

# IBEC participates in "la Caixa" Fellowship Programme with a set of **stimulating PhD projects** and **excellent research groups** to host the fellows



## Smart nano-bio-devices group

Group leader: Samuel Sánchez

### 3D Printed Bio-BOTS

IBEC's Smart Nano-Bio-Devices group focuses in the minituarization and design of new devices and advanced materials that bridge the gap between chemistry, biology, material science and physics, which can have relevant applications in the biomedical or environmental fields. The group has wide experience in the design and fabrication of smart nano- and micro-motors and actuators based on complex nanostructured materials which are fueled via catalytic reactions. The group also investigates the integration of artificial microstructures with living cells and biomaterials (hybrid bio-robots), either based on motile cells, such as bacteria, or externally controlled cells, such as skeletal muscle tissue.

The research project consists in the use of top-notch technologies such as 3D Bioprinting, nanotechnology and bioengineering to design and fabricate BIO-BOTS that will act as hybrid walkers or swimmers combining artificial components (hydrogels, smart polymers, magnets, nanoparticles) and biological moieties (enzymes, cells, tissues). The newly engineered BIO-BOTS will open new avenues in several fields from Soft Robotics, Tissue Engineering, biomedical tests and LabChip devices.

*ERC-Starting grant group for project "Lab-in-a-tube and Nanorobotic Biosensors". Samuel Sánchez received the MIT TR35 Award as "Innovator of the year" Spain Edition 2014, Princess of Girona Foundation Research Award 2015, Guinness World Record for smallest man-made jet engine in 2010, among other recognitions.*

### Job position description

The offered PhD position would be enclosed in the hybrid bio-robots line of research. Background on biomedical engineering, chemistry, biotechnology, materials science, physics and other engineering backgrounds are suitable.

The candidate should have a material science or material engineering profile. Experience in 3D printing or bio-printing techniques and smart materials are of great added value. Experience with simulations (such as finite element analysis) and 3D modelling is strongly advised, although not compulsory. Some basic knowledge of biochemistry or biology of muscle tissue would be taken into account. The PhD student will be integrated into a team of 4-5 multidisciplinary researchers involved in the design, fabrication and characterization of hybrid bio-robots based on muscle cells with 3D bio-printing techniques.

Thanks to IBEC's state-of-the-art 3D Bio-printer, complex structures can be created interfacing living tissue, hydrogels, biocompatible materials and UV-curable polymers. Furthermore, these hybrid bio-robots should be able to walk, swim, or offer some kind of actuation with the ability to be externally controlled via magnetic fields, electrical pulses, opto-genetical modifications, or chemical cues.