IBEC Annual Report 08

Institute for Bioengineering of Catalonia

Centres de recerca de Catalunya

IBEC Annual Report 08

"This Annual Report constitutes the irrefutable proof that IBEC is alive and keeps growing strong and healthy"

I am very pleased to write this short introduction of the IBEC 2008 Annual Report because this is the most relevant sign of IBEC being alive and properly organized. It is the main tool that in the future will allow writing the history of our Institution.

The Annual Report constitutes the main proof of the cumulative work performed by IBEC's members in their everyday activities. Most of these activities can be summarized as figures or indicators, but beyond the figures lays the large amount of solid work conducted by IBEC members, either individually or in a collective way. Ph.D. theses or awards individualize an activity lasting a long period of time, where many others may have also contributed.

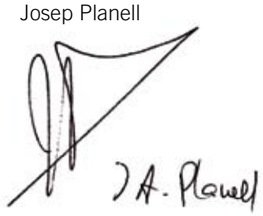
On the other hand, a paper published in a journal or the development of a competitive research project constitutes the achievement of a larger group of people. The report on all such activities and achievements demonstrates the common endeavour of IBEC members in making IBEC a world class reference research institute in Bioengineering and Nanomedicine, by means of their everyday effort.

A unique and distinctive feature of IBEC lays in the concentration of multidisciplinary talent that its members bring in. This is an attribute and also an asset that will provide IBEC a competitive advantage in order to face and handle the complexity of many research issues in the fields of Bioengineering and Nanomedicine.

Finally, it is especially rewarding that with this third Annual Report we are able to prove that, at present, the process of collecting the data and intelligence of IBEC's activities and putting them together in an ordered manner constitutes a well established procedure implemented by the different management units of our Institution. This Annual Report constitutes the irrefutable proof that IBEC is alive and keeps growing strong and healthy.

Thank you!

Josep Planell



Introduction Letter

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2008 News

2008 News

IBEC INCORPORATES A NEW GROUP INTO ITS CELLULAR BIOTECHNOLOGY LINE

In the final quarter of 2008, a new research line was created, led by Dr. José Antonio Del Río, which now forms part of the Cellular Biotechnology Programme.

The new line, molecular and cellular neurobiotecnology, bases its work on a number of different areas of research, including the use of atomic microscopy in protein-membrane neuronal interactions, the cloning of genes and the expression of regulated genes during development, pharmacological treatments for the promotion of axonal regeneration and the potential of neuronal stem cells in neuronal repair.

Seven researchers will be working alongside Dr. del Río, three of whom are PhD students, and four are doctoral students.

With the incorporation of this new line, there are now fourteen groups pursuing their own research activities in the six IBEC programmes.

IBEC SIGNS A MAJOR AGREEMENT IN SOUTH KOREA

IBEC has signed a framework agreement with the Institute of Tissue Regeneration Engineering (ITREN) of South Korea's Dankook University to promote exchange and collaboration in research and the training of experts in tissue engineering.

In the framework of this agreement, professor Hae-Hyoung Lee, director of the ITREN, and two researchers from the centre, Prof. Hae-Won Kim and Prof. Won-Cheoul Jang, visited IBEC in July 2008.

In November 2008, the director of IBEC, Prof. Josep A. Planell, and researcher Prof. Maria Pau Ginebra, participated as guest speakers at ITREN 2008 International Symposium "Emerging Biomaterials in Tissue Engineering" and had the opportunity to visit the ITREN facilities and establish the terms of a number of research and collaboration projects.

Within the framework of this scientific collaboration, the Ramon and Cajal IBEC researcher, Dr. Óscar Castaño, is currently at ITREN for a research stay in Prof. Kim's group.

As an extension of the collaboration agreement, the next IBEC-ITREN symposium is due to be held in Barcelona in July 2009.

SIBB BioBCN2008

Alongside the Universitat Politècnica de Catalunya (UPC), IBEC organized the SIBB BioBCN2008 conference, the third edition of the Iberian Biomaterials Conference, as well as the XXXI Symposium of Iberian Biomechanics and Biomaterials companies, which took place in Barcelona from 17 to 19 September 2008.

The SIBB BioBCN was a unique opportunity to learn about the most significant advances in biomaterials and biomechanical design and development, and to discuss the most prominent trends in this area.

The Symposium also included two roundtable discussion groups which focused on Sports Biomechanics and Orthopaedic Surgery.

IBEC SPIN-OFF

Aleria Biodevices is the first *spin-off* to have come from IBEC and has been created to launch a new technology, which has been developed and launched into the market by the Neuroengineering group led by Enric Claverol-Tinturé.

It involves totally polymeric cell culture trays with microchannels and culture chambers, which allows electrical cell activity generated by neurones in vitro to be easily measured.

This allows complex neuropathologies to be decoded, such as epilepsy, chronic pain and Alzheimer's disease.

SYMPOSIUM ON ADVANCED MICROSCOPY TECHNIQUES

The single molecule bionanophotonics group at the IBEC organized last October 15-17, the first international symposium on "Advanced Microscopy Techniques for Immunanoscopy". The meeting addressed major advances in microscopy techniques applicable to Immunology sharing, at the same time, knowledge on the most exciting topics in Immunology where these techniques may have a crucial impact. Around the 100 researchers from Europe and United States, from disciplines of cell immunology and biophysics participated at the symposium with top speakers in both fields. Prof. Maria Garcia-Parajo, head of the single molecule bionanophotonics group at IBEC coordinated the event within the framework of two European research projects. These new optical techniques allow the observation of cellular activity and molecular processes in real time, and on a nanometric scale with the potential to revolutionize the field of biomedicine.

WORKSHOP ON OPTICAL MEASUREMENT AND MANIPULATION OF NEUROTRANSMISSION.

On October 17th, IBEC organised together with the Catalan Institution of Research and Advanced Studies (ICREA) and the Institute for Biomedical Research of Bellvitge (IDIBELL), a workshop that introduced state-of-the-art tools for measuring and manipulating biological processes with light, as described by some of their creators and main players in the field of neurobiology. In addition, the workshop emphasized the importance of fluorescence techniques in biological research and was a unique and timely opportunity to gather attention on the recent breakthroughs in photoswitchable proteins.

The workshop was held successfully at Barcelona´s Picasso Museum and was attended by 100 participants. People who could not attend had the facility of watching the event through a live internet broadcast.

IBEC SUMMER TOUR 2008

The 2008 IBEC Summer Tour was held on 25th July, with the aim of putting the almost 1,300 square metres of IBEC's laboratories in the PCB on display.

The 2008 IBEC Summer Tour consisted of a series of guided tours around the IBEC facilities in the PCB, followed by a glass of cava. One hundred people attended the event.

IBEC TAKES PART IN THE 2008 ESOF PROGRAMME

The ESOF Programme is an open platform for debate and communication in the scientific community. Its objective is to showcase current European scientific trends. The ESOF was held in Barcelona from 18th to 22nd July.

As part of the ESOF scientific programme, IBEC organized a debate on 20th July on Bionics in Regenerative Medicine. Prof. Josep A. Planell, the director of IBEC, moderated this stimulating debate on the pros and cons in this field of medical research. The debate benefitted from the presence of Prof. Eduard Castells, Head of Heart Surgery at the Hospital de Bellvitge and an expert on heart transplants, as well as Prof. James Kirkpatrick, Director of the Johannes Gutenberg University of Mainz's Institute of Pathology and an expert on regenerative medicine.

On 19th July, Prof. Josep Samitier, head of an IBEC nanoengineering research group, moderated the session "What Can Nanotechnology Do for Your Health? This session addressed the enormous potential for the application of nanotechnology in the diagnosis and treatment of illnesses.

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The IBEC Private Foundation

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Northwestern University, USA

Prof. Bernt E. Uhlin
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Organizational Chart

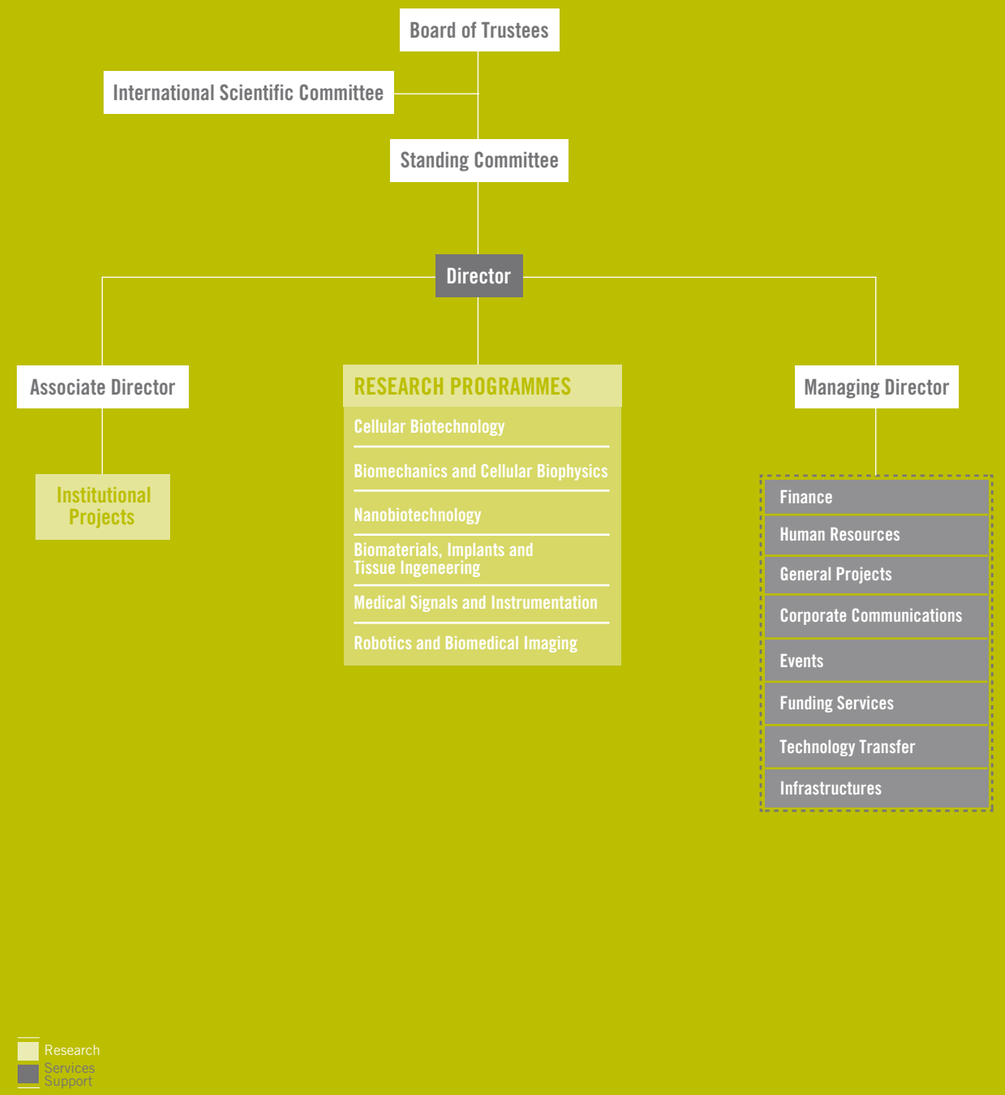


figure 1. Organizational chart of the IBEC Foundation






Organizational Structure

IBEC has 151 researchers and technical experts, who either work on an in-house basis, are UB or UPC staff, or come from various programmes for the recruitment of research staff: ICREA, Ramón y Cajal Programme (MEC), amongst others. There are researchers from 20 different countries at IBEC. In addition, IBEC employs 17 staff to carry out administrative duties.

