Combining microfluidics and GFETs arrays to probe *in vitro* neuronal networks

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Graphene field-effect transistors (GFETs) are highly sensitive bio-transducers, that we apply to record neuronal activity *in vivo* and *in vitro* [1]. The advantages of graphene bioelectronic relies in its exceptional neuronal affinity [2,3], nanoscale sensing ability [4] and optical transparency enabling to combine highly sensitive electrical recording and fluorescent imaging. Here, we show that GFET array can be combined with microfluidic chip for multiscale sensing of user-defined neuron networks. We investigate signal propagation and communication between fluidically isolated neuron populations, and also we compare the performance of the fabricated device with micro-electrode arrays (MEAs) [5] - widely used in electrophysiology - to critically review the GFET benefits. These devices can then be used to study model multi-nodal networks and in particular inter and intra-population communication at the fundamental level but also in health-related research and applications.

References

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Figures

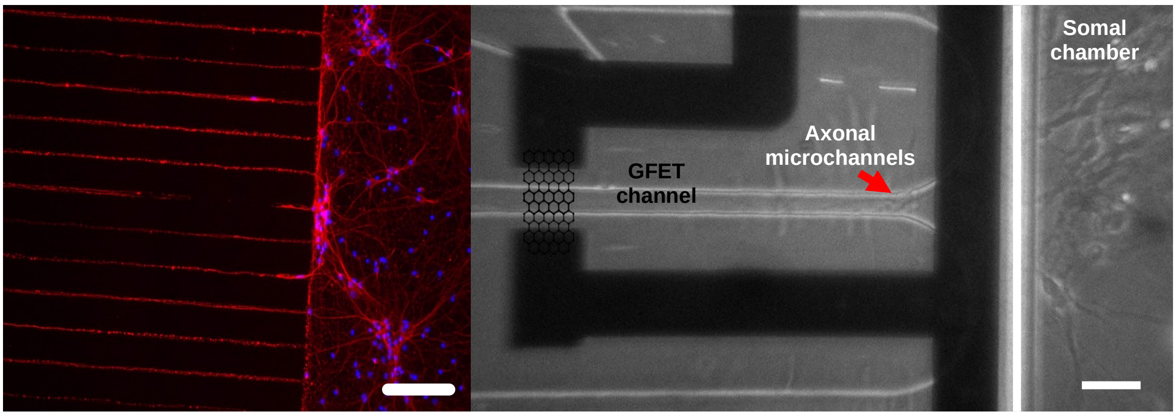

Figure 1: (left) Spatial segregation of soma (blue, DAPI) from neurites (red, alpha-tubulin) of cortical primary rodent neurons cultured in a microfluidic chip (DIV7, scale = 100µm). (right) Optical micrograph of a GFET aligned with a microchannel containing an axon bundle originating from the neuron compartment on the right (scale = 30µm).