



IBEC Annual Report

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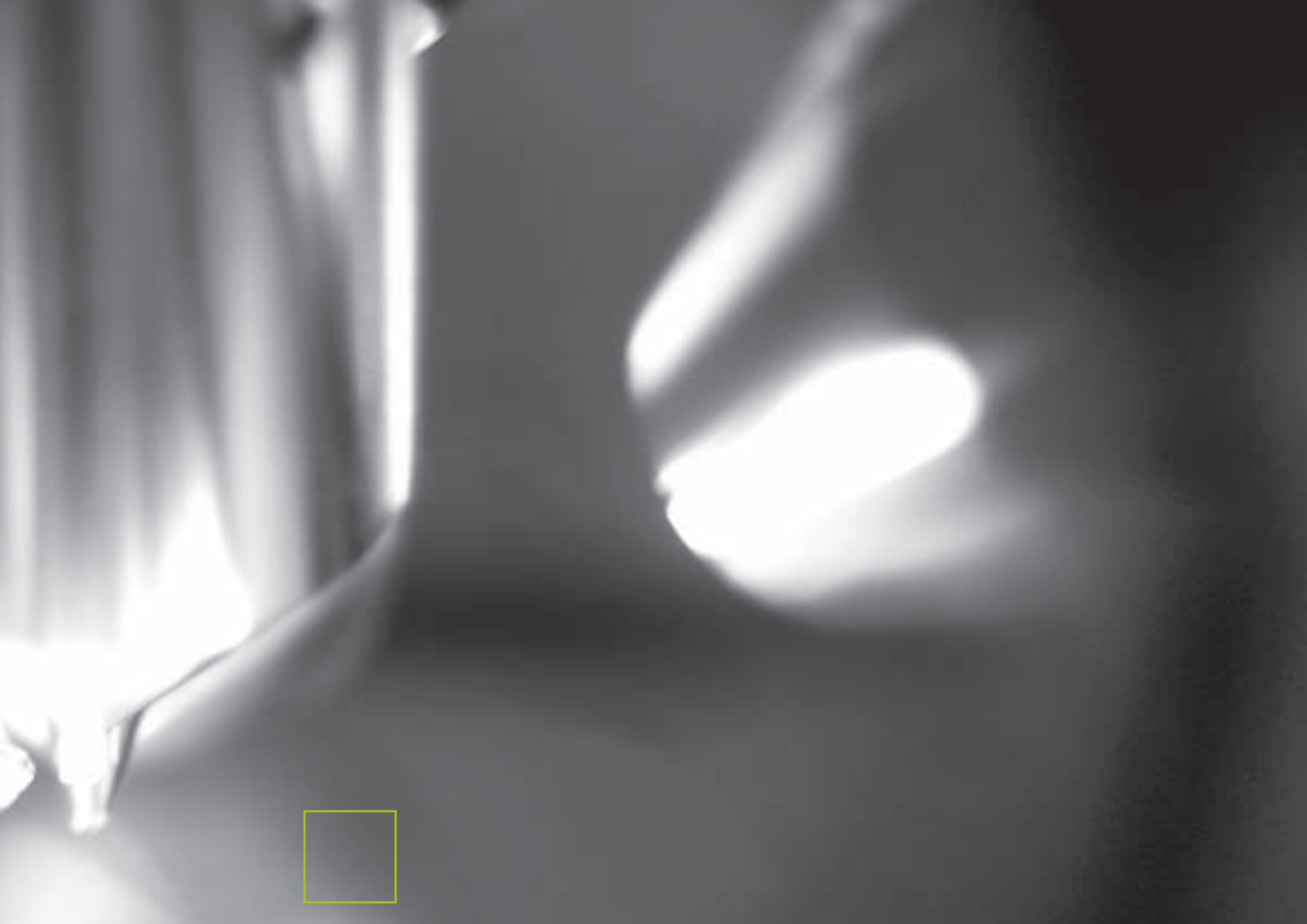
Institute for Bioengineering  
of Catalonia



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# News 2007

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- 03 FIRST IBEC INTERNATIONAL SCIENTIFIC COMMITTEE MEETING
- 04 IBEC BIOENGINEERING AND NANOMEDICINE SYMPOSIUM 2007
- 05 THE IBEC PHD DISCUSSION SEMINARS, A NEW MECHANISM FOR TRAINING AND NETWORKING
- 06 OUR WEBSITE
- 07 NEW LABORATORY SPACE AT PCB



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01 R. JANÉ  
02 M. GARCÍA  
03 A. CASALS  
04 D. NAVAJAS  
05 F. SANZ  
06 A. JUÁREZ



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## NEWS 2007

### 01 IBEC RECRUITS GROUP LEADERS FOR ITS SIX RESEARCH PROGRAMMES

At the end of 2006, IBEC published a call for applications in its efforts to recruit outstanding, highly-motivated candidates as group leaders for its six research programmes. The candidates were required to hold a PhD or MD and to have postdoctoral experience in the subject area, and it was hoped that they would be able to develop an independent research group within one of the Institute's research programmes. Applications from both senior and junior scientists were encouraged. The evaluation was carried out by the IBEC International Scientific Committee together with the direction of the Institute.

During 2007, thirteen research groups were established within its six research programmes. Three group leaders hold an ICREA position at IBEC, whereas the other ten come from the University of Barcelona (UB) and the Technical University of Catalonia (UPC).

Dr. Damien Lacroix, head of the IBEC Biomechanics and Mechanobiology research group, passed the first evaluation stage in this call. Only 6% of the submitted proposals were selected for the second stage of the peer review evaluation process.

The ERC, a newly-established European funding body, aims to stimulate scientific excellence by supporting and encouraging the very best, truly creative scientists, scholars and engineers to be adventurous and take risks in their research. In this sense, ERC Starting Grants support research leaders who are about to establish or consolidate an independent research team in Europe.



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07 G. ALTANKOV  
08 J. A. PLANELL  
09 E. CLAVEROL  
10 G. GOMILA  
11 J. SAMITIER  
12 S. MARCO



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### 02 ERC STARTING GRANT AWARDED TO DR. PAU GOROSTIZA

Dr. Pau Gorostiza, head of the IBEC Nanoprobes and Nanoswitches group, was awarded a Starting Grant from the European Research Council (ERC) to study neurosecretion by remote control of exocytosis and endocytosis with light. In this first call for ERC Starting Grants, only 201 of the 9,167 proposals submitted were accepted. Nevertheless, the ERC expects roughly 300 proposals overall to be funded.