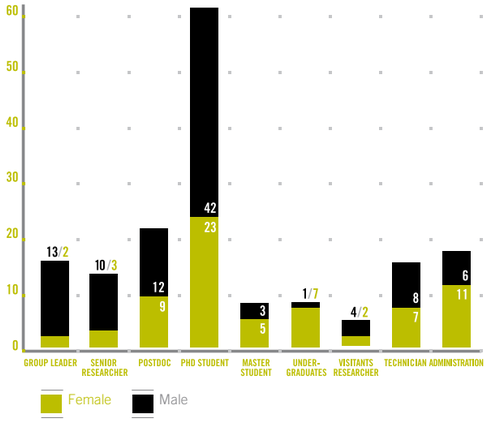


figure 2. IBEC researchers and technical and administration staff by gender

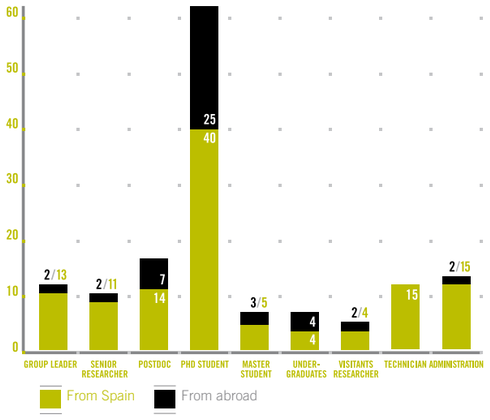


figure 3. IBEC researchers and technical and administration staff by nationality

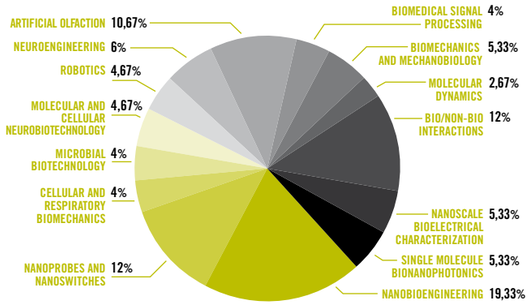


figure 4. Distribution of IBEC researchers and technicians by group

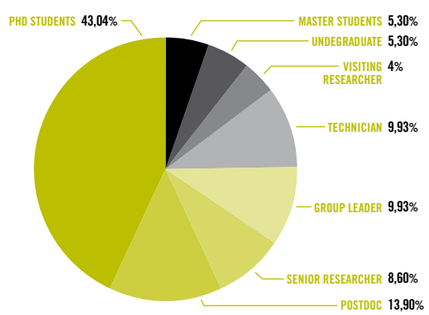


figure 5. Distribution of IBEC researchers and technicians by category

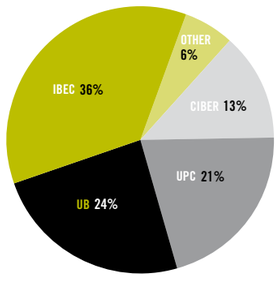
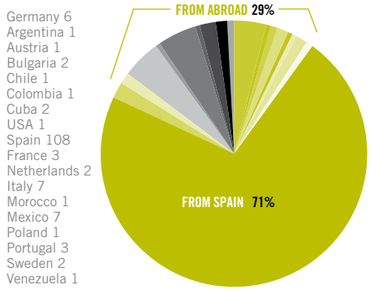


figure 6. Distribution of IBEC researchers and technicians by contracting or associated institution



Germany 6
Argentina 1
Austria 1
Bulgaria 2
Chile 1
Colombia 1
Cuba 2
USA 1
Spain 108
France 3
Netherlands 2
Italy 7
Morocco 1
Mexico 7
Poland 1
Portugal 3
Sweden 2
Venezuela 1

figure 7. Distribution of the IBEC's 151 researchers and technicians by nationality

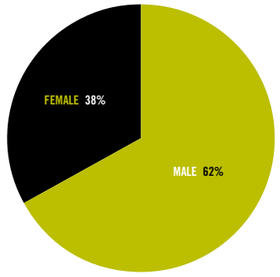


figure 8. Distribution of the IBEC's 151 researchers and technicians by gender

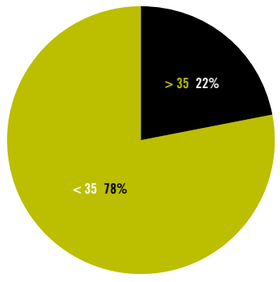


figure 9. Distribution of the IBEC's 151 researchers and technicians by age

Administration

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Josep A. Planell
DIRECTOR SECRETARY
Pilar Ciriquian Esguerra
ASSOCIATE DIRECTOR
Josep Samitier Martí
MANAGING DIRECTOR
Abel Riera Corominas

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HEAD OF GENERAL PROJECTS
Teresa Sanchis
PROJECT MANAGER
Javier Adrian

Institutional Projects

HEAD OF INSTITUTIONAL PROJECTS
Arantxa Sanz
PROJECT MANAGER
Vacant

Infrastructures

HEAD OF INFRASTRUCTURES
Isabel Oliveira

Finance

HEAD OF FINANCE
Ana González
ACCOUNTING MANAGER
Francisco Buenestado
PURCHASING MANAGER
Mayte Muñoz

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Corporate Communications

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Mariusa Reyes

Events

EVENTS MANAGER
Pilar Jiménez

Funding Services

FUNDING SERVICES MANAGER
Esther Gallardo

Research

Research Lines

Cellular biotechnology programme

Microbial biotechnology and host-pathogen interaction

Research staff
Prof. Dr. Antonio Juárez Group Leader
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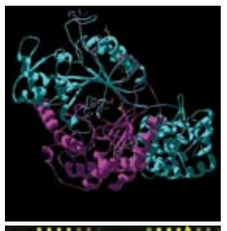
Dra. Rosa Carmen Baños Postdoctoral researcher
Laura Pedró PhD Student
M. Carmen Jaramillo Technician
Nahia Barberia Student
María del Mar Cendra Student

Structure and function of bacterial proteins that control expression of virulence factors: protein-protein and protein-DNA interactions play key roles in the ability of virulent bacteria to adapt to the host environment and cause disease. One of the group's current research interests is to gain a better understanding of the role of certain proteins involved in this process. Specifically, research focuses on two groups of proteins: nucleoid-associated proteins (NAPs) that contribute to DNA architecture and modulate gene expression, and ribonucleotidil reductases (RNRs), key enzymes in all living organisms as they provide the nucleotide precursors for DNA replication and repair. With respect to the first group, we are interested in unravelling the role that two of these proteins, Hha and H-NS, play in the regulation of virulence. With respect to the second group, our current research in this field is to analyse the importance of the different bacterial RNRs in pathogenesis, the molecular mechanisms that control the genetic expression of these proteins, the biological implications of the simultaneous presence of different RNR classes in a single microorganism and, finally, the screening of new specific RNR inhibitors.

Bacterial adherence to biomaterials. In many instances, bacterial adherence to various surfaces results in the development of biofilms. Microorganisms that form biofilms exhibit properties that differ from those of single planktonic cells, including an increased resistance to antimicrobial drugs. The treatment of biofilm-associated infections is a major clinical challenge. A major problem in titanium dental implant failure is the formation of dental plaque, which is a mixed bacterial biofilm. If plaque accumulation occurs and is left for a period of time, the inflammation around the implant may spread rapidly and can easily reach the bone. It could, therefore, cause bone resorption with the subsequent failure of osseointegration. We seek to gain a better understanding of the interaction of Streptococcaceae with titanium surfaces to determine (i) which physicochemical modifications result in delayed biofilm formation and (ii) which environmental factors favour/interfere with the adherence of S. sanguinis to titanium.

Application of nanotools to bacterial biotechnology. We previously showed that dielectrophoresis can be a valuable tool for bacterial cell sorting and characterization. We are interested in the use of chip devices for analysing the surface properties of single cells of bacterial pathogens.



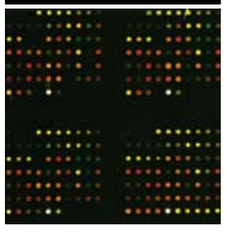


Fig.1 (top) 3D modelling of the ribonucleotide reductase

Fig. 2 (bottom) Representative portion of a Salmonella typhimurium microarray.

Molecular and cellular neurobiotechnology

Research staff
Prof. Dr.José Antonio Del Río Group Leader
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Dr. Rosalina Gavín Postdoctoral researcher
Dr. Franc Llorens Postdoctoral researcher
Vanessa Gil PhD Student
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Alejandra Rangel PhD Student
Oscar Seira PhD Student

a) Study of re-expressed signs of development in adults that arise in the absence of axonal regeneration in the central nervous system. Development of repair strategies (1). Pharmacological and molecular treatments.

b) Characterization of cellular and molecular alterations in Alzheimer's disease and human prion diseases.

c) Development of repair strategies for neurodegenerative diseases and axonal regeneration (II). Treatment using neural stem cells and the potentiation of axonal regeneration of the central nervous system using glial cells through the application of genetic modifications and nanotechnology tools.

The results obtained to date highlight that the complex nature of axonal regeneration necessarily requires a multidisciplinary approach in which various methodologies and the functional screening of bioactive molecules must come together. Over the past few years, the group has described the limits of the combined use of some pharmacological and/or molecular techniques in order to boost axonal regeneration in the central nervous system. In addition, it has carried out a number of transcriptomic analyses using microarrays in development models and adults with various medical conditions. Thanks to this, the group has identified specific genes involved in the development of the cerebral cortex, neural angiogenesis and maturation, and axonal guidance. Many of them are expressed by particular groups of neurons present during specific stages of neuronal development. The researchers have also determined the overexpression of 313 known genetic products after a cortical lesion. The transcriptomic and biological analyses have made it possible to determine the roles of some of them in specific processes such as neuronal maturation, neuronal migration, neuritogenesis, etc. The potential role of some of these produces as a therapeutic target is currently the subject of research by the group.

The research group has also demonstrated that the factors that regulate neuronal progenitors depend both on extrinsic and intrinsic factors in what are known as "neurogenic niches". Moreover, in the work based on cellular treatment genetically modified lines have been developed in order to secrete key compounds in neurodegenerative disorders (e.g. acetylcholine (Ach)). The high capacity for these cellular lines to integrate in the nervous parenchyma makes it possible to use them as "mini cellular bombs" that supplement the cholinergic deficit, as was observed in the mice used for the study on Alzheimer's disease. The group is researching other stem cell treatments, such as its study of biocompatibility and molecular encapsulation in neurodegeneration models. Work has also begun on genetically modified olfactory glial cells in order to assess their healing properties in cortical lesions for treatments that are based on the controlled nanodelivery of growth factors.

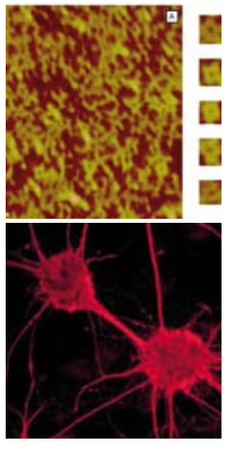


Fig.1 (top) Study of the interaction of specific peptide domains of the PrP with lipid bilayers using AFM.

Fig. 2 (bottom) 2D neuronal culture after 15 days in vitro immunolabelled with anti beta-tubulin antibodies.

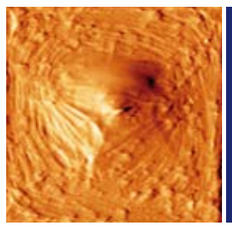
Biomechanics and cellular biophysics programme

Cellular and respiratory biomechanics

Research staff
Prof. Dr. Daniel Navajas Group Leader
Dr. Jordi Alcaraz Senior researcher
Dr. Xavier Trepat Senior researcher
Dr. Pere Roca-Cusachs Postdoctoral researcher
Xavier Serra PhD Student
Danielle Mascarenas Master's degree student (Fulbright Scholarship)

The research in this line seeks to gain a better understanding of cellular and respiratory biomechanics with the aim of improving the diagnosis and treatment of respiratory diseases. The work is structured into two interrelated areas focusing on the systemic and cellular levels of respiratory mechanics. We adopt basic and translational approaches within a multidisciplinary framework of cooperation with clinical research groups in pneumology. At the systemic level, we study the mechanical properties of the airways and lung tissues and their alteration in the mechanical dysfunction associated with respiratory diseases. The research is mainly focused on the mechanics of the upper airway in the sleep apnea syndrome and on mechanical ventilation in acute and chronic respiratory failure.

