1. **HYVIS: Building hybrid synapses as a therapeutic strategy for photoreceptor degeneration”**

Tutors: Fabio Benfenati fabio.benfenati@iit.it and Elisabetta Colombo elisabetta.colombo@iit.it

The project aims at the development and characterization of a device able to release glutamate upon illumination by a plasmonic enhancement of electromagnetic radiation. These opto-neural interfaces will be tested on neural cells and tissues *in vitro* and *ex vivo*. In particular, the candidate will be in a unique position to join a multidisciplinary team (medicine, biology, physics and chemistry) and to exploit recent advances in the development of nano-tools able to elicit light-driven stimulation of dystrophic neural tissue such as a degenerated retina in the framework of a dedicated research line on “*Neuroscience and Smart Materials*”. Applicants should have a background in Biology/Biotechnology, Biomedical Engineering. Previous experience in molecular biology and viral vectors are welcome. The ideal candidate wishes to develop practical skills on the nano-functionalization of the devices with adhesion molecules and viral vectors able to recreate the secluded environment of a retinal synapse.

2. **Physiopathology of neuronal excitability and synaptic plasticity in murine and human models of neurological diseases.**

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The project aims at investigating the neuronal and astrocyte transcriptional and posttranscriptional mechanisms contributing to the regulation of excitability and excitation/inhibition balance and to epileptogenesis. The project will also include electrophysiology of human neurons differentiated from induced pluripotent stem cells (iPSCs). Applicants should have a background in Cellular Neurophysiology with experience in patch-clamp and multielectrode array recordings. Previous experience in molecular biology and viral vectors is welcome.