### 03 FIRST IBEC INTERNATIONAL SCIENTIFIC COMMITTEE MEETING

The IBEC International Scientific Committee (IBEC-ISC) is a consultative body of the IBEC Board of Trustees for the selection and evaluation of the IBEC Group Leaders. In spring 2007, the IBEC-ISC members were asked to evaluate the proposals received for the first call for IBEC group leaders. This evaluation procedure was carried out by e-mail and the results were communicated to the candidates in fall 2007.

The IBEC-ISC met for the first time in Barcelona between November 8-9, 2007. During this one-and-a-half day meeting, the ISC members were able to talk and interview the selected group leaders, to visit the facilities of the Institute, and to meet some local authorities on the Board of Trustees.



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13 D. LACROIX  
14 P. GOROSTIZA



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## 04 IBEC BIOENGINEERING AND NANOMEDICINE SYMPOSIUM 2007



On November 7, the public presentation of IBEC was held within the framework of the IBEC Bioengineering and Nanomedicine Symposium 2007. The event took place at the Parc Científic de Barcelona (PCB, Barcelona Science Park), with an excellent attendance of 180 professionals.

After the welcome address by the Director of the Institute, Prof. Dr. Josep A. Planell, the event continued with presentations of the outstanding achievements of national and international experts in the fields of bioengineering and nanomedicine.

The parallel poster session was also very well received, with the presentation of 29 posters from different institutions exhibited during the whole event and 19 flash presentations by their authors.

Supported by the University of Barcelona, the Technical University of Catalonia and the Generalitat de Catalunya, this symposium is an international meeting that focuses on the interdisciplinary fields of bioengineering and nanomedicine.

## 05 THE IBEC PHD DISCUSSION SEMINARS, A NEW MECHANISM FOR TRAINING AND NETWORKING

In December a new networking activity was initiated among researchers at IBEC: the IBEC PhD Discussion Seminars.

This series of seminars is a mechanism to exchange knowledge and experience, provide training for PhD students, enhance networking and stimulate collaboration.

## 06 OUR WEBSITE

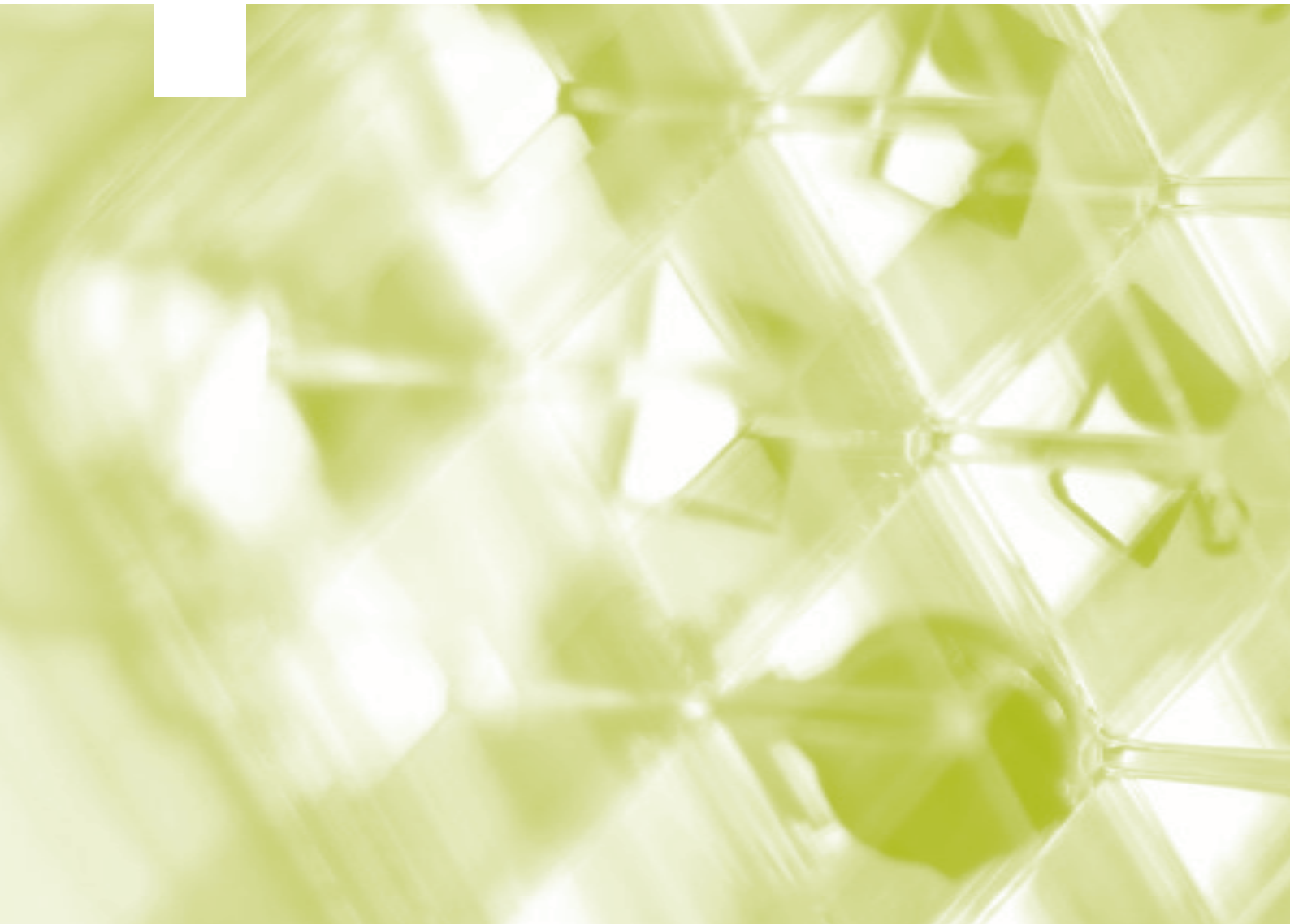
In June IBEC launched its new website, [www.ibecbarcelona.eu](http://www.ibecbarcelona.eu), a communication tool for the Institute intended to open a door to knowledge in the field of bioengineering and to act as an international point of reference.

With this new website, IBEC aims to attract the attention of researchers interested in this specific field and to encourage the interest of the public in research in general.

The website has two main areas. The first is concerned with the more institutional aspects of the Institute. The second outlines the six research programmes in which the research activity of IBEC is currently focused. Of note for website visitors is the "Activities" section where all the activities organized by IBEC are published, as well as other external initiatives related to the field of bioengineering.