At the cellular level, we develop and apply cutting-edge nanotechnology and advanced biophysical techniques to probe the mechanical behaviour of the cells and their mechanical interactions with the microenvironment. We study the mechanical properties of the cell and its response to inflammation and mechanical stress. We study the mechanisms of tissue damage and repair. Specifically, we have carried out research into the mechanical signalling involved in tissue regeneration by stem cells. We study the biophysical mechanisms that regulate the adhesion and vascular transmigration of leukocytes. We also investigate the mechanical determinants of carcinogenesis.



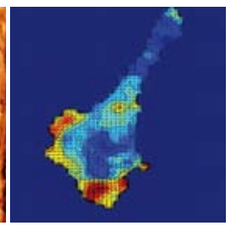


Fig.1 (left) Cell contraction map

Fig.2 (right) Control of cell shape by surface micro-patterning.

Nanoprobes and Nanoswitches

Research staff
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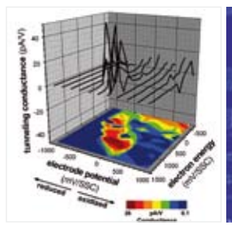
Felipe Caballero PhD Student
Aleix Garcia-Güell PhD Student
Javier Hoyo PhD Student
Andrés Martín-Quirós PhD Student
Lorena Redondo PhD Student
Mercè Izquierdo Graduate student
Ivan Rimmaudo Graduate visitor
Karolina Szczesna Undergraduate visitor
Anna Palacios Undergraduate

The group's research focuses on developing nanoscale tools to study biological systems. These tools include instrumentation based on proximity probes, such as electrochemical tunnelling microscopy and spectroscopy that is being applied to the study of metal oxides and redox proteins. Another set of nanotools that we are developing is based on molecular actuators that can be switched with light, such as azobenzene, which can be chemically attached to biomolecules in order to optically control their activity.



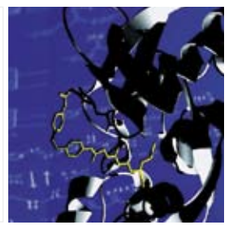


Fig.1 (left) Conductance map of an iron polycrystal in borate buffer solution, obtained by electrochemical tunnelling spectroscopy. Credit: I. Díez-Pérez, F. Sanz and P. Gorostiza (2007). Curr. Op. Sol. St. Mat. Sci. 10:144-152.

Fig.2 (right) Light-activated glutamate receptor based on the photoisomerizable tethered ligand MAG (in yellow). Credit: P. Gorostiza and E. Y. Isacoff (2007). Mol. Biosyst. 3:686-704.

Nanobiotechnology Programme

Nanobioengineering

Research staff

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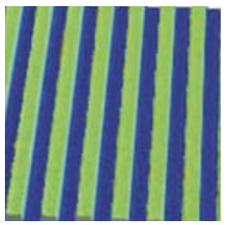
Dr. Xavier Fernández-Busquets Senior researcher
Dra. Elena Martínez Senior researcher
Dr. Christopher Mills Senior researcher
Dr. Christian Sporer Senior researcher
Dra. Anna Lagunas Postdoctoral researcher
Dr. Juan José Valle Postdoctoral researcher
Dra. Nadia Zine Postdoctoral researcher
Dr. Antoni Homs Postdoctoral researcher
Ramona Bravo PhD Student
David Caballero PhD Student
Óscar Castillo PhD Student
Jordi Comelles PhD Student
Maruxa Estévez PhD Student
Javier G. Fernández PhD Student
Mathias Kuphal PhD Student
Sergio Martínez PhD Student
Sabine Oberhansl PhD Student
Isabel Oliveira PhD Student
Ivón Rodríguez PhD Student
Santiago Rodríguez PhD Student
Patricia Urban PhD Student
Michael Lee PhD Student
Christian Widmer Project manager
Miriam Funes Technician
Adai Colom Master's degree student
Óscar Ramírez Master's degree student



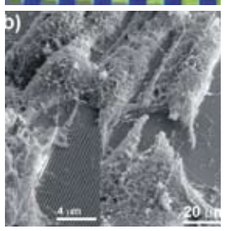


Fig.1 (top) Interferometer image of the line pattern of the PMMA substrate.

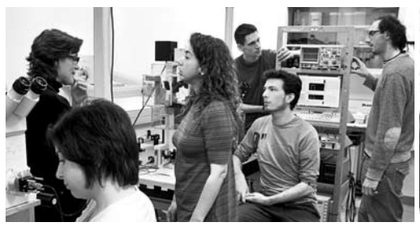
Fig.2 (bottom) SEM image (08 to the sample) of MG63 cells cultured on a large array of line nano-structures 200 nm wide, 1 mm long and 200 nm deep. The nanostructures cause the cells to align and elon- gate. The insert shows a magnified view of a cell on the nanopatterned PMMA substrate.

The engineering of micro-nanosystems is a new interdisciplinary applied field of research that combines materials, technologies, structures, devices and algorithms to obtain new smart subsystems. The assembly of these subsystems allows the high-density functionality needed in small devices and/or instruments such as lab on chips, microrobots or biochips. It is then expected that microsystem engineering will contribute to improving sustainability and manufacturing processes and, thus improve the quality of life.

Biomedical applications increasingly require the miniaturization of sensors, actuators and systems. Biomedical systems that combine accurate and stable sensors, efficient actuators, low-power and wireless integrated circuits and hermetic and biocompatible packages are now needed in applications ranging from in vivo implantable bio-systems for diagnostics and prostheses to in vitro portable devices for blood and DNA analysis. In these applications, reducing the size of their components is a key to improving system functionality and reliability and, at the same time, to making savings in reagent consumption and analysis time.

The introduction of complex biological entities such as eukaryotic or bacterial cells and viruses into micro-nanosystems, however, requires an advanced methodology for particle handling and manipulation combining materials, devices and fluidics. In the appropriate methodological context, data from chip-based experiments can provide significant quantitative information about major cellular pathways and processes. The main challenges in biology and the medical sciences could be addressed by the development of complete lab-on-a-chip and point-of-care systems.

Single molecule bionanophotonics



Research staff

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Merche Rivas Technician
Joan Junyent Technician

Our group, Single Molecule BioNanophotonics, devotes its research activities to the development and application of modern optical techniques for the study of biological processes at the single molecular level. Indeed, one of the ultimate challenges in biology is to understand the relationship between structure, function and dynamics of biomolecules in the living cell. However, observing such molecular processes is still a major challenge since key multi-molecular interactions occur at the nanometre scale, a size regime not accessible by optical techniques as they suffer from diffraction. In our group we aim at developing optical tools that allow nanometric probing and manipulation of biological function at the level of single molecules in their native environment: the living cell. In conjunction with an increased spatial optical resolution, we also apply in our Lab other single molecule fluorescence approaches based on confocal microscopy such as fluorescence correlation spectroscopy (FCS) and Epi/Total internal reflection fluorescence microscopy (TIRF) for single molecule tracking.

Over the past year we have focused on the nanometer scale organization of the alpha subunits of the receptors for IL2 and IL15 in T cells using our most exquisite high resolution optical technique: near-field scanning optical microscopy (NSOM) (J. Cell Sci. 121, 627, 2008). Together with other European partners we are exploring novel concepts of optical antennas to increase further the optical resolution of our NSOM to 30nm (Nat. Photonics 2, 201, 2008). Using our Epi/TIRF set-up in combination with the microcontact printing technique we are fabricating ligand pattern surfaces to study the distinct dynamic re-organization of integrin adhesion receptors involved in the immune system. An intriguing topic that also catches our attention concerns the driving mechanisms that control receptor clustering. In this context, we are actively investigating lipid rafts as local organizers of the cell membrane and their functional role. As additional activities in our group, we had the pleasure to organize the first international symposium on Immunanoscopy at IBEC, with about 100 participants from Europe and United States. The meeting addressed major advances in microscopy techniques applicable to Immunology sharing, at the same time, knowledge on the most exciting findings in Immunology where these techniques may have a crucial impact.

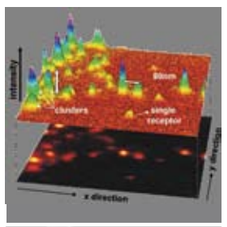

Fig.1 (top) Single receptor imaging on a dendritic cell obtained with high resolution scanning near- field optical microscopy. The spatial resolution is 80 nm. Differences in intensity reflect the organization of the receptor (DC-SIGN) in mono- mers and nanoclusters on the cell membrane.

Fig. 2 (bottom) Artist's impression of the BIO-LIGHT-TOUCH European project coordinated by our group: a nanometric sized aperture probe scans the cell membrane providing simultaneous topographic, optical and biochemical recognition at the single molecule level.

Nanoscale bioelectrical characterization

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Aurora Dols PhD Student
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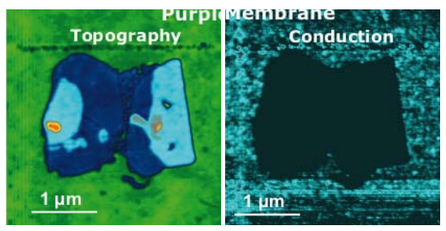
Joan Junyent Technician

The main goal of the research line is the development of experimental set ups based on atomic force microscopy and of adequate theoretical frameworks to measure and understand the electrical properties of biological samples (e.g. biomembranes and single biomolecules) at the nanoscale. The objective of this research line is to assist in the development of new label free biological characterization methods and of new electronicbiosensors.

Insofar as instrumentation is concerned, we focus our research on a) the development of electronic instrumentation for carrying out a variety of electrical measurements at the nanoscale that is not available in commercial equipment, such as small signal AC impedance measurements or electronic noise measurements, both in air and liquid environments; b) the design and manufacture of atomic force microscopy probes and sample holders specifically adapted to the proposed electrical measurement techniques and environments; and c) the development of new measuring modes specific to the electrical characterization of biological samples at the nanoscale.

As the main applications of the experimental set-ups, we are researching a) the supramolecular organization of native biological membranes at the nanoscale; b) single receptor ligand binding processes in olfactory receptors and bacteriorhodopsin for biosensor applications; and c) electrical properties of individual bacteria.



Images of topography and electrical conduction obtained simultaneously on a fragment of purple membrane.

Biomaterials, Implants and Tissue Engineering

Bio/non-bio interactions for regenerative medicine

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The understanding of cell-substrate interactions is a crucial issue for the design of third generation biomaterials for tissue engineering and regenerative medicine as well as for the development of clinical implants and medical devices. Surface properties such as topography, chemistry, energy or crystallinity govern these interactions. Cell density, cell morphology and viability differ according to the surface reactivity and the physico-chemical nature of the substrate.

Progress in nanotechnology introduces new efficient tools for the control, design and characterization of substrate surface architecture and properties. Surfaces can be modified and functionalized at the nanolevel and, consequently, their physical and biochemical properties can be adequately tailored in order to stimulate stem cells to differentiate totally or partially for regenerative therapies.

Processes such as cell adhesion, survival, proliferation, migration and differentiation could be controlled using a non-invasive approach. The principle of the technique relies on genetic reprogramming via intracellular signalling pathways, triggered by specific interactions between customized micro-/nanostructured surfaces in contact with cell surface receptors.

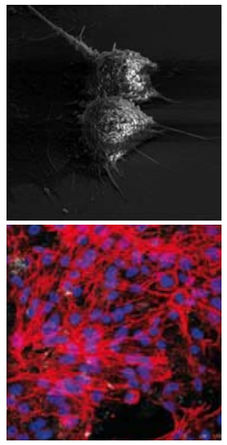

Fig.1 (top) Osteoblastic cell dividing on functionalized silicon nitride with NH2 groups.

Fig. 2 (bottom) Osteoblast cells on composite biomaterial scaffolds (bioactive PLA and glass) for tissue regeneration.

Molecular dynamics at cell-biomaterial interface

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Kameliya Hristova PhD Student

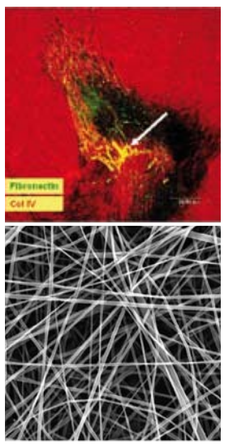

Fig.1 (top) Fibroblast arrangement of substratum associated collagen IV along with fibronectin fibrils.

