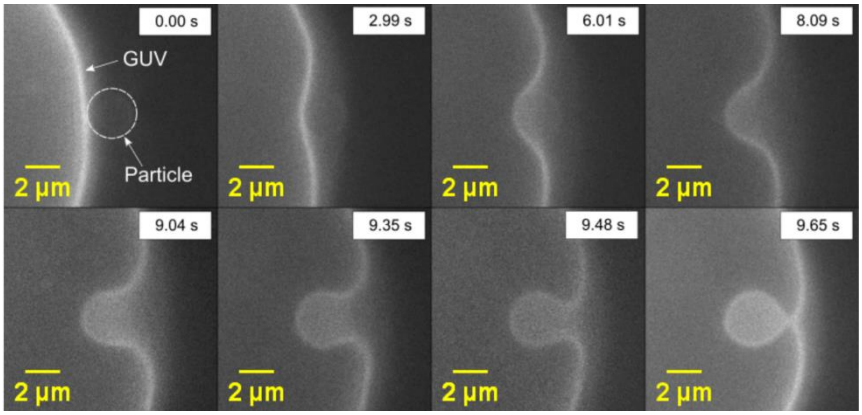

Figure. Giant unilamellar vesicle (GUV)-Particle interaction by fluorescence microscopy and optical trapping.

REFERENCES:

1 Active colloids orbiting giant vesicles, V. Sharma et al. Soft Matter 2021.

2 Entry of microparticles into giant lipid vesicles by optical tweezers, F Fessler et al. PRE 2023

3 Driven engulfment of Janus Particles by Giant Vesicles in and out of thermal equilibrium, V. Sharma et al. Nanomaterials 2022