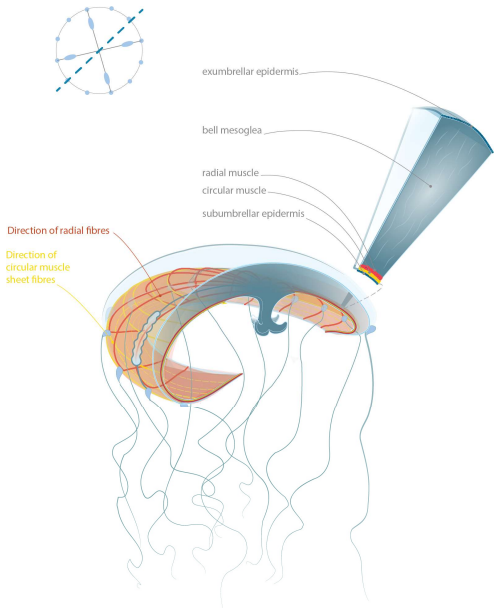

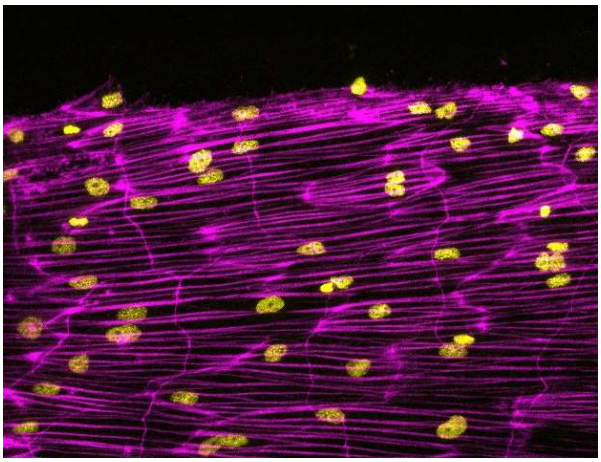

Deciphering the epithelial/extracellular matrix transcriptional-mechanical crosstalk in regenerating jellyfish

We are seeking an enthusiastic master student to join our new group "Cnidarian Regeneration, Development and Evolution" (www.cnidevolab.com), located in the Oceanographic Observatory of Banyuls-sur-Mer (Sorbonne University/CNRS), in the South of France.

Our team investigates the regulation of regenerative processes in jellyfish, in particular how mechanical and chemical cues are integrated by a wounded animal, in order to cope with random injuries. We are asking a key question, uniquely accessible with our laboratory jellyfish, *Clytia hemisphaerica*: why some wounds are "simply" repaired, while others lead to the activation of a regenerative program?

Clytia is a small and transparent laboratory model, where recent technological developments have enabled *in vivo* approaches. We have shown that *Clytia* has excellent repair capacities (bisected medusa recovers shape in less than 12 hr, and a new functional mouth in 4 days), and that both mechanical and transcriptional cues participate in the recovery of forms (Sinigaglia et al., 2020, eLife). The body of Clytia is characterized by a "passive" thick extracellular matrix (ECM) layer, called mesoglea, and an "active", contractile, epithelio-muscular tissue that covers the inner side of the umbrella. We are currently characterizing the molecular and biophysical parameters of regeneration vs repair programs. The aim is to generate a stress-based simulation model which will shed light on how different cues are integrated at the cellular, tissue and organismal level. Modeling is performed by the team of Dr. Carl Modes, a biophysicist expert in tissue mechanics, located at the Max Planck Institute of Molecular Cell Biology and Genetics (Dresden, Germany).

In *Clytia*, we have shown that the onset of a regenerative program depends on the sustained activation of Wnt signaling (Sinigaglia et al., 2020, eLife). Wnt signaling is always activated following an injury, but it is later turned off if no regeneration follows. Additionally, morphological and RNAseq data from repairing *Clytia* indicate that the ECM is heavily remodeled, and that ECM-related genes are expressed.

The M2 project will probe whether ECM deformations during repair modulate Wnt signaling, directing the regenerative process. The student will focus on the link between transcriptional dynamics and changes in the ECM properties, in wounded and unwounded jellyfish, by:
- characterizing the spatio-temporal ECM properties;
- correlating them with transcriptional dynamics in the tissues;
- functionally addressing the link, by manipulating both ECM properties and gene expression.

The mesoglea properties depend on the distribution and morphology of its collagen and fibrillin fibers - which determines its stiffness/elasticity. The ECM biology will be addressed by combining *ex vivo* (ECM slab compression), *in vivo* (jellyfish compression, drugs) and *in vitro* (immunostaining, DIC and electron microscopy) approaches. The gene expression dynamics will be studied with *in vitro* (in situ hybridization) and *in vivo* (drugs, RNAi).

The student will gain a multidisciplinary laboratory experience. The data collected will contribute to the *in silico* model, providing a further broadening of perspectives.

Contact: chi.sinigaglia@gmail.com