Fig.2 (bottom) Nanofibres from native fibrinogen, SEM.

The interaction of cells with foreign materials is fundamental for biology and medicine and the key to understanding the phenomena of biocompatibility. Cell adhesion and the generation of a proper cellular response are prerequisites for the successful incorporation of implants, the colonization of scaffolds and, possibly, all tissue engineering applications. Our recent studies have shown that tissue compatibility of materials is highly dependent on cells being able to remodel the surface-associated proteins and to form a provisional matrix. How the underlying surface properties affect this process is of substantial scientific interest. To address this, we focus our research on the cellular interaction with biomaterial surfaces that represent intrinsic nanotopography or distinct molecular organization. We want to learn how they affect the organization of the ECM (extracellular matrix) and subsequent tissue integration. Thus, our research is related to the current needs of IBEC in that it monitors the biological response of newly designed biomaterials.

Another of our research lines highlights the dynamic behaviour of integrins, the cellular adhesive mechanism that controls adhesion strength and matrix assembly. We wish to discover how the cells “imprint” their specific biological information at the biomaterials interface and how this reflects the organization of the surrounding ECM. We wish to determine whether clues can be introduced that guide cellular behaviour and if nanofibres, designed from natural or synthetic polymers, might provide such an instrument. In conjunction with our observation that integrin dynamics is strongly altered on low compatible surfaces, we anticipate that the biocompatibility of materials requires that they adsorb matrix proteins loosely, i.e. in such a way that the integrins can be organized in a matrix-like structure. Thus, our research has the potential to shed direct light on the specific area of nano-tissue engineering with major implications for regenerative medicine and biohybrid organ strategies.

Biomechanics and Mechanobiology

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Ramiro González PhD Student
Martin Koch PhD Student
Andy Olivares PhD Student
Andrea Malandrino PhD Student

The research line in biomechanics and mechanobiology focuses its research on the study of the effects of mechanical stimuli on biological response. It is clear that among the physical and chemical cues that influence tissue response and adaptation, mechanical loading plays an important role throughout our life. In this research line, numerical methods based on the finite element method are used to model implants at the organ level, and to model implant/cell interactions at the cellular level. The numerical concepts developed in this research line are tested against in vivo and in vitro models that make it possible to validate the numerical models. In particular, mechanical devices such as bioreactors and a tissue chamber for tissue engineering have been developed to study the microenvironment of mechanical stimuli on cells. Emphasis is placed on the study of the load transfer of biomaterials onto the cells or directly onto tissue. In order to develop accurate numerical models of the biomaterial/cell interaction, imaging techniques based on microCT and synchrotron data have been developed to build micro-finite element analyses. The research group is developing numerical simulations based on a mechano-regulation concept that can predict tissue differentiation over time. This has been successfully applied to fracture healing and bone distraction previously and is now being used for tissue engineering.

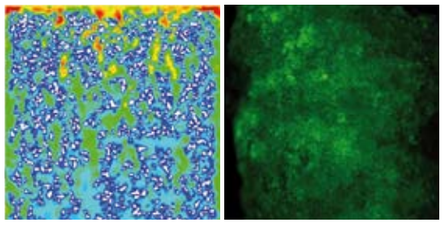

Fig.1 (left) Simulation of fluid flow within a composite scaffold for bone tissue engineering.

Fig.2 (right) Cells mechanically stimulated within a composite porous biomaterial in a perfusion bioreactor.

Medical Signals and Instrumentation Programme

Biomedical signal processing and interpretation

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Ainara Garde PhD student
Leonardo Sarlabous PhD student
Joana Mesquita PhD student

The research line is oriented to new methods and techniques for multi-channel and multimodal acquisition, processing, modelling and interpretation of clinically relevant information from biomedical signals. The main objective is to improve the diagnosis capability through the characterization of physiological phenomena, and to the enhance early detection of major diseases. The group's research addresses the design and development of advanced signal processing techniques and the interpretation of biomedical signals to improve monitoring, diagnosis, disease prevention and pathology treatment.

Recent studies have shown that there is a close relationship between sleep, respiratory and cardiac signals in different pathologies. In some cases, obstructive respiration during the night, such as obstructive sleep apnoea syndrome (OSAS), gives rise to sleep disorders and the subsequent cardiovascular effects. In other cases, cardiac pathologies result in significant changes to respiratory patterns. This biological interaction suggests that a multimodal-multichannel approach will improve the identification and study of major cardiac and respiratory diseases that are highly prevalent in the world population. Simultaneous analyses and the processing of bioelectrical, mechanical, sound and blood signals will enhance our understanding of physiology and our diagnostic capabilities.

Relevant applications are proposed in this line in the fields of sleep disorders related to breathing, respiratory and cardiac pathologies.

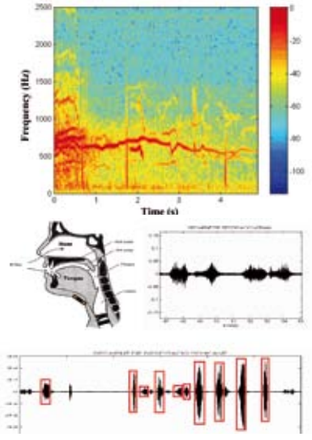

Fig.1 (top) Analysis and interpretation of time-frequency respiratory sounds for monitoring and diagnosing asthma and obstructive lung diseases.

Fig. 2 (bottom) Diagnosis of the obstructive sleep apnoea syndrome, through the detection and interpretation of snoring episodes.

Artificial olfaction

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Victor Pomareda, Master student
Aina Adell Technician
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Miriam Gallart Technician
Francesc Figueres Technician
Xavier Cano Technician

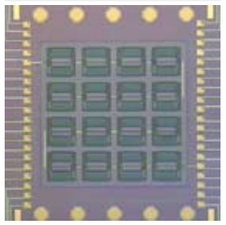
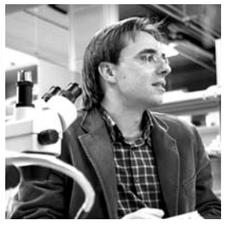


Fig. 1 (top) Smart chemical instrumentation: 12 chemical sensor array system and related electronics.

Fig. 2 (bottom) 4x4 thermopile array for a 16-channel IR analyser with non-specific bands.

Artificial olfaction systems are smart chemical instruments for volatile and odour detection and identification. They usually combine an array of partial specificity chemical sensors with a pattern recognition system. In contrast, with analytical instrumentation, the emphasis lies not so much on the identification and quantification of individual components but rather on global odour assessment. Moreover, AO Systems usually favour miniature systems with analysis times of just seconds. Within this framework, the IBEC group emphasizes the development of signal and data processing inspired by the olfactory pathway. Rather than developing a detailed biological systems model at the level of individual cells and their connections, our interest lies in the abstraction and identification of computational solutions with learning capabilities that are suitable for application to real problems. We are also interested in benchmarking the techniques developed with state-of-the-art solutions from the fields of statistical pattern recognition, machine learning and chemometrics. Recently, we have been working on various applications that include: safety (detection of toxic and flammable chemicals); security (detection of explosives); the food industry (oil, fish, fruit, etc.); industry (detection of oil leakages in air compressors for the pharmaceutical sector); and health (breath analysis, indoor air quality). In parallel, the group also has research interests in neurophysiology signal and image analysis, in particular as methods for the investigation of the workings of the olfactory system.

Neuroengineering



Research staff
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Michael Riss PhD student
Ling Wang PhD student
Ricard Prehn Master's degree student

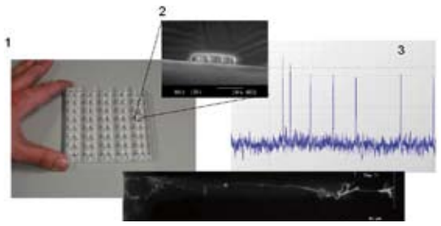
The neuroengineering group focuses on technology to monitor and control neuronal activity with the aim of empowering basic research, drug discovery and therapeutic action against neuropathologies.

We have developed the PoM (Polymer-on-Multielectrode) array technology, which combines planar arrays of substrate-embedded electrodes and 3D polymeric structures to monitor and stimulate neuronal activity in vitro. Using the PoMs, it has been possible to culture individual neurons within microstructures and to obtain multisite recordings of single-unit activity along individual neurites. This tool renders possible a whole new set of experiments in which the anatomy and function of individual neurons can be correlated in vitro.

The group has also achieved a novel family of consumable, all-polymeric cell culture dishes with embedded microchannels and culture chambers. These enable low-complexity, low-cost electrophysiological measurements, including drug screening, with convenient manufacturability. A spin-off, Aleria Biodevices SL, has been created to market this approach to in vitro electrophysiology.

The production of neurochips using conventional technologies is costly and technically complex. In order to help address this issue, we have developed a laser-write lithography system that supports rapid-prototyping of the PoM and all-polymeric devices.

In parallel with work on lab-on-a-chip electrophysiology, we are pursuing research on novel optical techniques to monitor neuronal activity. We are particularly interested in photobleaching-free techniques capable of supporting long-term studies on learning both in vitro and in vivo. Along these lines we are focusing on plasmon-resonance as measured on functionalized nanoparticles bound to electroactive membranes.



Multiwell polymeric chip (1) for integrated electrophysiology on a large scale (see scanning electron microscopy — SEM — of an integrated microchannel (2). Figures 3 and 4 show neuronal activity measured using our devices and an axon growing inside the microchannels.

Robotics and Biomedical Imaging Programme

Robotics

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Dr. Joan Aranda Senior researcher
Margarita Cudolà Fortuny Master student
Manuel Vinagre Technician

The research into medicine in the field of robotics involves a close interaction between humans and robots. This group seeks to develop intelligent robotic systems that are able to provide assistance to the disabled. The group's on-going project involves creating a robotized kitchen with an intelligent interface that offers the user easy means of communication so as to control all the elements with their restricted mobility. The system is endowed with a vision system for locating objects and visualizing space while the potential control options allow the user to interact easily and intuitively. The main research is being undertaken in the following lines: a 3D vision system for object localization, a vision-based robot control strategy, 3D accessibility study, task coordination, interactive monitoring and manipulation control.

The group's research into surgical robotics involves the design of assisted teleoperation strategies so that surgeons are freed of the stress to which they are subject when they perform operations that require high precision or extremely delicate procedures. Some surgical procedures may be performed more safely, more effectively and more reliably if backed up by robotic assistance. The group's research is looking into the cooperation between robots and humans based on the interpretation of human intention and the interpretation of space.

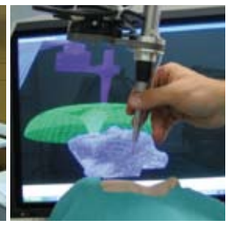

Fig.1 (left) Experimental kitchen for the disabled.
Fig.2 (right) Co-manipulation in robot assisted surgery.

Research Projects

IBEC, which aims to be an international reference point in the field of bioengineering research, took part in various international projects and consortiums in 2008. In addition, the Institute established the foundations for future collaborations with clinical institutions, hospitals and other university and research centres.

IBEC projects with European funding

BIO-LIGHT-TOUCH. *Advanced near-field optical tools with biochemical functional recognition at the single molecule level* (2007-2010).
PI: **Maria Garcia-Parajo**
NEST Project **coordinated by IBEC** within the framework of the EU–FP6.

IMMUNANOMAP. *Unraveling the nano-landscape of receptors controlling molecular processes of the immune system* (2007-2010).
PI: **Maria Garcia-Parajo**. Marie Curie Research Training Network within the framework of the EU–FP6.

ERC-STARTING GRANT. *Neurosecretion by remote control of exocytosis and endocytosis with light* (2008-2013).
PI: **Pau Gorostiza**
European Research Council.

ANGIOSCAFF. *Highly porous bioactive scaffolds controlling angiogenesis for tissue engineering* (2008-2012).
PI: **Josep A. Planell**
Collaborative project within the framework of the EU–FP7.

DISC REGENERATION. *Novel biofunctional high porous polymer scaffolds and techniques controlling angiogenesis for the regeneration and repair of the degenerated intervertebral disc* (2008-2012).
PI: **Josep A. Planell**
Collaborative project within the framework of the EU–FP7.

