DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

The aim of this project is the understanding of how tissues develop, become organised and are maintained during the life time. We know that this is done by cell to cell communication, yet many of the molecular details are far from clear. One of the main molecular players in cell-cell communication and differentiation is the Notch signalling pathway.

While there are 4 Notch receptors, there are 5 ligands. Surprisingly, the outcome during cell differentiation is determined by the ligand type at play, often producing 2 distinct outcomes e.g. ligand Jag induced angiogenesis (vasculature formation), while ligand Dll4 suppresses it.
One of the problems to study Notch signalling is that it requires mechanical forces to be activated (Notch receptor needs to be pulled by a ligand presented by another cell). We have created a system where Notch is activated by light, in the absence of ligand. Using this system we will be able to determine how Notch signalling takes place, if the presence of the ligand within the same cell has an effect on signalling, or if the dose (number of Notch molecules activated) is what determines the downstream effects (selective gene activation and cellular differentiation). Moreover, using the same system we will be able to regulate the ligand and potentially block Notch activation as well.

Our work will bring a more detailed understanding of some of the processes that make every single multicellular organism what they are. Moreover, the Notch signalling is deregulated in several diseases such as cardiovascular diseases and cancer. Thus, our work could have many implications in many scientific and medical fields.