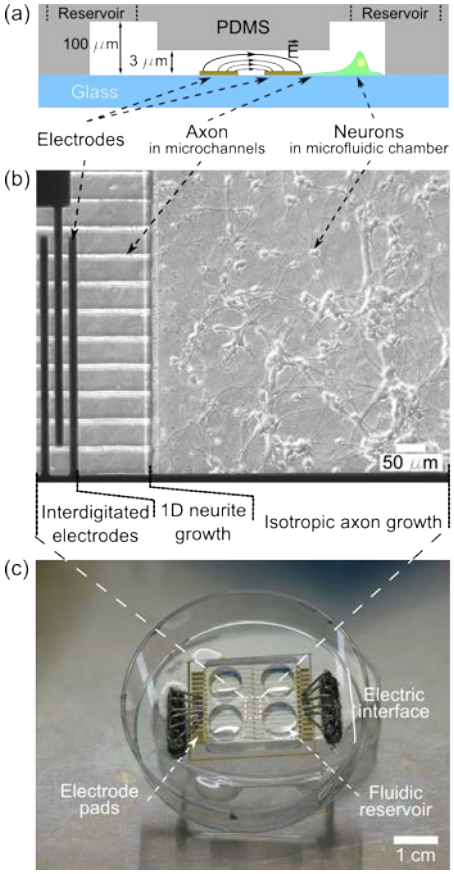
Neurites growth in a microfluidic chip

Neurodegenerative diseases (NDD) such as Alzeihmer's or Parkinson diseases affect an increasing aging population in Europe. However developing efficient therapeutic approaches is difficult due to the complexity of the brain circuitry that is modified in NDDs. New evidences have highlighted abnormal structural (connections) and functional (communication) brain networks in NDDs. Our group develops BioMEMs that model healthy and diseased brain circuits in microfluidic chips with neurons extracted from rats (exemple in the Figure). This technological approach is based on the acute control of neurite (axons and dendrites) growth in-vitro.



Objectives and detailed work:

Although the group has developed several strategies to control neurite growth in microlfuidic chip, the objective of the intern is to evaluate a novel mechanical way to guide neurites in a microfluidic chip. The student will have first to simulate a mechanical model of the deformation of the substrate in order to compute the optimized parameters for neurite development. The student will then have to fabricate such substrates in clean room, obtain rat primary hippocampal neurons by dissection (performed by someone else) and evaluate the growth of neurites on different substrates by doing cell culture in the microfluidic chip and observing the growth with fluorescent imaging. If successful, this new technique will be integrated in more complex microfluidic chips to create a full in vitro model of a NDD. This work will be in close collaboration with the Institute of Neuroscience of Grenoble.

Future possibility:

Ph.D. with national grant. High grades required in M1/M2.

Student profile:

Master 1 in engineering, microtechnology or biotechnology. A strong taste for fabrication and interdisciplinary experiments are recommended.

Position open in: October 2016 **Salary**: Official internship rates

Duration: 6 months / more if extended to M2

Contact: Dr. Thibault HONEGGER
Laboratoire des Technologies de la Microélectronique – CNRS
c/o CEA LETI, 17 rue des Martyrs, 38054, Grenoble
Phone: + 33 4 38 78 90 62
Mail: thibault.honegger@cnrs.fr

Ref : Honegger T. et al, Electrokinetic confinement of axonal growth for dynamically configurable neural networks, Lab. Chip. 13, 589-598, 2013