## 07 NEW LABORATORY SPACE AT PCB

It is planned that IBEC will have its own independent building by 2011. However, in the meantime, our provisional location is at the PCB, on the premises of the University of Barcelona. In December 2007, IBEC expanded to occupy 730 square meters of research laboratory space, having previously occupied just 210 square meters. The new joint laboratory space is housed in a new building in the PCB and provides facilities for six IBEC research groups.







- 01 ORGANIZATIONAL CHART
- 02 THE IBEC PRIVATE FOUNDATION
  - 02.1 BOARD OF TRUSTEES
  - 02.2 STANDING COMMITTEE
  - 02.3 INTERNATIONAL SCIENTIFIC COMMITTEE
- 03 SCIENTIFIC AND ADMINISTRATIVE STRUCTURE

# Organizational Structure



## Organizational Structure

## 01 ORGANIZATIONAL CHART

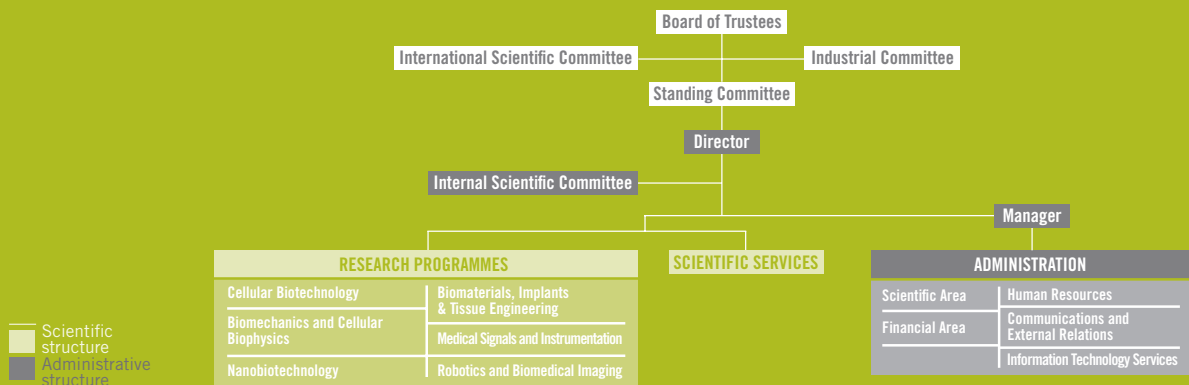


figura 1. Organizational chart of IBEC foundation

## 02 THE IBEC PRIVATE FOUNDATION

## 02.1 Board of Trustees

## PRESIDENT

**Sr. Josep Huguet Biosca** Minister of Innovation, Universities and Enterprise  
Generalitat de Catalunya

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**Sra. Marina Geli Fàbrega** Minister of Health  
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Generalitat de Catalunya

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Programme Director  
Ministry of Health, Generalitat de Catalunya

**Dr. Ramon Maspons i Bosch**  
Ministry of Health, Generalitat de Catalunya

**Dr. Josep Samitier Martí** Vice-Rector of Innovation and  
International Research Programmes  
University of Barcelona

**Dr. Marçal Pastor Anglada** Vice-Rector of Research  
University of Barcelona

**Dr. Xavier Gil Mur** Vice-Rector of Research and Innovation  
Technical University of Catalonia

**Dr. Joaquim Casal Fàbrega** Professor  
Technical University of Catalonia

## SECRETARY

**Sr. Josep Maria Alcobarro Pericay**  
CERCA, Ministry of Innovation, Universities and Enterprise  
Generalitat de Catalunya

## 02.2 Standing Committee

### PRESIDENT

**Dr. Josep Samitier Martí**

Vice-Rector of Innovation and International Research Programmes, University of Barcelona

### MEMBERS

**Dr. Ramon Moreno Amich**

General Director for Research, Ministry of Innovation, Universities and Enterprise, Generalitat de Catalunya

**Dr. Ramon Maspons i Bosch**

Ministry of Health, Generalitat de Catalunya

**Dr. Xavier Gil Mur**

Vice-Rector of Research and Innovation, Technical University of Catalonia

### SECRETARI

**Sr. Josep Maria Alcoberro Pericay**

CERCA, Ministry of Innovation, Universities and Enterprise, Generalitat de Catalunya

## 02.3 International Scientific Committee

**Dra. Marta Aymerich i Martínez** Director

Catalan Agency for Health Technology Assessment, Spain

**Prof. Luigi Ambrosio** Director

Institute for Composite and Biomedical Materials, University of Naples, Italy

**Léonard Aucoin** President

InfoVeille Santé Ltée, Canada

**Prof. Jean Louis Coatrieux** Professor

Laboratoire de Traitement du Signal et de l'Image, INSERM, Université de Rennes, France

**Prof. Paolo Dario** Coordinator

Center for the Research in Microengineering, University of Pisa, Italy

**Prof. Jeffrey Fredberg** Professor of Bioengineering and Physiology

Harvard School of Public Health, USA

**Prof. Gunter Fuhr** Director

Fraunhofer Institute for Biomedical Engineering, Germany

**Prof. Samuel Stupp** Director

Institute for BioNanotechnology in Medicine, Northwestern University, USA

**Prof. Bernt E. Uhlin**

Professor of Molecular Biology, University of Umeå, Sweden

### 03 SCIENTIFIC AND ADMINISTRATIVE STRUCTURE

IBEC has 119 researchers and technical experts, who form part of either its own staff or that of the UB and UPC, or various programmes for the recruitment of research staff: ICREA, Ramón y Cajal Programme (MEC), and others. In addition, the IBEC administration comprises 11 staff employees.