PHOTOSYN-STM. *Single-molecule studies of photo-conductance on photosynthetic molecular systems by SPM break-junction measurements* (2008-2011).
Fellow: **Ismael Diez**
PI: **Pau Gorostiza** International Outgoing Fellowships (IOF)
Marie Curie Action within the framework of the EU–FP7.

CELL TRANS. *Integrated molecular and cellular mechanotransduction mediated by protein p130Cas* (2008-2011).
Fellow: **Pere Roca-Cusachs**
PI: **Daniel Navajas**
International Outgoing Fellowships (IOF)
Marie Curie Action within the framework of the EU–FP7.

VIRTUAL PHYSIOLOGICAL HUMAN NETWORK OF EXCELLENCE.
PI: **Damien Lacroix**
European Commission, FP7 NoE (2008-2011).

Projects with European funding managed by the UB or PCB

An integrated platform enabling theranostic applications at the point of primary care–theraEdge (2008-2011).
PI: **Josep Samitier**
Large-scale project within the framework of the EU-FP7.

FP7-STREP BIO-ICT CONVERGENCE.
NEUROCHEM: *Biologically inspired computation for chemical sensing* (2008-2010).
PI: **Santiago Marco** (Coordinator)
STREP Project within the framework if the EU-FP7.

CELLPROM. *Cell programming by nanoscaled devices* (2004-2008).
PI: **Josep Samitier**
Integrated large-scale nanotechnologies project within the framework of the EU-FP6.

NANO2LIFE. *A network for bringing NANOtechnologies to life* (2004-2008).
PI: **Josep Samitier**
Network of excelence within the framework of the EU-FP6.

STREP. *Deep vein thrombosis: impedimetric microanalysis system-DVT-IMP* (2006-2009).
PI: **A. Errachid**
Nanobiotechnologies project within the framework of the EU-FP6.

General olfaction and sensing projects at a European level-GOSPEL (2004-2008).
PI: **Santiago Marco**
Network of excellence within the framework of the EU-FP6.

Assembling reconfigurable endoluminal surgical system–ARES (2006-2009).
PI: **Josep Samitier**
NEST project within the framework of the EU–FP6.

VECTOR. *Versatile endoscopic capsule for gastrointestinal tumor recognition and therapy* (2006-2010).
PI: **Josep Samitier**
STREP project within the framework of the EU–FP6.

Training for micro-analytical Platform Technology-MapTech (2005-2010).
PI: **A. Errachid**
Marie Curie RTN within the framework of the EU-FP6.

Priority, Protecting the food chain of prions: *Shaping European priorities through basic and applied research* (2009).
PI: **José Antonio Del Río**
FP7 EU program

GABA cell Types (2007-2010).
Coordinator: **José Antonio Del Río**
Marie Curie Grant FP7-PEOPLE-2007-4-3 IRG.

Projects with European funding managed by the UPC

SmartCaP-*Injectable macroporous biomaterials based on calcium phosphate cements for bone regeneration* (2005-2008). PI: **Josep A. Planell**
Tissue engineering project within the framework of the EU-FP6.

STEPS-*Systems approach to tissue engineering processes and products* (2005-2009).
PI: **Josep A. Planell**
Tissue engineering project within the framework of the EU-FP6.

BioPolySurf-*Engineering advanced polymeric surfaces for smart systems in biomedicine, biology, materials science and nanotechnology: a cross-disciplinary approach of biology, chemistry and physics* (2005-2009).
PI: **Josep A. Planell**
Marie-Curie Research Training Networks within the framework of the EU-FP6.

VSN. *Voltage sensitive-resonant nanoparticles / Novel nanotransducers of neuronal activity* (2006-2009).
PI Coordinator: **Enric Claverol-Tinturé**
Project in nanobiotechnologies within the framework of the EU-FP6.

PROJECTE INTER-REG EUROPEU FLASHPOMS.
A novel strategy for development of multielectrode devices and integration of microfluidics for recording of neuronal activity.
PI: **Enric Claverol-Tinturé.**

National projects managed by IBEC

NANOBIOMED. *Nanotecnologías en biomedicina.*
PI: **Xavier Fernández-Busquets**
MEC, CONSOLIDER programme (CSD2006-00012).

Development of photoswitchable peptides with biological implications (2008-2011)
PI: **Pau Gorostiza**. MEC.

NANOMULTIPLEX. *Parallelized single biomolecule nano-assays* (2007-2008).
PI: **Josep Samitier**
MEC, Acción Complementaria.

HYBRID-NANOCELL. *Novel hybrid nanotechnologies to explore molecular interactions at bio-nonbio-interfaces* (2007-2010).
Coordinator: **Maria Garcia-Parajo**
MEC, Proyectos I+D.

Plataforma Española de Nanomedicina (2007-2008).
PI: **Josep Samitier**
MEC, Redes Científico-Tecnológicas.

Workshop on Optical Measurement and Manipulation of Neuortransmission (2008)
PI: **Pau Gorostiza**
ICREA Workshops & Meetings.

Workshop on Optical Measurement and Manipulation of Neurotransmission (2008)
PI: **Pau Gorostiza**
Acciones Complementarias MEC.

MOBILITY ACTION (2008). Fellow: **Patrick Prendergast**
PI: **Josep A. Planell**
MEC, Movilidad.

MOBILITY ACTION (2007-2008).
Fellow: **Izabella Rajzer**
PI: **Josep A. Planell**
MEC, Movilidad.

NANOFARMA. *Sistemas de liberación dirigida de fármacos* (2006-2009). PI: **María Garcia-Parajo** Coordinació: **FAES FARMA i PharmaMar**
CDTI, CENIT Programme.

CIBER-BBN. *CIBER en Bioingeniería, Biomateriales y Nanomedicina* (2006-2010).
PI: **Josep A. Planell**
Instituto de Salud Carlos III.

CIBER-BBN. *CIBER en Bioingeniería, Biomateriales y Nanomedicina* (2006-2010).
PI: **Maria Garcia-Parajo**
Instituto de Salud Carlos III.

CIBER-BBN. *CIBER en Bioingeniería, Biomateriales y Nanomedicina* (2008-2010).
PI: **Raimon Jané**
Instituto de Salud Carlos III.

National projects managed by UB or PCB

HYBRID-NANOCELL. *Novel hybrid nanotechnologies to explore molecular interactions at bio-nonbio-interfaces* (2007-2010).
PI: **Gabriel Gomila**
MEC, Proyectos I+D.

Ayuda para la intensificación de la actividad de la investigación.
PI: **Gabriel Gomila**
Programa 13, MEC-Generalitat de Catalunya.

Alteración de la Nanomecánica de los neutrófilos en la lesión pulmonar inducida por el ventilador.
PI: **Daniel Navajas**
Ministerio de Sanidad y Consumo (PI081908).

Centro de Investigación Biomédica en Red (CIBER) de Enfermedades Respiratorias (Ciberes).
PI: **Daniel Navajas**
Ministerio de Sanidad y Consumo (CB06/06/0026).

Centro de Investigación Biomédica en Red (CIBER) de Bioingeniería, Biomateriales y Nanomedicina (CIBER-BBN).
PI: **Daniel Navajas**
Ministerio de Sanidad y Consumo (CB06/01/1023).

Biomarcadores inflamatorios, de estrés oxidativo y metabonómicos en el aire exhalado en la enfermedad pulmonar crónica y el cáncer de pulmón (PI-080283).
Sub-project leader: **Santiago Marco** Coordinated by Hospital Clínic de Barcelona).

Implementación del módulo de microscopía y espectroscopía túnel electroquímica en los microscopios de sonda próxima Nanotec (2008).
PI: **Pau Gorostiza**
Projects with transferred investigation results (PETRI). MEC.

Centro de Investigación Biomédica en Red (CIBER) de Enfermedades Respiratorias (Ciberes).
Ministerio de Sanidad y Consumo (CB06/06/0026).
Group PI: **Daniel Navajas.**

Diseño, fabricación y caracterización de plataformas nanofuncionalizadas que permitan la detección y cuantificación de biomoléculas mediante procesos ópticos y electrónicos (2005-2008).
PI: **Josep Samitier**. MEC.

4SENSES. *Generación de conocimientos sobre la interacción multisensorial del ser humano con los entornos para el desarrollo de nuevos productos y servicios en el sector cerámico* (PSE-020400-2007-1).
PI: **Santiago Marco**. MEC.

Study of the kinetics of ligand-selectin bonds in neutrofils by optical tweezers. Strategic Action on Nanoscience and Nanotechnology (NAN2004-09348-C04-04).
PI: **Daniel Navajas**. MEC.

Early diagnostics of prostate cancer by nanobiosensors based on olfactory receptors.
PI: **Josep Samitier**. Instituto de Salud Carlos III.

ONCNOSIS. *Research and development of diagnostic-prognostic technologies and products and therapeutic applications in neoplastic disease* (2006-2009).
PI: **Josep Samitier**. Coordinated by ONCNOSIS PHARMA AIE. Project CENIT, MITC.

NANOBIOELEC. *Electrical characterizations of biological samples at the nanoscale (2007-2010).*
PI: **Gabriel Gomila.** MEC.

Design, manufacture and characterization of nanofunctionalized platforms that allow detection and quantification of biomolecules using optical and electronic processes (MEC-NAN09415). PI: **Josep Samitier**. MEC.

Función de las proteínas asociadas al nucleoide H-NS y Hha en la regulación de la expresión génica global en Salmonella. Estudio por DNA array (GEN2003-20234-C06-06). PI: **Antonio Juárez.** AEGP - Acción Estratégica de Genómica y Proteómica del Programa Nacional de Biotecnología.

Regulación dependiente de factores ambientales de la expresión de factores de virulencia y de la transferencia de plásmidos de resistencia a antibióticos: papel de las proteínas Hha y H-NS (BIO2004-02747)
PI: **Antonio Juárez.** NBME - Programa Nacional de Biomedicina.

National Projects managed by the UPC

Multimodal multichannel biomedical signal processing (MUBISIPRO) PI: **Raimon Jané**
Universitat Politècnica de Catalunya, Universidad de Zaragoza. CICYT ref. TEC2007-68076-C02-00, proyecto coordinado (2007-2010).

Angiogenesis en ingeniería de tejidos (2008-2010).
PI: **Elisabeth Engel**
Project co-financed by the Universitat Politécnica de Catalunya dins Eix C: Directed by own strategic plan. Based on new areas of emerging research under the management and leadership of PDI or PAS doctor. MEC project.

Funciones de nuevos genes candidatos y proteínas asociadas a mielina durante el desarrollo y regeneración de las conexiones corticales. (2006-2009)
PI: **José Antonio Del Río.** (MEC, BFU2006-13651).

CIBERNED. Spanish Network of Neurodegenerative Diseases of the Ministry of Health (FISS 2008-).
Coordinator: **José Antonio Del Río**.

Support on Excellence Research Groups of Catalunya
Coordinator: **José Antonio Del Río**
Catalonia Science Agency.

Desarrollo de nuevos materiales porosos para la regeneración ósea: estudios «in vivo» e «in silice» (2005-2008).
PI: **Damien Lacroix**. MEC.

Injectable macroporous Smart CaP-Biomaterial. (2005-2008). PI: **Josep A. Planell.** MEC.

Materiales biofuncionalizados para regeneración tisular (2006-2009). PI: **Josep A. Planell**. MEC.

Multichannel monitoring and multimodal processing of biomedical signals in sleep-disordered breathing, respiratory diseases and cardiac pathologies (M3PBIO). Coordinated project (2007-2010). PI: **Raimon Jané**. MEC.

Aplicaciones biomédicas del tratamiento de señal en la monitorización, interpretación y modelado multimodal de señales cardiorespiratorias y polisomnográficas. Coordinated project (2005-2008).
PI: **Raimon Jané**. MEC.

Diseño y desarrollo de un sistema experimental para el estudio y evaluación de nuevas técnicas de cirugía robotizada. Coordinated project (2005-2008).
PI: **Alícia Casals.** MEC.

