

## Internship subject

## Self-sustained velocity waves and pattern emergence in tissues

<p><b>Confidential subject:</b> No</p> <p><b>Subject open to M2:</b> Yes                      <b>to M1-RIT:</b> Yes</p> <p><b>Subject adapted to LabTraining:</b> Yes</p>
<p><b>Summary</b></p> <p>The project aims at investigating the role of self-sustained velocity waves in the emergence of a supracellular organisation in a multicellular context.</p> <p>Several recent works reported that wave-like patterns of the velocity spontaneously appear in colonies of epithelial cells. Those waves appear in spreading epithelial sheets, regardless of cell proliferation, and they are correlated to oscillations of the forces exerted by the cells on the substrate. Strikingly, we recently observed that Supra-cellular waves are characterized by a precise wavelength much larger than the cell size, and a period several times shorter than the typical duration of a cell cycle.</p> <p>The student will use optogenetics to stimulate the contractility 1D cell strips. With this method, the student will test the robustness of supra-cellular waves, with respect to coordination loss in time and space, by imposing incongruent patterns of contractions, with wavelength and/or periods incommensurable with (or opposite to) the natural ones.</p> <p>The project will be realized in collaboration with Christophe Guilluy (Institute for Advanced Biology – Grenoble) for the biological aspects and with Pierre RECHO (Laboratoire Interdisciplinaire de Physique, Grenoble) for the theoretical description of oscillatory waves in epithelial layers.</p>
<p><b>Related Publications</b></p> <p><b>Petrolli V</b> et al. <i>Phys Rev Lett</i> <b>2019</b>, <b>122</b>, 168101, <b>Confinement-Induced Transition between Wavelike Collective Cell Migration Modes</b></p> <p><b>Ladoux B</b> et al. <i>Nat Rev Mol Cell Biol.</i> 2017;18:743-757.</p> <p><b>Deforet M</b> et al. <i>Nat Commun.</i> 2014;5:1-9.</p> <p><b>Serra-Picamal X</b> et al. <i>Nat Phys.</i> 2012;8:628.</p> <p><b>Tlili S</b> et al. <i>Subject Areas</i> : 2018. <b>Trepat X</b> et al. <i>Nat Phys.</i> 2009;5:426-430.</p>
<p><b>Background and skills expected</b></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><b>Competences that will be acquired during the internship</b></p> <p>Cell culture and manipulation, microfluidics, microscopy and data analysis.</p>
<p><b>Supervisor :</b> Giovanni CAPPELLO, Pierre RECHO</p> <p><b>Laboratory :</b> Laboratoire Interdisciplinaire de Physique</p> <p><b>Team/Group :</b> MOTIV / MicroTiss</p> <p><b>Contacts - E-mail :</b> Giovanni.Cappello@univ-grenoble-alpes.fr      <b>Tel :</b> +33 (0)616208511</p> <p><b>Web-page :</b> <a href="https://www-liphy.ujf-grenoble.fr/Giovanni-Cappello-546?lang=fr">https://www-liphy.ujf-grenoble.fr/Giovanni-Cappello-546?lang=fr</a></p>
<p><b>This Master internship could be followed into a PhD within the same research area:</b> Yes</p>