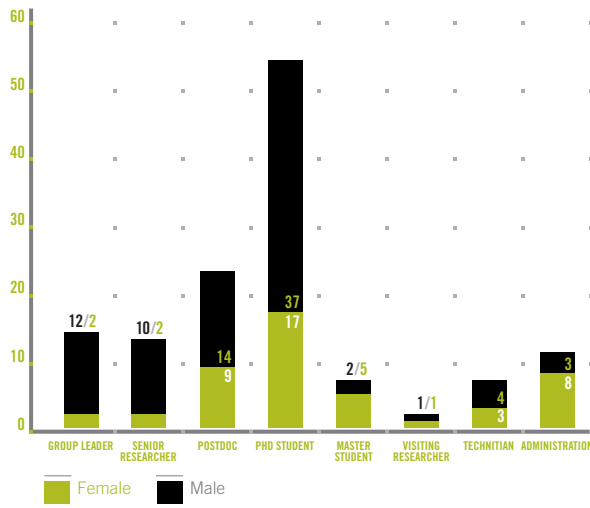


figure 2. IBEC researchers and technical and administration staff by gender

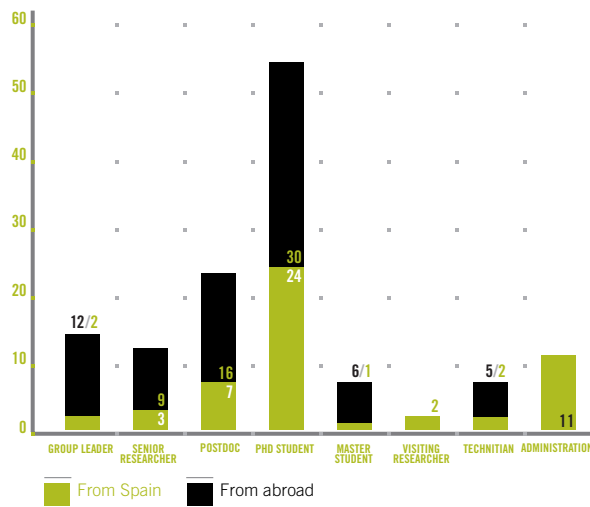


figure 3. IBEC researchers and technical and administration staff by nationality

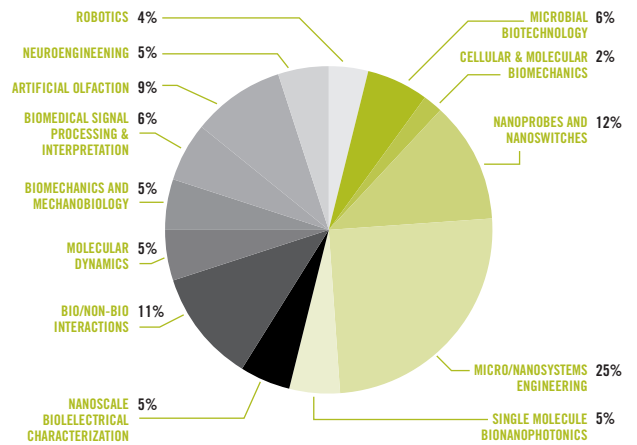


figure 4. Distribution of IBEC researchers and technicians by group

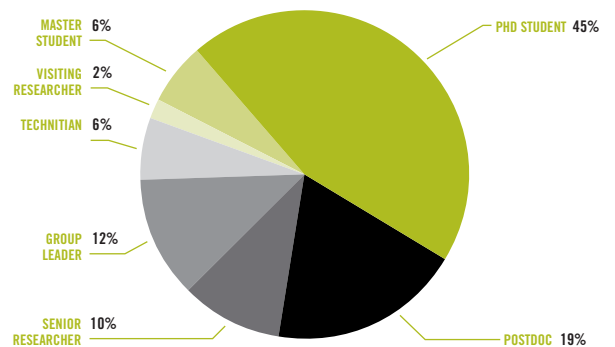


figure 5. Distribution of IBEC researchers and technicians by category

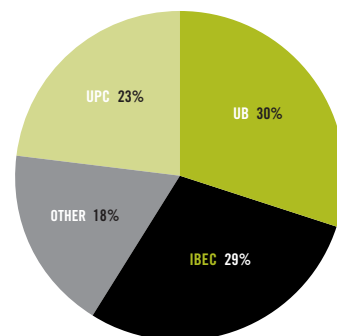


figure 6. Distribution of IBEC researchers and technicians by contracting or associated institution ("Other" means CIBER, PCB, and FBG)



01/02  
DIRECTION  
03/04  
SCIENTIFIC AREA  
05/06  
FINANCIAL AREA

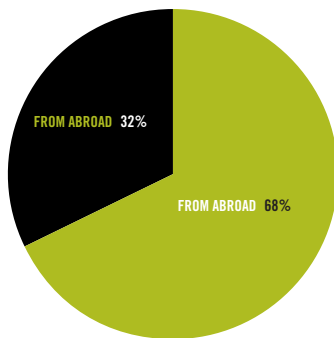


figure 7. Distribution of IBEC researchers and technicians by nationality

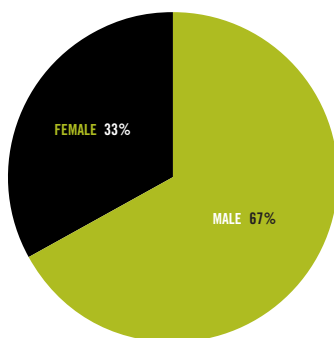


figure 8. Distribution of IBEC researchers and technicians by gender

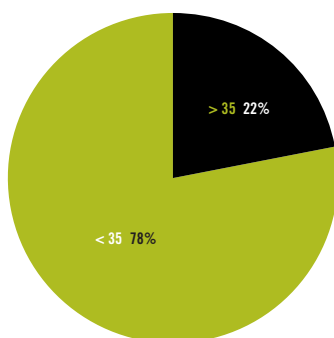


figure 9. Distribution of IBEC researchers and technicians by age

### 03.1 Administration Direction and Management

- DIRECTOR**  
Prof. Dr. Josep A. Planell i Estany
- ASSISTANT DIRECTOR**  
Dr. Teresa Sanchis Estruch
- DIRECTOR'S SECRETARY**  
Pilar Ciriquián Esguerra
- HEAD OF NANOMEDICINE STRATEGIC LINE**  
Prof. Dr. Josep Samitier Martí
- PROJECT MANAGER NANOMEDICINE STRATEGIC LINE**  
Dr. Arantxa Sanz García
- ASSISTANT DIRECTOR - CIBER-BBN**  
Montserrat Naranjo Cánovas

### Scientific Area

- DIRECTOR**  
Dr. Pastora Martínez Samper
- PROJECT MANAGERS**  
Dr. Javier Romero Ortega  
Dr. Teresa Sanchis Estruch  
Dr. Arantxa Sanz García
- AREA SECRETARY**  
Pilar Jiménez Sánchez
- PROGRAMMES SECRETARY**  
Marta Redón Zorita
- LAB MANAGER**  
Isabel Oliveira

### Financial Area

- DIRECTOR**  
Ana María González Núñez
- PURCHASES**  
Mayte Muñoz Cruz
- ACCOUNTING**  
Francisco Javier Buenestado Simón



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# Research Activities

- 01 RESEARCH LINES
- 02 RESEARCH PROJECTS
- 03 PUBLICATIONS
- 04 COLLABORATIONS WITH  
OTHER RESEARCH CENTRES
- 05 SCIENTIFIC EQUIPMENT

