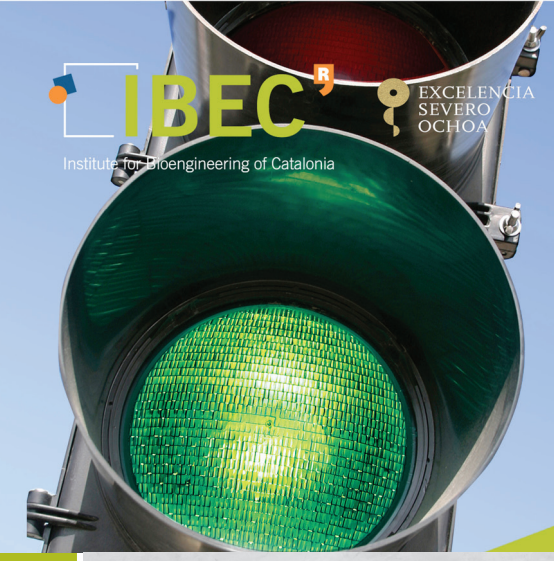

IBEC
Institute for Bioengineering of Catalonia
EXCELENCIA SEVERO OCHOA

Fellowships IBEC International PhD Programme

A green light for your future

Nanoprobes and nanoswitches group

Group leader: Pau Gorostiza

Molecular prosthetics for vision restoration based on freely-diffusible and covalently bound photoswitches

Light-regulated drugs allow remotely photoswitching biological activity and enable plausible therapies based on small molecules. We develop efficient compounds to manipulate neuronal activity for fundamental and therapeutic purposes. In the first case, simultaneous photocontrol of synaptic receptors and fluorescence imaging of neuronal activity in vivo will allow studying synaptic plasticity from the single dendritic spine level up to the whole brain. Regarding therapeutic applications, the compounds developed will be used to impart light sensitivity to remaining inner retinal neurons in animal models of degenerated retina. As small molecules, our photoswitches can be subject to optimization in well-established pharmacological and safety assays, and can be tested in non-genetic model organisms of the disease. Thus they have the potential to become preclinical candidate drugs to be transferred to the pharmaceutical industry. The development, optimization and applications of photoswitches in several animal models offers outstanding opportunities as a fundamental tool to photomanipulate synaptic plasticity in vivo, as well as a small-molecule therapeutic approach to vision restoration.