Sensing neurons at multiple scales

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In order to understand how neural circuits operate, we need to access the activity of large numbers of neurons individually and simultaneously, and to identify the connections and type of the constituting network. As a contribution to this vast subject, we are developing novel approaches and devices to picture neural network activity at the nano and mesoscales with highly biocompatible materials. Especially, we will report the fabrication of dense arrays of highly sensitive field effect transistors (graphene and silicon nanowire FETs) and their ability to detect a wide range of neuronal signals from single spike (action potential) [1,2] to ion channel,[3] useful to investigate neuronal architectures *in-vitro* and for brain interfaces. In addition to numerous advantages, graphene exhibits an exceptional neuronal affinity[4] and can be combined with biomimetic material,[5] for improving accuracy and life time of current intracortical probes.[6]

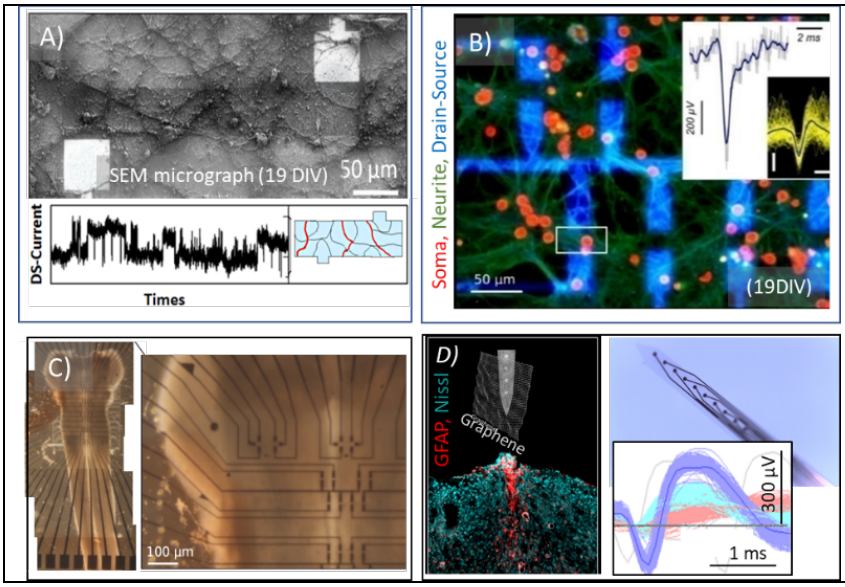

Figure 1. GFET arrays for in-vitro assays (A-B, hippocampal neurons), ex-vivo preparation (C, spinal cord) and brain interface (D, intracortical). Insets : Recording traces show individual ion channels opening/closing (A), and single spikes from individual cultured (B) and intracortical (D) neurons.

Reference

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