## Research Activities

# 01 RESEARCH LINES

### ■ Cellular biotechnology programme

#### Microbial biotechnology and host-pathogen interaction



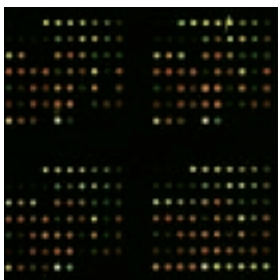
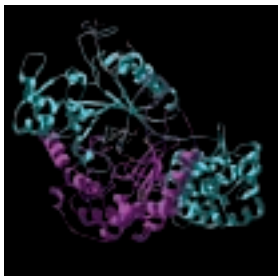
##### Research staff

Prof. Dr. Antonio Juárez Principal Investigator  
 Dr. Eduard Torrents Senior researcher  
 Dr. Rosa Carmen Baños PostDoc researcher  
 Laura Pedró PhD student  
 M. Carmen Jaramillo Technician  
 Nahia Barberia Student  
 Montserrat Cartaña Student

Structure and function of bacterial proteins that modulate virulence expression: 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 current research interests of the group is to gain a better understanding of the role of certain proteins involved in this process. Specifically, two groups of proteins are being investigated: 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 former group, we are interested in unravelling the role that two of these proteins, Hha and H-NS, play in virulence regulation. With respect to the latter, 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: Bacterial adherence to various surfaces results, in many instances, in biofilm development. Microorganisms that form biofilms exhibit properties that differ from those of single planktonic cells, including an increased resistance to antimicrobial drugs. Treatment of biofilm-associated infections represents a major clinical challenge. A relevant problem in titanium dental implant failure is formation of dental plaque, which is a mixed bacterial biofilm. If plaque accumulation occurs and is left for a period of time, inflammation around the implant may spread rapidly and can easily reach the bone. It could, therefore, cause bone resorption with 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 *S. sanguinis* adherence 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.





## ■ Biomechanics and cellular biophysics programme

### Cellular and respiratory biomechanics

#### Research staff

Prof. Dr. Daniel Navajas Principal Investigator

Dr. Jordi Alcaraz PostDoc researcher

Dr. Xavier Trepap PostDoc researcher

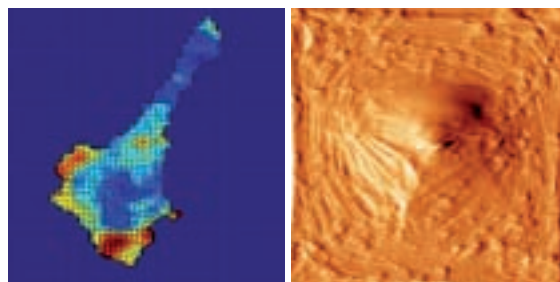
Dr. Pere Roca-Cusachs PostDoc researcher

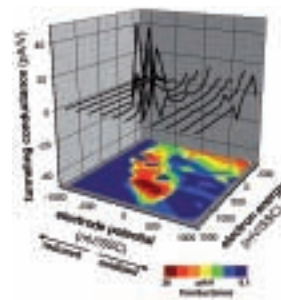


The research in this line seeks to gain a better understanding of cellular and respiratory biomechanics with the aim of improving the diagnosis and treatment of respiratory diseases. The work is structured into two interrelated areas focusing on the systemic and cellular levels of respiratory mechanics. 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 stresses. We study the mechanisms of tissue damage and repair. In particular, we investigate the mechanical signalling involved in tissue regeneration by stem cells. We study the biophysical mechanisms regulating the adhesion and vascular transmigration of leukocytes. We also investigate the mechanical determinants of carcinogenesis.





## Nanoprobes and Nanoswitches

### Research staff

Dr. Pau Gorostiza Principal Investigator  
 Prof. Dr. Fausto Sanz Principal Investigator  
 Dr. Amir Broomand PostDoc researcher  
 Dr. Marina Inés Gianotti PostDoc researcher  
 Dr. Ismael Díez-Pérez PostDoc researcher  
 Muriel Arimon PhD student  
 Juan Manuel Artés PhD student  
 Felipe Caballero PhD student  
 Aleix Garcia-Güell PhD student  
 Javier Hoyo PhD student  
 Andrés Martín-Quirós PhD student  
 Marcel Ruiz-Mejías PhD student  
 Lorena Redondo PhD student  
 Mercè Izquierdo Undergraduate student

Research in the group is focused on developing nanoscale tools to study biological systems. These tools include instrumentation based on proximity probes, such as Electrochemical Tunnelling Microscopy and Spectroscopy that we are applying 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.

## ■ Nanobiotechnology Programme

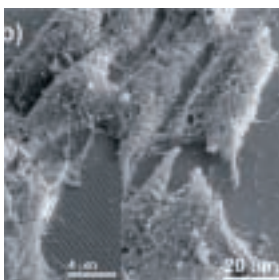
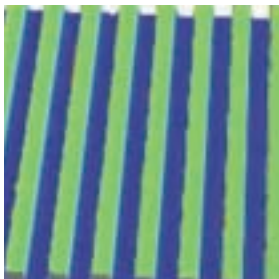
### Nanobioengineering



#### Research staff

Prof. Dr. Josep Samitier Principal Investigator  
 Dr. Martin Arundell Senior researcher  
 Dr. Abdelhamid Errachid Senior researcher  
 Dr. Xavier Fernández-Busquets Senior researcher  
 Dr. Elena Martínez Senior researcher  
 Dr. Christopher Mills Senior researcher  
 Dr. Christian Sporer Senior researcher  
 Dr. Anna Lagunas PostDoc researcher  
 Dr. Juan José Valle PostDoc researcher  
 Dr. Nadia Zine PostDoc 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  
 Romén Rodríguez PhD student  
 Santiago Rodríguez PhD student  
 Patricia Urban PhD student  
 Michael Lee Postgraduate student  
 Christian Widmer Project manager  
 Miriam Funes Technician  
 Adai Colom Master student  
 Óscar Ramírez Master student



The engineering of micronanosystems is a new interdisciplinary applied research field 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 improve sustainability and manufacturing processes and, thus improving life quality.

When dealing with biomedical applications, miniaturization of sensors, actuators and systems is increasingly required. 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 point to improve system functionality and reliability and, at the same time, to save reagent consumption and analysis time.

The introduction of complex biological entities like eukaryotic or bacterial cells and viruses into micronanosystems, 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 important cellular pathways and processes. Main challenges in biology and medical sciences could be addressed by the development of complete lab-on-a-chip and point-of-care systems.