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Artificial olfaction

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E. Abad, F. Palacio, M. Nuin, A. González-de-Zarate, A. Juarros, J.M. Gómez-Cama, S. Marco, *RFID smart tag for traceability and cold chain monitoring of foods: demonstration in an intercontinental fresh fish logistic chain*, J. Food Eng. (Accepted)

A.Gutierrez, S. Marco (editors), *Biologically Inspired Signal Processing for Chemical Sensing*, Springer-Verlag, Studies in Computational Intelligence, (In Press) (2008).

I. Montoliu, K:C. Persaud, M. Shah, S. Marco, *Multivariate Analysis of the Activity of the Olfactory Bulb, in "Biologically Inspired Signal Processing for Chemical Sensing"*, Springer-Verlag, Studies in Computational Intelligence, (In Press) (2008).

Neuroengineering

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Robotics

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A. Casals, J. Amat, M. Frigola, L.E. Rodríguez, C. Torrens y A. Ginés. *Monitoring and robotizing shoulder arthroplasty for training and optimization of suturing techniques,* Int. Journal of Computer Assisted Radiology and Surgery, Springer, (2008).

A. Casals. Foreword: *Wearable Robots,* Wearable Robots. Biomechatronic exoskeletons, Wiley, (2008).

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A. Casals, *L'impacte de la tecnologia en el tractament quirúrgic, Discurs de recepció com a membre numerària.* Institut d'estudis Catalans. Secció de Ciències i Tecnologia, (2008).

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Collaborations with other Research centres

Microbial biotechnology and host-pathogen interaction

Prof. Britt-Marie Sjöberg Molecular Biology and Functional Genomics Dept., Stockholm University (Sweden).

Prof. Miquel Pons Dept. de Química Orgànica, Universitat de Barcelona (Spain).

Prof. Yair Aharonowitz Molecular Microbiology and Biotecnology Dept., Tel Aviv University (Israel).

Mollecular and cellular neurobiotechnology

Prof. Manuel Nieto Sampedro Instituto Cajal, Madrid (Spain).

Prof. Marc Tessier Lavigne Genentech, Inc., South San Francisco, California, (USA).

Prof. Binhai Zheng Dept. Neuroscience, University of California at San Diego, La Joya, California, USA.

Prof. Eduardo Soriano IRB (Institute for Research in Biomedicine), Barcelona (Spain).

Prof. Isidro Ferrer Institut d'Investigació Biomèdica de Bellvitge (IDIBELL). Universitat de Barcelona (Spain).

Prof. Jesús Ávila Consejo Superior de Investigaciones Científicas (CSIC). Universidad Autónoma de Madrid (Spain).

Prof. Josep Samitier Institut de Bioenginyeria de Catalunya (IBEC) (Spain).

Dr. Enric Claverol Institut de Bioenginyeria de Catalunya (IBEC).

Prof. Josep A. Planell Institut de Bioenginyeria de Catalunya (IBEC) (Spain).

Cellular and respiratory biomechanics

Prof. R. Farré Unitat de Biofísica i Bioenginyeria, Dept. de Ciències Fisiològiques, Facultat de Medicina, Universitat de Barcelona/IDIBAPS (Spain).

Prof. J. J. Fredberg Physiology Program, School of Public Health, Harvard University, Boston (USA).

Prof. J. M. Montserrat i Prof. A. Torres Servei de Pneumologia, Hospital Clínic/IDIBAPS Barcelona (Spain).

Prof. A. Artigas Intensive Care Service, Hospital de Sabadell (Spain).

Prof. F. Ritort Small Biosystems Lab, Dept. de Física Fonamental, Facultat de Física, Universitat de Barcelona (Spain).

Prof. D. Petrov Grup de Biofotònica, Institut de Ciències Fotòniques, Castelldefels (Spain).

Prof. M. Sheetz Biological Sciences, Columbia University New York (USA).

Prof. V. T. Moy Physiology and Biophysics Dept., Miami University (USA).

Prof. A. Pedotti Bioengineering Dept., Politecnico di Milano (Italy).

Nanoprobes and nanoswitches

Prof. Miquel Àngel Pericàs Institut Català d'Investigació Química (ICIQ). Tarragona (Spain).

Dr. Jordi Hernando Universitat Autònoma de Barcelona (UAB) (Spain).

Dr. Piotr Bregestovski (Institut de Neurobiologie de la Mediterraneé (INMED), Marsella, France.

Dr. Carles Solsona i Dr. Artur Llobet IDIBELL/Dept. de Patologia i Terapèutica Experimental, Universitat de Barcelona (Spain).

Dr. Dirk Trauner Chemistry Dept., UC Berkeley (USA).

Dr. Joan Torrent Escola Universitària d'Òptica i Optometria de Terrassa (Spain).

Dr. Ernest Giralt Dept. de Química Orgànica, Universitat de Barcelona (Spain).

Dra. Mireia Oliva Dept. de Farmàcia i Tecnologia Farmacèutica, Universitat de Barcelona (Spain).

Dra. Teresa Montero Dept. de Fisicoquímica, Facultat de Farmàcia, Universitat de Barcelona (Spain).

Dr. Ehud Isacoff Dept. Molecular and Cell Biology, UC Berkeley (USA).

Nanobioengineering

Prof. M. Madou Irvine, University of California (USA).

Prof. G. Fuhr FhG. Biomedicine, St. Ingbert (Germany).

Dr. Edith Pajot INRA (France).

Dr. Christophe Vieu LAAS-CNRS Toulouse (France).

Dr. Pascal Colpo i Prof. François Rossi JRC-Ispra (Italy).

Prof. Ullmann USAAR (Germany).

Prof. Paolo Dario Pisa (Italy).

Prof. José Rivas
Iberian Nanotechnology Institute, Braga (Portugal).

Prof. D. Anselmetti Universitat de Bielefeld (Germany).

Dr. Max M. Burger Novartis AG (Switzerland) and Marine Biological Laboratory, Woods Hole (USA).

Prof. H. Börner Max-Planck Institute of Colloids and Interfaces, Golm (Germany).

Prof. E. Faszewski Wheelock College, Boston (USA).

Prof. M. Sampietro Politecnico di Milano (Italy).

Prof. L. Reggiani
INFM, Nanotechnology Laboratory, Lecce (Italy).

Prof. R. Salesse INRA, Jouy-en-Josas (France).

Single molecule bionanophotonics

Prof. Carl G. Figdor Nijmegen Centre for Molecular Life Sciences (NCMLS) (Netherlands).

Prof. Peter Hinterdorfer Biophysics Institute, Johannes Kepler University, Linz (Austria).

Dr. Gerald Kada Agilent Technologies, Linz (Austria).

Prof. Thomas Schmidt Biophysical Group, University of Leiden (Netherlands).

Dr. Tom Jovin Max Planck Institute for Biophysical Chemistry, Göttingen (Germany).

Dr. Herman Offerhaus OT group, MESA+, University of Twente, (Netherlands).

Prof. Vincenzo Cerundolo The Chancellor, Masters and Scholars of the University of Oxford (United Kingdom).

Dr. Attila Jenei Dep. Biophysics, University of Debrecen (Hungary).

Prof. David Reinhoudt SMCT group, MESA+, University of Twente (Netherlands).

Prof. Markus Sauer Physics Dept., University Bielefeld (Germany).

Prof. Vinod Subramaniam BPE group, University of Twente (Netherlands).

Prof. Niek van Hulst
Institut de Ciències Fotòniques (ICFO), Barcelona (Spain).

Dr. Jordi Hernando Universitat Autònoma de Barcelona (Spain).

Nanoscale bioelectrical characterization

Prof. Esteve Padrós Centre d'Estudis en Biofisica, Universitat Autònoma de Barcelona.

Prof. Lino Reggiani National Nanotechnology Laboratory, Universita dil Salento, Lecce (Italy).

Prof. Roland Salesse Neurobiologie de l'olfaction et la prise alimentaire, Institut National de la Recherche Agronomique, Jouy-en-Josas (France).

Prof. Juan José Saenz Dept. de la Matèria Condensada, Universidad Autónoma de Madrid (Spain).

Dra. Adriana Gil Nanotec Electronica SL, Madrid (Spain).

Prof. Marco Sampietro Laboratorio di Strumentazione Analogica e Materiali Polimerici, Politecnico di Milano (Italy).

Bio/non-bio interactions for regenerative medicine

Joelle Amedee INSERM, Bordeaux, France.

Alvaro Mata Plataforma Nanotecnología.

Dra. Soledad Alcántara Grup de Desenvolupament Neural, Universitat de Barcelona, IDIBELL (Spain).

Dr. Luigi Ambrosio Centro di Recerca Interdipartimental Biomateriali, Università di Napoli (Italy).

Dr. Mateo Santin School of Pharmacy and Biomolecular Sciences, University of Brighton (United Kingdom).

Dr. Etiene Schach Polymer Chemistry and Biomaterials Research Group, Ghent University (Belgium).

Dr. Jeffrey Hubbell Institute of Bioengineering, École Polytechnique Fédérale de Lausanne (Switzerland).

Dr. José Carlos Rodríguez-Cabello Dept. de Física de la Matèria Condensada, Universitat de Valladolid (Spain).

Dr. Juan Rojo Universitat Complutense de Madrid (Spain).

Dr. G. J. Vancso Materials Science and Technology of Polymers and MESA+, Institute for Nanotechnology, University of Twente (Netherlands).

Dr. Nick Rhodes Dept. of Clinical Engineering, University of Liverpool (United Kingdom).

Dr. Julio San Román Dept. of Biomaterials, Institute of Polymer Science and Technology, CSIC, Madrid (Spain).

Dr. Manuel Doblaré Group of Structural Mechanics and Materials Modelling, Institute of Engineering Research (I3A), Universidad de Zaragoza (Spain).

Dra. Margarita Calonge Institute of Ophthalmobiology (IOBA), Universidad de Valladolid (Spain).

Dra. Nuria Villaboa Unidad de Investigación, Hospital Universitario La Paz, Universidad Autónoma de Madrid (Spain).

Dr. Francisco Blanco Complejo Universitario Juan Canalejo, La Coruña (Spain).

Dr. Juan Bellón Dept. de Cirugía, Facultad de Medicina, Universidad de Alcalá, Alcalá de Henares (Spain).

Dra. Julia Bujan Dept. de Ciencias Morfológicas y Cirugía, Facultad de Medicina, Universidad de Alcalá de Henares (Spain).

Dra. Anita Ignatius Institut für Unfallchirurgische Forschung und Biomechanik, University of Ulm (Germany).

Dr. Patrick J. Prendergast Trinity Centre for Bioengineering, Trinity College Dublin (Ireland).

Molecular dynamics at cell-biomaterial interface

GKSS Research Centrum Institute of Chemistry Teltow (Germany).

Institute of Pharmacy Martin Luther University, Halle (Saale) (Germany).

Institute for Biophysics Bulgarian Academy of Sciences Sofia (Bulgaria).

University of Bologna, LEBSC (Laboratorio di Strutturistica Chimica Ambientale e Biologica), Bologna (Italy).

Centre de Biomaterials Universitat Politècnica de València (Spain).

Biomechanics and mechanobiology

Dr. Dani Tost Universitat Politècnica de Catalunya, Barcelona (Spain).

Prof. Luigi Ambrosio Institute of Composite and Biomedical Materials, University of Naples Federico II (Italy).

Prof. Patrick Prendergast Trinity Centre for Bioengineering, Trinity College (Ireland).

Dr. Fernando Muñoz Facultad de Veterinaria, Universidad de Santiago de Compostela (Spain).

Dra. Nathalie Maurel i Dr. Amadou Diop ENSAM París (France).

Dr. Maurice Whelan Institute for Health and Consumer Protection, European Commission DG Joint Research Centre (Italy).

Prof. Hans-Joachim Wilke Institute of Orthopaedic Research and Biomechanics, Universitat de Ulm (Germany).

Biomedical signal processing and interpretation

Prof. Andrés Santos Grupo de Tecnologías de Imágenes Médicas (BIT). Universidad Politécnica de Madrid (Spain).

Prof. Alejandro Frangi Grupo de Imagen Computacional y tecnologías de Simulación en Biomedicina (CISTIB). Universidad Pompeu Fabra (Spain)

Prof. Javier Pavía Grupo de Imagen Médica (GIB). Universidad de Barcelona (Spain).

