

Internship subject
Composite materials in Life

<p>Confidential subject: No</p> <p>Subject open to M2: Yes to M1: Yes</p> <p>Subject adapted to LabTraining: Yes</p>
<p>Summary</p> <p>Biological tissues are composite materials. They are made of incompressible cells, surrounded by a compliant extracellular matrix and permeated by interstitial fluid. Unexpected biological and mechanical behaviors emerge from the coexistence of these three phases. From a biological perspective, multicellular aggregates are much more sensitive to small mechanical stimuli, as compared to individual cells. In practice, a gentle compression (1 kPa) inhibits cell proliferation. From the rheological point of view, multicellular aggregates appear 10-100 times more compressible than individual cells.</p> <p>The objective of the project is to verify the hypothesis that the poro-active and composite character of biological tissues is essential to the detection of mechanical stresses. Through a series of experiments, the student will determine whether cells can read and interpret the mechanical state of the extracellular matrix and how they react.</p> <p>The project will be realized in collaboration with Corinne ALBIGES-RIZO (Institute for Advanced Biology – Grenoble) for the biological aspects and with Pierre RECHO (Laboratoire Interdisciplinaire de Physique, Grenoble) for the theoretical description of poro-active composite materials.</p>
<p>Related Publications</p> <p>Extracellular Matrix acts as pressure detector in biological tissues. M. Dolega et al. https://hal.archives-ouvertes.fr/hal-01958769</p> <p>Cell-like pressure sensors reveal increase of mechanical stress towards the core of multicellular-spheroids under compression. M. Dolega et al. <i>Nature Communications</i> 8 (2017) 14056</p>
<p>Background and skills expected</p> <p>The student should be either a physicist or a biologist, who would like to work at the interface between the two disciplines.</p>
<p>Competences that will be acquired during the internship</p> <p>Cell culture and manipulation, microfluidics, microscopy and data analysis.</p>
<p>Supervisor : Giovanni CAPPELLO, Pierre RECHO</p> <p>Laboratory : Laboratoire Interdisciplinaire de Physique</p> <p>Team/Group : MOTIV / MicroTiss</p> <p>Contacts - E-mail : Giovanni.Cappello@univ-grenoble-alpes.fr Tel : +33 (0)616208511</p> <p>Web-page : https://www-liphy.ujf-grenoble.fr/Giovanni-Cappello-546?lang=fr</p>
<p>This Master internship could be followed into a PhD within the same research area: Yes</p>