## Single molecule bionanophotonics

### Research staff

Prof. Dr. Maria Garcia-Parajo Principal Investigator

Dr. Olga Esteban PostDoc researcher

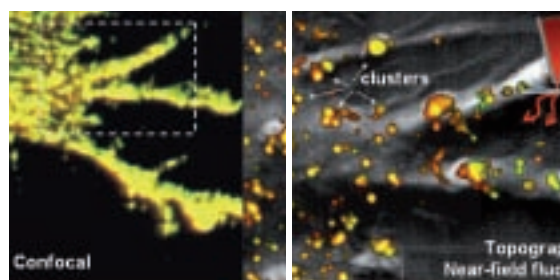
Dr. Davide Normanno PostDoc researcher

GertJan Bakker PhD student

Ruth Diez Ahedo PhD student

Thomas van Zanten PhD student

The Bionanophotonics group focuses its research activities on the development and application of near- and far-field optical techniques for the study of biological processes at the single molecular level. On the instrumentation side, 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. Major efforts are thus being concentrated on the development of near-field scanning optical microscopy (NSOM) for routine operation in aqueous conditions with improved spatial resolution and speed. Besides NSOM, we are also applying single-molecule wide field (Epi/TIRF illumination) for the study of dynamic processes occurring at the cell membrane. On the biological side, we are particularly interested on the spatio-temporal organisation of the cell membrane in relation to cell function. Specific topics of interest are the study of receptors involved in pathogen recognition and cell adhesion. An intriguing topic that also engages our attention is the driving mechanisms that control receptor clustering. In this context, we are actively investigating lipid rafts as local organisers of the cell membrane (size and structure) and their potential role in different membrane related processes. In more general terms, our group also has extensive experience in single-molecule fluorescence imaging and spectroscopy and we have made significant contributions to elucidate the photodynamics of individual organic molecules, supramolecular complexes and autofluorescence proteins.





## Nanoscale bioelectrical characterization

### Research staff

Dr. Gabriel Gomila Principal Investigator

Dr. Laura Fumagalli PostDoc researcher

Jordi Tuset PhD student

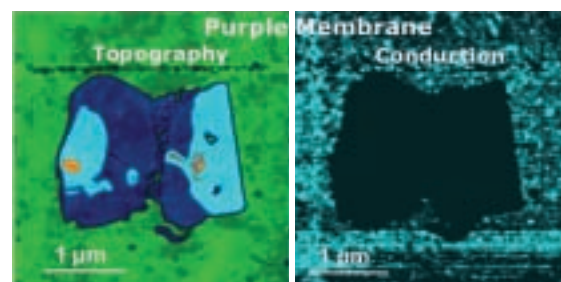
Georg Gramse PhD student

Aurora Dols Master student

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 electronic biosensors.

On the instrumentation side, we focus our research in (i) the development of electronic instrumentation for the realization of a variety of electric measurements at the nanoscale not available in commercial equipments, such as small signal AC impedance measurements or electronic noise measurements, both in air and under liquid environments; (ii) the design and fabrication of Atomic Force Microscopy probes and sample holders specifically adapted to the proposed electric measurement techniques and environments; and (iii) the development of new measuring modes specific to the electric characterization of biological samples at the nanoscale.

As the main applications of the experimental set-ups, we are investigating (i) the supramolecular organization of native biological membranes at the nanoscale and (ii) single receptor ligand binding processes in olfactory receptors and bacteriorhodopsin for biosensor applications.



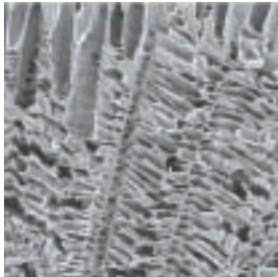
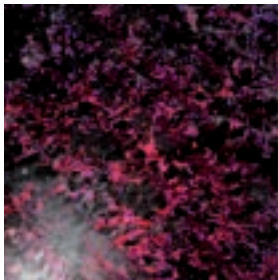
## ■ Biomaterials, Implants and Tissue Engineering Programme

### Bio/non-bio interactions for regenerative medicine



#### Research staff

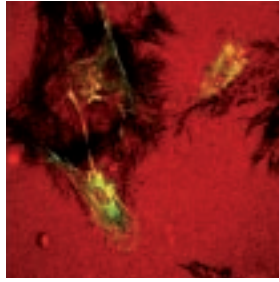
Prof. Dr. Josep A. Planell Principal Investigator  
 Dr. Elisabeth Engel Senior researcher  
 Dr. Melba Navarro PostDoc researcher  
 Dr. Alexandra Michiardi PostDoc researcher  
 Dr. Miguel Angel Mateos PostDoc researcher  
 Dr. Izabella Rajzer PostDoc researcher  
 Dr. Oscar Castaño PostDoc researcher  
 Johan Gustavsson PhD student  
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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.



## Molecular dynamics at cell-biomaterial interface



### Research staff

Prof. Dr. George Altankov Principal Investigator

Nuno Coelho PhD student

Dencho Milkov PhD student

Georgi Toromanov PhD student

Kameliya Hristova PhD student

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, colonization of scaffolds and eventually, all tissue engineering applications. Our recent studies have shown that tissue compatibility of materials is highly dependent on cells being allowed 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 ECM (Extracellular Matrix) organization and subsequent tissue integration. Thus, our research is related to the current needs of the 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 it 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.

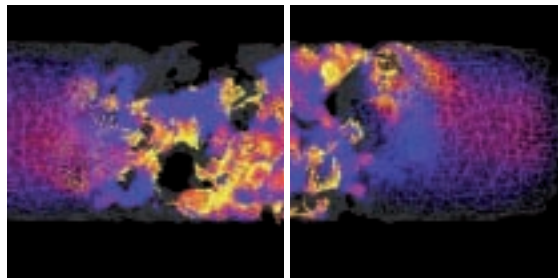


## Biomechanics and Mechanobiology

### Research staff

Dr. Damien Lacroix Principal Investigator  
 Dr. Jean-Louis Milan PostDoc researcher  
 Clara Sandino PhD student  
 Ramiro González PhD student  
 Martin Koch PhD student  
 Andy Olivares PhD student

The research line in Biomechanics and Mechanobiology focuses its research on the study of the effects of mechanical stimuli on the 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 allow validation of the numerical models. In particular, mechanical devices such as bioreactors and a tissue chamber for tissue engineering are developed to study the microenvironment of mechanical stimuli on cells. Emphasis is given to the study of load transfer of biomaterials on to the cells or tissue directly. 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.