Prof. Domènec Ros Grupo de Imagen Médica (GIB). Universidad de Barcelona (Spain).

Prof. Manuel Doblaré Grupo de Mecánica Estructural y Modelado de Materiales. Universidad de Zaragoza (Spain).

Prof. Pablo Laguna Instituto de Investigación de Aragón (I3A), Universidad de Zaragoza (Spain).

Prof. Dana H. Brooks Communications and Digital Signal Processing Center, Northeastern University, Boston (USA).

Dr. Alfredo Hernández Laboratoire Traitement du Signal et de l'Image. Université de Rennes-1,

Institut Francès de Salut, INSERM (France).

Dr. Eric Laciar Dept. Electrónica y Automática, Universidad Nacional de San Juan (Argentina).

Prof. Armin Bolz Institute of Biomedical Engineering, University of Karlsruhe (Germany).

Dr. Matthias Schwaibold MCC-Med GmbH & Co. KG, Karlsruhe (Germany).

Dr. Salvador Benito Medicina Intensiva, Hospital de la Santa Creu i Sant Pau, Barcelona (Spain).

Dr. Josep Morera Servei de Pneumologia, Hospital Germans Trias i Pujol, Badalona (Spain).

Prof. Leif Sörnmo Signal processing group, Lund University (Sweden).

Artificial olfaction

Leon and Johnson Group Dept. of Neuroscience, UC Irvine (USA).

Dr. F. P. Gómez Hospital Clínic de Barcelona (Spain).

Prof. Dr. Jacques Nicolas Environmental Surveillance Group, University of Liege (Belgium).

Dr. Jürgen Wöllenstein IPM, Fraunhofer Institute, Freiburg (Germany).

Prof. Paul Vershure Cognitive, Perceptive and Emotive Systems, Universitat Pompeu Fabra, Barcelona (Spain).

Prof. Anders Lansner The Brain Institute, Stockholm (Sweden).

Prof. Krishna Persaud Chemoreception Group, University of Manchester (United Kingdom).

Dr. D. Martinez Cortex Group, LORIA, Nancy (França).

Prof. Dr. Gerhard Müller EADS Innovation Works, Munic (Germany).

Centre Nacional de Microelectrònica Barcelona.

Prof. Pere Caminal CREB, Universitat Politècnica de Catalunya, Barcelona (Spain).

Neuroengineering

Technical University of Eindhoven (Netherlands).

Ludwig-Maximilians-Universität Munic (Germany).

University de Nottingham (United Kingdom).

Vrije Universiteit Amsterdam (Netherlands).

Diver Drugs SL.

Multichannel Systems GmbH.

Hebrew University of Jerusalem (Israel).

University of Milano (Italy).

Robotics

Dr. Josep M. Tormos Fundació Institut Guttmann, Barcelona (Spain).

Dr. Enric Laporte Corporació Sanitària Parc Taulí, Sabadell (Spain).

Dr. Joan Antoni Hueto Hospital de la Vall d'Hebrón, Barcelona (Spain).

Dr. Carlos Torrens Hospital del Mar, Barcelona (Spain).

Javier Magriñá Mayo Clinics, Scottsdale, Arizona (USA).

Scientific Equipment

Microbial biotechnolgy and host-pathogen interpretation

- Technology of microbial culture facilities
- Protein expression and purification systems
- Process of biomolecule production
- Protein and DNA electrophoresis
- Thermocycler (PCR)

Mollecular and cellular neurobiotechnology

- in situ hybridization oven
- Gradient and DNA electrophoresis
- Sloped thermocycler (PCR)
- Lentiviral and retroviral production and characterization
- Technology of microbial culture facilities (2D and 3D)
- Protein expression and purification systems

Cellular and respiratory biomechanics

- Atomic Force Microscopy
- Magnetic Tweezers
- Optical Tweezers
- Live cell fluorescence microscopy
- Cell stretching
- Traction Microscopy
- Surface Micro/Nano-patterning
- Cell culture

Nanoprobes and nanoswitches

- Molecular Imaging Electrochemical STM
- Patch clamp setup
- Autolab potentiostat
- Molecular force probe
- Asylum Research Molecular Force Probe

Nanobioengineering

- Chemical functionalization
- Soft lithography
- Electrochemical sensor characterization equipment
- Surface Plasmon Resonance
- Quartz crystal microbalance
- Atomic Force Microscopy
- Nanoplotter equipment
- Microfluidics laborator
- Automatized microcontact printing system (custom-made)
- Optical Waveguide Lightmode Spectroscopy (OWLS System)
- Biologic LP Chromatography System. BioRad
- Microplate Manager. BioRad

Single molecule bionanophotonics

- Aperture type near-field optical microscopy (NSOM) for working under aqueous conditions
- Single molecule detection sensitive scanning confocal microscopy: imaging, polarization and wavelength sensitive
- Dual colour total internal reflection fluorescence microscopy (TIRF): polarization and wavelength sensitive
- Dual colour wide field fluorescence microscopy equipped with intensified CCD camera
- Lasers: Ar/Kr+, He-Ne

Nanoscale bioelectrical characterization

- Atomic Force Microscope fully customized for nanoscale direct and alternating current sensing
- Sub-femtoAmp remote sourcemeter
- Optical Microscope

Bio/non-bio interactions for regenerative medicine

- Surface characterization equipments (Contact angle, Z potential, Quartz Crystal Microbalance, Nanoindenter)
- Cell culture facilities
- Molecular Biology equipments: protein and DNA electrophoresis
- Thermocycler (PCR)
- Biotool (Rapid prototyping)

Molecular dynamics at cell biomaterial interface

- Flow chamber for measuring the strength of cell adhesion
- Experimental electrospinning device designed for the production of nanofibres from natural and synthetic polymers
- Equipment for advanced cell culturing

Biomechanics and Mechanobiology

- Finite Element softwares
- High performace computing server
- Constant head permeater
- Strain gauges data acquisition system
- Perfusion bioreactor system
- Image reconstruction software (Mimics)
- Universal mechanical testing machine (MTS)

Biomedical signal processing and interpretation

- Computing server for high performance biomedical signal processing
- Beat to beat arterial blood pressure and haemodynamic monitor equipment
- Polisomnographic equipment available in the Sleep. Laboratory of collaborator Hospital
- Sensors to obtain cardiac, respiratory and sleep biomedical signals
- Snoring analyzer equipment (SNORYZER)
- Databases of biomedical signals from Hospitals and Animal Laboratories
- BIOPAC system for multichannel cardiac and respiratory biomedical signal acquisition

Artificial Olfaction

- VocMeter Electronic Nose
- Infrared Camera
- NST 3320 Electronic Nose
- Climatic Chamber adapted for atmosthere modification
- Computer and general purpose Electronic Instrumentation
- Gas Chromatograph/Mass Spectrometer
- Gas sensor test station, with associated equipment for excitation, data logging and mixture generation
- Ion Mobility Spectrometer
- Computing cluster with 32 processors
- Automated HeadSpace Sampler
- ThermoScientific
- Temperature and Humidity Gas Conditioner
- Photolonization Detector
- Double Column - Gas Chromatograph- Flame Ionization Detector
- Olfative Port for Gas Chromatography
- Head Sapce Sampler

Neuroengineering

- Dual-micromanipulator electrophysiology set up
- UV laser scanning direct-lithography system
- 64-channel multielectrode array amplifi er

Robotics

- Experimental robotized kitchen composed of: a robot, several adapted cupboards, a kitchen counter and a PC for robot and environment control.

Networking Activities

Strategic Nanomedicine Line

Spanish Nanomedicine Platform

During 2008, the Spanish Nanomedicine Platform, Nanomed Spain, carried on with its initiative to bring together the main Spanish players in research, industry and the public administration in this research area, with the intention of boosting the implementation of the multidisciplinary field of nanomedicine.

IBEC hosts and manages the Platform´s technical office, in charge of the execution of the annual Strategic Plan. IBEC is a driving force behind the Platform, with two of its senior members in the Coordinating Committee: the Director, Head of the Education and Communication working group, and the Associate Director, who acts as Coordinator.

ACTIVITIES IN 2008

Internationalisation:

- Creation of *NanoMed-UII, International Innovation Unit.* An instrument financed by the CDTI within the TECNOEUROPA program aimed at motivating corporate associations and technological platforms to support and advise Spanish enterprises whishing to participate in projects financed by the PM7.
- Co-organisation of the *Working Group Assembly of the European Technological Platform on Nanomedicine* (alongside Zeltia): kick-off of a new Roadmap for Nanomedicine in Europe. Madrid, 24th-25th September.

Representing Spanish Nanomedicine at local and international events:

- *Exhibition of a NanoMed poster, 1st Clinam (European Foundation for Clinical Nanomedicine) Conference.* Basel (Switzerland), 19th-22nd May.
- *NanoMed stand Nanobioeurope 08.* Barcelona (Spain), 9th -13th June. IBEC was one of the organising members.
- Invited keynote talk, *4th Annual Symposium of the American Academy of Nanomedicine,* Washington DC (USA) 4th -7th September.
- *Exhibition of a NanoMed poster,* Forum Biocat, Barcelona, 4th December.

Education and Communication:

- Collaborated in the organisation of ESF-UB Nanomedicine. Sant Feliu de Guixols, Catalunya, 19th-23rd September.
- Development of a new NanoMed web page and intranet.

Nano2Life

Nano2Life, the first European Network of Excellence in nanobiotechnology, continued to work towards achieving the main goal for which it was created in 2004: to increase Europe´s industrial competitiveness and scientific excellence in this field. As a unique initiative Nano2Life created the largest and most tightly organised network of experts in nanobiotechnology to date.

As leader of the Working Package *"Relations with Industry"* in this network, IBEC hosted and co-organised two international events in 2008:

- **Nano2Life meets Industry,** held in Barcelona 6th May 2008, offered a forum for the exchange of innovative business solutions with the participation of top European research institutions.

  In a one-day workshop, leading international Nano2Life experts discussed developments and future trends in specific areas such as Bioanalytics Instrumentation, Surface functionalisation for the development of biosensors, Integrated lab-on-a-chip systems and Cancer-related nanodiagnostics.
- **Nano2Life Prospective Workshop on Emerging Nanotechnology-based Oncology II**, held in Barcelona, on 12-13 June 2008.

  Participants from companies, academia and clinical practice discussed the main challenges and achievements that should be expected in the diagnosis, prognosis and monitoring of four different types of cancer (sarcomas, brain tumours, leukaemia and other circulating tumours, and gastrointestinal and colorectal tumours) in the future.

Nanoaracat

Nanoaracat is a general protocol setting the collaboration frame between the regional governments of Aragon and Catalonia, to foment and coordinate R&D projects in nanoscience and nanotechnology. A member of its Scientific and Monitoring Committees, IBEC is one of 17 institutions involved in Nanoaracat.

Strategic Alliances

IBEC associated groups from the UB and the UPC

The collaboration between IBEC, the University of Barcelona (UB) and the Polytechnic University of Catalonia (UPC) to carry out joint research programs continued during 2008. Under the agreement signed in 2006, IBEC agreed to fund 10 PhD scholarships each year, one for each associated group. IBEC´s associated groups are:

- Biomaterials, Biomechanics and Tissue Engineering (UPC)
- Biomedical Signals and Systems Unit (UPC)
- Robotics and Vision Unit (UPC)
- Instrumentation and Bioengineering Unit (UPC)
- Ionizing Radiation Dosimetry Unit (UPC)
- Graphical Computer Science Unit (UPC)
- Bioelectronics Unit (UB)
- Biophysics and Bioengineering Unit (UB)
- Microbiology Unit (UB)
- Surface Science and Nanotechnology Unit (UB)

Biomaterials, Bioengineering and Nanomedicine CIBER (CIBER-BBN)

The Bioengineering, Biomaterials and Nanomedicine CIBER (CIBER-BBN) is part of the Biomedical Research Centres Network (CIBER), which was set up in Spain in 2006. The CIBERs are networked research bodies which are legal entities in their own right. They each comprise several research groups, both public and private, and are based in different regions around the country. The idea underlying the CIBERs is to create large "virtual" research centres of a multidisciplinary and multi-institutional nature In which basic, clinical and population research can be integrated, in order to develop a common research programme CIBER-BBN is financed through the Instituto de Salud Carlos III and it works in areas that include bioengineering and biomedical imaging, biomaterials and tissue engineering and nanomedicine. Its research is focused on the prevention of diseases, systems for diagnostics and technologies for specific therapies such as regenerative medicine and nanotherapies.

