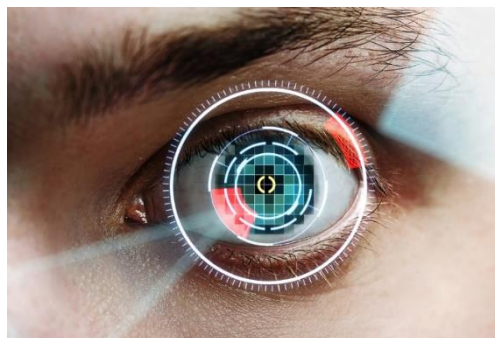


Optobioelectronics enabled by organic semiconductors

We are looking for candidates with a background in **material physics** or **chemical physics** to start a PhD thesis in Nanoscience. Topic of the thesis is the material science related to **novel biotic/abiotic interfaces**. Such interfaces are present whenever modern electronic technology is engaged to transduce information into or out of biological cells. The progress obtained in such interfaces in recent years has led to **novel medical therapies** including Cochlear Implants or Artificial Retinas that help patients to recover auditory or visual senses. However, current interfaces are driven by microelectronic implants that have to incorporate batteries as power-sources as well as microprocessors and complex electrical wiring to achieve local stimulation or recording of cells. The inherent complexity of such devices impedes further miniaturization and reduction of invasiveness.



The research proposed for this PhD-position targets to overcome these limitations by introducing organic semiconductors at the abiotic/biotic interface. Such semiconductors combine biocompatibility with an unprecedented capability in transforming local optical excitation into physicochemical stimuli making wires as well as internal power sources unnecessary. First proof-of-principle experiments demonstrate for example that organic semiconductor based photocapacitors convert a local light flash into an ionic current pulse, strong enough to activate a retinal neuron.¹ Clearly, in order to achieve **wireless, optical control of bioelectronic interfaces**, further progress in the material science and the understanding of the underlying microscopic mechanisms in organic semiconductor enabled optobioelectronics is necessary and will be topic of the thesis.

The proposed research work is **embedded in the European FET-OPEN Project “Light and Organic Nanotechnology for Cardiovascular Disease (LIONHEARTED)”**, that involves eight European research facilities and universities. Typical activities to be carried out during the PhD-work are:

- **Scanning probe microscopy experiments** on interface materials to characterize morphological and electronic properties at the microscale
- **Optoelectronic characterization** of materials and devices
- **Fabrication** of nano-structured model interfaces.
- Joint experiments with cellular biologists and medical doctors.
- Participation in international project meetings and conferences.

A closer description of our research group as well as our laboratory facilities can be found here: <https://site.unibo.it/semiconductor-physics/en>

In case of interest please contact

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1. Rand, D. *et al.* Direct Electrical Neurostimulation with Organic Pigment Photocapacitors. *Adv. Mater.* **1707292**, 1–11 (2018).