## ■ Medical Signals and Instrumentation Programme

### Biomedical signal processing and interpretation



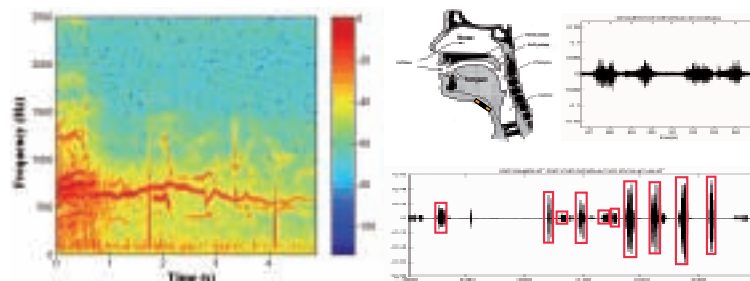
#### Research staff

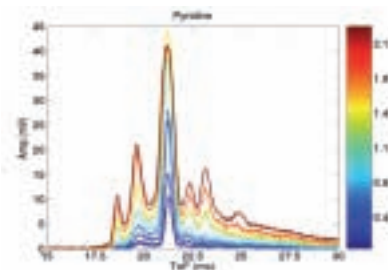
Prof. Dr. Raimon Jané Principal Investigator  
 Dr. José Antonio Fiz Senior researcher  
 Dr. Abel Torres PostDoc researcher  
 Dr. Beatriz Giraldo PostDoc researcher  
 Dr. Jordi Solà PostDoc researcher  
 Christian Morgenstern PhD student  
 Ainara Garde PhD student  
 Leonardo Sarlabous PhD student

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

Recent studies have shown strong relationships between sleep, respiratory and cardiac signals in different pathologies. In some cases obstructive respiration during the night, such as Obstructive Sleep Apnoea Syndrome (OSAS), produces sleep disorders and subsequent cardiovascular effects. In other cases, cardiac pathologies generate 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 analysis and processing of bioelectrical, mechanical, sounds and blood signals will enhance physiological knowledge and diagnostic capability.

Relevant applications are proposed in this line in the fields of sleep-disordered breathing, respiratory and cardiac pathologies.





## Artificial olfaction

### Research staff

Dr. Santiago Marco Principal Investigator

Dr. Antonio Pardo Senior researcher

Dr. Agustín Gutiérrez Senior researcher

Xavier Cano PostDoc researcher

Francisco Palacio PostDoc researcher

Alicia Kalms PhD student

Sergi Udina PhD student

Marta Padilla PhD student

Miquel Tarzan PhD student

Jordi Fonollosa PhD student



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 emphasises 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, suitable for application with 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), Food Industry (Oil, Fish, Fruit, etc.), Industrial (Detection of Oil Leakages in Air Compressors for the Pharmaceutical Sector), 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

Dr. Enric Claverol-Tinturé Principal Investigator

Ricardo Morales PhD student

Michael Riss PhD student

Ling Wang PhD student

Ricard Prehn Master student

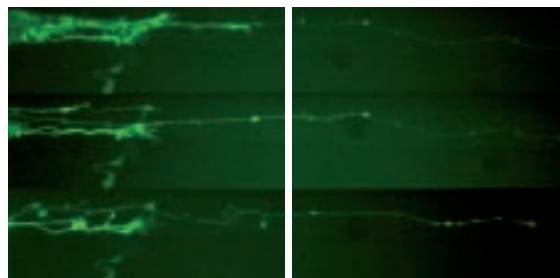
The Neuroengineering group focuses on technology to monitor and control neuronal activity with the aim of empowering basic research, drug discovery and therapeutic action against neuropathologies.

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*. With 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 electrophysiology *in vitro*.

The production of neurochips with conventional technologies is costly and technically complex and so to help address this issue we have developed a laser-write lithography system which supports rapid-prototyping of 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 functionalised nanoparticles bound to electroactive membranes.



## ■ Robotics and Biomedical Imaging Programme

### Robotics

#### Research staff

Prof. Dr. Alicia Casals Principal Investigator

Dr. Manel Frigola Senior researcher

Dr. Joan Aranda Senior researcher

Manuel Vinagre Technician



This group seeks to develop intelligent robotic systems that can provide assistance to the disabled. The 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 the scene while the potential control options allow the user to interact easily and intuitively. The main research is being undertaken in the following lines: 3D vision system for object localization, a vision-based robot control strategy, 3D accessibility study, task coordination, interactive monitoring and manipulation control.

## 02 RESEARCH PROJECTS

IBEC, which aims to act as an international point of reference in bioengineering research, has actively participated in several projects and international consortiums during 2007. In addition, the Institute has laid the foundations for future collaborations with clinical and hospital institutions and with other universities and research centres.

### ■ European funded projects managed by IBEC

**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** in 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 in the framework of the EU-FP6.

**ERC-2007-Starting Grant:** *Neurosecretion by remote control of exocytosis and endocytosis with light*.

PI: **Pau Gorostiza**  
European Research Council.

**ANGIOSCAFF:** *Highly porous bioactive scaffolds controlling angiogenesis for tissue engineering*.

PI: **Josep A. Planell**  
Large collaborative project in 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*.

PI: **Josep A. Planell**  
Large collaborative project in the framework of the EU-FP7.

**PHOTOSYN-STM:** *Single-Molecule studies of photo-conductance on photosynthetic molecular systems by SPM break-junction measurements*.

Fellow: **Ismael Diez** PI: **Pau Gorostiza**  
International Outgoing Fellowships (IOF).  
Marie Curie Action in the framework of the EU-FP7

**CELL TRANS:** *Integrated molecular and cellular mechanotransduction mediated by protein p130Cas*.

Fellow: **Pere Roca-Cusachs**  
PI: **Daniel Navajas**  
International Outgoing Fellowships (IOF)  
Marie Curie Action in the framework of the EU-FP7.

### ■ European funded projects managed by UB or PCB

*An integrated platform enabling Theranostic applications at the Point of Primary Care-TheraEdge.*

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**  
Small-scale integrated project within the framework of the EU-FP7.

**FP7-CHRONIOUS:** *An Open, Ubiquitous and Adaptive Chronic Disease Management Platform for COPD and Renal Insufficiency*. European Commission.

PI: **Raimon Farré**  
Large-scale integrated project within the framework of the EU-FP7.

**CELLPROM:** *Cell Programming by nanoscaled devices* (2004-2008)

PI: **Josep Samitier**  
Largest integrated project in Nanobiotechnologies within the framework of the EU-FP6.

