Eukaryotic cell-free synthetic circuits expressed in a microfluidic chemostat

Where ? Bioinspired Communications Systems, TU Darmstadt, Germany
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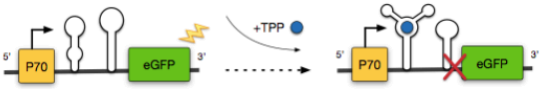
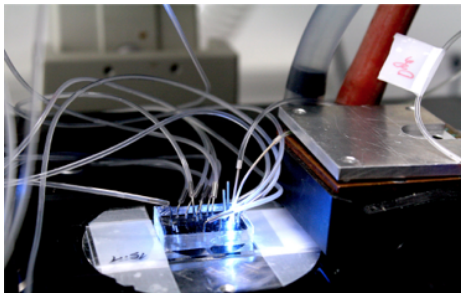
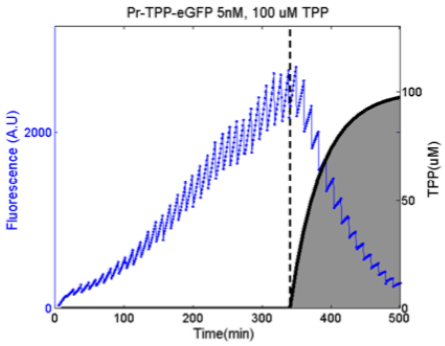
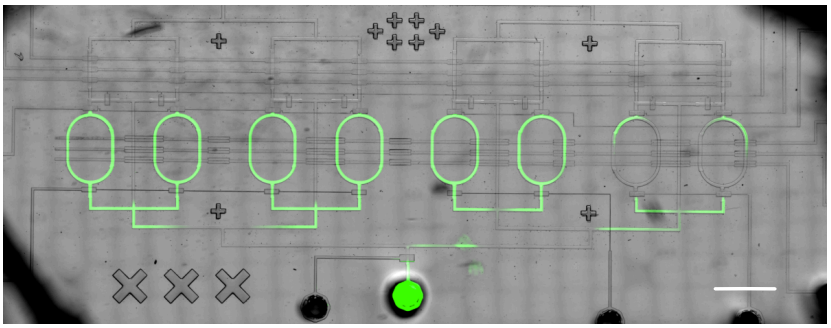
Project : The aim of the project will be to control biological circuits in microfluidics nano-liters reactors, based on previously characterized riboswitches circuits for human cells.









They will be in a first time tested in a cell free extract ran at steady state via the use of a microfluidic nanoliter-scaled reactor [2]. The chip enables to vary the concentration of the multiple components of the circuit, while keeping the transcription/translation reactions at a steady state for multiple hours, or even days. One can therefore control the input of this artificial-cell-like reactor and dynamically control the system for the desired output. For instance, one can induce different gradients patterns of inducers over time and study the reversibility ability of such circuit entirely *in vitro*. It would be the first time that one shows the use of eukaryotic cell-free systems to control dynamically the expression of gene circuits through the use of a microfluidic platform.

Skills used : Molecular Biology, Microfluidics, Microscopy, Data Analysis, matlab

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[1] Implementation of cell-free biological networks at steady-state. Niederholtmeyer H., Stepanova V., and Maerkl S.J. PNAS 110(40):15985-15990. DOI: 10.1073/pnas.1311166110