The scientific management and coordination of CIBER-BBN is based at a centre in Zaragoza. For further information regarding this CIBER, please visit: http://www.ciber-bbn.es/

Fundació Clínic – Hospital Clínic

Together with the Fundació Clínic and Barcelona's Hospital Clínic, IBEC aims to promote applied research in the three institutions.

ICREA

ICREA, the Catalan Institution for Research and Advanced Studies, is a foundation promoted jointly by the Catalan Government through its Ministry of Innovation, Universities and Enterprise, and the Catalan Foundation for Research and Innovation (FCRI). ICREA helps to promote the Catalan R&D system by recruiting top scientists with the ability to lead research groups and/or support existing groups in the Catalan universities and research centres.

Three IBEC group leaders hold an ICREA position: two of whom are ICREA research professors, while the third is an ICREA researcher.

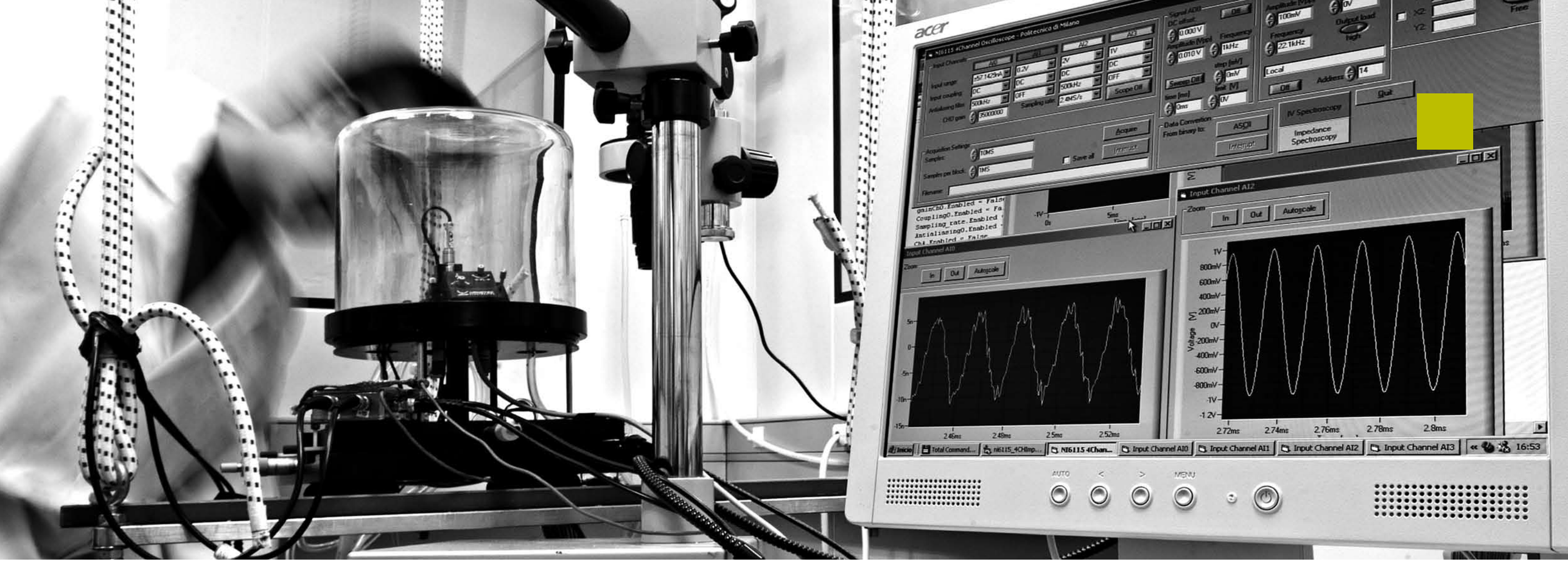
Catalan Researcher Mobility Support Node

IBEC has signed a letter of intent in order to support research and the mobility of researchers from outside Catalonia. The initiative was promoted by the Catalan Foundation for Research and Innovation (FCRI) with the intention of attracting researchers from abroad to Catalonia.

All of Catalonia's universities and a Lumber of research centres are members of this node.

The BioRegió Forum

The BioRegió Forum is a new regional development model that was created with the aim of improving people's quality of life through the enhanced coordination of biotechnological activities in Catalonia. The aim is to make Catalonia an international point of reference in terms of high quality research, its competitive networks and an increasingly dynamic knowledge transfer system. IBEC contributes to the BioRegió programme by taking part in the BioRegió Forum, which is an advisory body that is also actively involved with the organizations that collaborate with the Foundation.IBEC has taken an active part in the initiative by creating a medical technology cluster in Catalonia that is run by BIOCAT.



Events and Communication Activities

Seminars and Lectures

IBEC Seminars

IBEC runs a programme of seminars that are given by the leaders of different research groups. Over the past year, 19 seminars have been held, which were attended by nine special guests:

Prof. Anders Lansner
Head of Department of Computational Biology School of Computer Science and Communication KTH - Royal Institute of Technology (Sweden)

Dr. Danny O'Hare
Department of Bioengineering
Imperial College (UK)

Dr. Eduard Batlle
Oncology Program & ICREA
Institute for Research in Biomedicine (IRB)

Prof. Rodríguez-Cabello
Associate Professor
Dpto. Física Materia Condensada, Cristalografía y Mineralogía
E.T.S.I.I. / Universidad de Valladolid

Dr. Patrick Prendergast
Trinity College, Dublin, Ireland

Dr. Roberto Fernández Galán
Case Western Reserve University
Department of Neuroscience

Prof. Eduard Castells
Bellvitge University Hospital

Dr. Javier Buceta
Co.S.Mo. LAB (Computer Simulation & Modeling)

Prof. Leif Sörnmo
Lund University (Sweden)

PhD Discussion Seminars

Seminars intended to encourage the participation of PhD students. They are held throughout the year on Mondays. Total in 2008: 15 seminars.

IBEC Lectures

Lectures directly run by IBEC research lines:
Single molecule bionanophotonics: 6 lectures
Bio/non-bio interactions for regenerative medicine: 3 lectures.
Microbial biotechnology and host-pathogen interaction: 1 lecture.
Nanobioengineering: 1 lecture.
Nanoprobes and Nanoswitches: 1 lecture.
Biomechanics and Mechanobiology: 1 lecture.
Biomedical Signal Processing and Interpretation: 1 lecture.
Total in 2008: 14 lectures.

Conferences and Symposia

SIBB BioBCN2008

IBEC organized the third edition of the Iberian Biomaterials Conference and the XXXI Symposium of the Iberian Society of Biomechanics and Biomaterials.

Event details:

- 17-19 September 2008
- MoviStar Marquee
- IBEC-UPC
- 96 attendees
- 54 oral presentations
- 21 posters
- 2 round tables

Workshop on Optical Measurement and Manipulation of Neurotransmission

Event details:

- 17 October 2008
- Picasso Museum
- IBEC-ICREA-IDIBELL
- 100 attendees
- 6 oral presentations
- Live Internet broadcast

Symposium on Advanced Microscopy Techniques

In October, a Group of researchers from Europe and the United States took part in this symposium run by IBEC.

Event details:

- 15-16 October 2008
- Faculty of Physics
- IBEC-ICFO-IrsiCaixa
- 70 attendees
- 20 oral presentations
- 29 posters

Electrochemical and electrical scanning probe microscopy techniques for imaging biological systems in a fluid environment

Course given by Prof. Julie Macpherson, from Warwick University (UK) and coordinated by Dr. Gabriel Gomilla from IBEC.

Event details:

- Six-hour course
- UB-IBEC
- 40 attendees

Media Summary

DATE 24/03/2008
PUBLICATION LA VANGUARDIA (1)
TEMAS DE DEBATE: *Bioingeniería: Ciencia, no ficción*
Josep A. Planell

DATE 31/03/2008
PUBLICATION EFE
A new optical technique makes it possible to observe cellular activity on a nanometric scale.
"The Researcher María García-Parajo, head of the IBEC Bionanophotonics Laboratory, located in the Barcelona Science Park, explained in a release that new advances could bring about a "genuine revolution" for biomedicine as, for the first time, it is now possible to study interactions which take place on a molecular level".

DATE 14/04/2008
PUBLICATION DIARIO MÉDICO (2)
Neurochips will enable screening of drugs prior to clinical trials.
"The development of neurochips, plastic ´neuron carriers´ which keep neurons alive allowing their electrical and synaptic activity to be analysed, will contribute to studies of various neurological illnesses and will allow the industry to carry out premedical screening on potential drugs. Their inventors, from the Catalonia Institute of Bioengineering, have taken out a patent".

DATE 17/06/2008
PUBLICATION LA VANGUARDIA (Monográfico especial) (3)
NEWS STORY: *High level bioengineering research.*

DATE 20/09/2008
PUBLICATION BARCELONA TV
EINSTEIN A LA PLATJA
Interview with **Elisabeth Engel.**

DATE 29/09/2008
PUBLICATION EL PERIÓDICO (4)
CIÈNCIA: *La bioenginyeria s'acosta al somni dels òrgans biònics.*

DATE 14/10/2008
PUBLICATION TELEVISIÓN ESPAÑOLA (Catalonia)
The journalist Paloma Vidal interviewed Doctor **Josep A. Planell** for a report on IBEC tissue research.

DATE 06/11/2008
PUBLICATION LA VANGUARDIA (5)
ONLINE: Aleria Biodevices consigue una ronda de financiación de un millón de euros.
El ruido de las neuronas.

DATE NOVIEMBRE 2008-11-26
PUBLICATION Revista PRONTO (6)
Órganos biónicos: La Medicina del Futuro.

1


TEMAS DE DEBATE
Bioingeniería ciencia, no ficción
Un gran reto en progreso constante
Oportunidad de éxito
Bioingeniería

2


Los neurochips permitirán el cribado de fármacos previo a ensayos clínicos

3


BREVES
Recerca de màxim nivell

4


La bioenginyeria s'acosta al somni dels òrgans biònics

5


El ruido de las neuronas

6


ÓRGANOS BIÓNICOS:
LA MEDICINA DEL FUTURO
Así será un cuerpo biónico

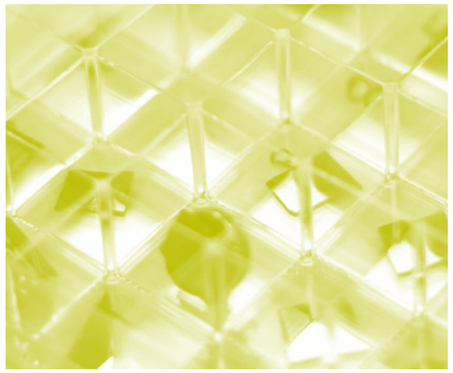
Experimental workshops Open to the General Public

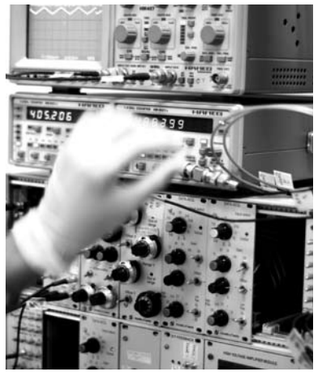
"Research!" is a series of experimental workshops organized by the Barcelona Science Park (PCB) and offered to the general public.

In the course of the workshops, participants are able to experience what it really means to carry out scientific research and to learn about the research currently being undertaken at IBEC, the PCB and the University of Barcelona.

The experiments are brought to life by researchers who also provide fascinating insights into their ongoing work These experimental workshops aim to foster a greater scientific understanding among the general public, to provide the public with an opportunity to gain hands-on experience of real scientific methods in action, to provide information about the scientific methodologies and research currently being pursued at the PCB and within IBEC and the University of Barcelona and to promote careers in the sciences.









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