

The Nanobioengineering Research Laboratory

J. Samitier

Institute of Bioengineering of Catalonia

The Institute of Bioengineering of Catalonia (IBEC) is promoted by the Autonomous Government of Catalonia, with the aim to coordinate multidisciplinary research activities in biomedical engineering carried out in Catalonia and to strengthen interdisciplinary research by integrating basic research and clinical and industrial applications.

One of its aims is to promote the Nanobioengineering Research Laboratory, situated in the PCB and earmarked to become a pioneering research centre in biomedical engineering on nanometric scale. Born out of a collaboration between the *Universitat de Barcelona* (UB) and the *Universitat Politècnica de Catalunya* (UPC) (Technical University of Catalonia), the Nanobioengineering Research Laboratory is a multidisciplinary centre in which investigators from the Accredited Centre for Research in Bioelectronics and Nanobioscience (CBEN) of the UB and the Centre for Research in Biomedical Engineering (CREB) of the UPC carry out joint research. It is also involved in joint projects with researchers from other universities or those contracted through re-incorporation programmes for doctors or technicians. The mission of the Nanobioengineering Laboratory is the development of interdisciplinary research combining Physical Sciences and Engineering with Biology and Medicine integrating basic science together with clinical and industrial applications.

Its location within PCB enables the laboratory's researchers to carry out their work in a biomedical research setting which includes both public and private sector bodies who have already expressed an interest in the potential applications of nanotechnology in the biomedical field. The laboratory also has access to powerful technological facilities which, in addition to the usual scientific services of the PCB (culture rooms, characterisation services, etc.) and the scientific and technical services of the UB, includes the recently developed Nanotechnology Platform, which offers services such as nanomanufacturing, nanomanipulation and the analysis and characterisation of nanotechnologies.

1. Research lines

- Cellular and molecular nanotechnology. Functionalization of surfaces. Nanomanipulation and detection of proper-

ties at cellular level. Electrical characterization of individual molecules and molecular devices.

- Engineering of tissues and cell cultures. Studies of biocompatibility and the growth of the electrical and mechanical properties of cells. Computer modelling of the growth and remodelling of tissues.
- Characterization of tissues and /or cell cultures. Monitoring cell growth and activity via electrical properties. Acquisition and processing of cell signals. Processing of micro-potentials and models of cellular potentials.
- Design of devices for the manipulation and processing of cells and molecules on a chip (biochip/lab-on-a-chip). Development of biosensors and micro/nano devices for molecular detection. Development of molecular and cellular micro- and nanomanipulation. Study of cell response to specific stimuli.
- Acquisition and treatment of biomedical signals and images. Development of tools for processing and visualization at molecular and cellular levels.

2 Facilities at the Barcelona Science Park

The *Parc Científic de Barcelona* (PCB, Barcelona Science Park) is a cornerstone of the innovation system developed by the *Universitat de Barcelona* (UB, University of Barcelona), with the support of the *Fundació Bosch i Gimpera* (FBG, Bosch and Gimpera Foundation) and the *Caixa Catalunya*, which hosts research groups from both the public and private sectors and offers a wide range of technological facilities.

The coming together of public research centres and private enterprise makes the PCB a pioneering point of reference in promoting the transfer of knowledge and technology, and also facilitates the setting up of new technology-based companies.

Situated on the Diagonal Campus, the *Parc Científic de Barcelona* hosts twenty companies, four research centres, and the CIDEM-PCB Bioincubator, all of which work in emerging research areas of chemistry, pharmacy, biotechnology and nanobioengineering. These research activities are located in a 20,000 m² laboratory building, which is also home modern platforms to R+D+I.

The research carried out at the Barcelona Science Park is multidisciplinary and covers an array of areas in experimental, human and social sciences. The result is the convergence, in a single setting, of a critical mass of human resources in areas linked to production sectors of special relevance, thus contributing to greater economic and social cohesion in the new knowledge-based economy

The Nanotechnology Platform at the *Parc Científic de Barcelona* (PCB) provides researchers with the facilities required for Nanotechnology research projects, particularly in Nanobio-engineering.

The platform is a 10000 /100 class cleanroom appropriately equipped with the state-of-the-art equipment for the manufacture of micro and nanostructures and their subsequent study

and characterization. The Nanotechnology Platform comprises equipment for the manufacture and characterization of structures with sizes ranging from the millimetre to a few nanometers. The manufacturing techniques include Focused Ion Beam (FIB) lithography, Hot Embossing Lithography (HEL), Nanoimprint Lithography (NIL) Polymer processing (spinner deposition, curing) and photolithography, Chemical wet etching and E-beam evaporation.

Other platforms located at the PCB are Combinatorial Chemistry Platform, Fine Chemistry Platform, Transcriptomics, Platform, Proteomics Platform, NMR Platform for biomolecules, X-Ray Diffraction Platform. Also common facilities include cell culture rooms, cold rooms, dark rooms, and microscopy rooms.

For more information: <http://www.ibecbarcelona.eu>