**NANO2LIFE.** *A network for bringing NANOTEchnologies to life* (2004-2008).

PI: **Josep Samitier**  
Network of Excellence within the framework of the EU-FP6.

**STREP.** *Deep vein thrombosis: impedimetric microanalysis system-DVT-IMP* (2006-2009).

PI: **A. Errachid**  
Project in Nanobiotechnologies 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.*

PI: **Josep Samitier**  
NEST Project in the framework of the EU-FP6.

**VECTOR.** *Versatile endoscopic capsule for gastrointestinal tumor recognition and therapy.*

PI: **Josep Samitier**  
STREP Project in the framework of the EU-FP6.

*Training for micro-analytical Platform Technology-MapTech.*

PI: **A. Errachid**  
Marie Curie RTN within the framework of the EU-FP6.

## ■ European funded projects managed by UPC

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

STEPS-Systems approach to tissue engineering processes and products (2005-2009).

PI: **Josep A. Planell**

Project in Tissue Engineering 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 Coordinador: **Enric Claverol-Tinturé**

Project in Nanobiotechnologies within the framework of the EU-FP6.

PROJETE 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).

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.

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: **Maria Garcia-Parajo** Coordination: **FAES FARMA and PharmaMar** CDTI, CENIT Programme.

CIBER-BBN. CIBER in Bioengineering, Biomaterials and Nanomedicine (2006-2010).

PI: **Josep A. Planell**

Instituto de Salud Carlos III.

CIBER-BBN. CIBER in Bioengineering, Biomaterials and Nanomedicine (2006-2010).

PI: **Maria Garcia-Parajo**

Instituto de Salud Carlos III.

CIBER-BBN. CIBER in Bioengineering, Biomaterials and Nanomedicine (2008-2010).

PI: **Raimon Jané**

Instituto de Salud Carlos III.

## ■ National projects managed by UB or PCB

Diseño, fabricación y caracterización de micro/nanodispositivos para la manipulación, caracterización y análisis de células y biomoléculas individuales en un chip (2004-2007). PI: **Josep Samitier**. MEC.

Manipulación, análisis y caracterización de células individuales y biomoléculas en un chip (2004-2007).

PI: **Gabriel Gomila**. MEC.

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 neutrofilis by optical tweezers. Strategic Action on Nanoscience and Nanotechnology (NAN2004-09348-C04-04).

PI: **Daniel Navajas**. MEC.

Study of the mechanisms of stretch-induced disruption of the epithelial alveolar barrier in ventilator induced lung injury (SAF2005-00110). PI: **Raimon Farré**. MEC.

Nariz electrónica con procesado de señal inteligente (2004-2007). PI: **Santiago Marco**

Programa Nacional de Tecnología Electrónica y de Comunicaciones, MIC.

Early diagnostics of prostate cancer by nanobiosensors based on olfactory receptors. 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. Projecte 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.

*Development of devices for the in-chip manipulation and characterisation of cells and molecules* (TEC6515 - 2004-2007). PI: **Josep Samitier**. MEC.

*Función de las proteínas asociadas al nucleóide 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 - Strategic action of Genomics and Proteomics of the Spanish Programme in Biotechnology.

*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 - Spanish Programme in Biomedicine.

## ■ National projects managed by UPC

*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: **Alicia Casals**. MEC.

## 03 PUBLICATIONS

### ■ Microbial biotechnology and host-pathogen interaction

E. Torrents, I. Grinberg, B. Gorovitz-Harris, H. Lundström, I. Borovok, Y. Aharonowitz, B. M. Sjöberg, G. Cohen, *NrdR controls differential expression of the Escherichia coli ribonucleotide reductase genes*. *J. Bacteriol.* **189**, 5293-5301 (2007).

C. Madrid, J. García, M. Pons, A. Juárez, *Molecular evolution of the H-NS protein: interaction with Hha-like proteins is restricted to Enterobacteriaceae*. *J. Bacteriol.* **189**, 265-268 (2007).

C. Madrid, C. Balsalobre, J. García, A. Juárez, *The novel Hha/YmoA family of nucleoid-associated proteins: are they active, naturally-occurring truncated forms of the H-NS protein*. *Mol. Microbiol.* **63**, 7-14 (2007).

N. C. Friedrich, E. Torrents, E. A. Gibb, M. Sahlin, B. M. Sjöberg, D. R. Edgell, *Insertion of a homing endonuclease creates a genes-in-pieces ribonucleotide reductase that retains function*. *Proc. Natl. Acad. Sci. USA*, **104**, 6176-6181 (2007).

### ■ Cellular and respiratory biomechanics

X. Trepast, L. Deng, S. S. An, D. Navajas, D. J. Tschumperlin, W. T. Gerthoffer, J. P. Butler, J. J. Fredberg, *Universal physical responses to stretch in the living cell*. *Nature*, **447**, 592-595 (2007).

I. Almendros, I. Acerbi, F. Puig, J. M. Montserrat, D. Navajas, R. Farré, *Upper airway inflammation triggered by vibration in a rat model of snoring*. *Sleep*, **30**, 225-227 (2007).

F. Rico, P. Roca-Cusachs, R. Sunyer, R. Farré, D. Navajas, *Cell dynamic adhesion and elastic properties probed with cylindrical atomic force microscopy cantilever tips*. *J. Mol. Recognit.* **20**, 459-466 (2007).

### ■ Nanoprobes and nanoswitches

I. Díez-Pérez, F. Sanz, P. Gorostiza, *Diving in solid/liquid nanointerfaces*. *Imaging & Microscopy*, **1**, 2 (2007).

P. Gorostiza, E. Isacoff, *Optical switches and triggers for the manipulation of ion channels and pores*. *Mol. Biosyst.* **3**, 686-704 (2007).

I. Díez-Pérez, F. Sanz, P. Gorostiza, *In situ studies of passive films*. *Curr. Op. Sol. St. Mat. Sci.* **10**, 144-152 (2007).

## ■ Nanobioengineering

A. Errachid, C. A. Mills, M. Pla-Roca, M. J. Lopez, G. Villanueva, J. Bausells, E. Crespo, F. Teixidor, J. Samitier, *Focused Ion Beam Production of Nanoelectrode Arrays*. *Mater Sci. Eng. C*. doi: 10.1016/j.msec.2007.10.077 (2007).

R. Rodríguez-Trujillo, C. A. Mills, J. Samitier, G. Gomila, *Low cost Micro-Coulter counter with hydrodynamic focusing*. *Microfluidics & Nanofluidics*, **3**, 171-176 (2007).

J. G. Fernández, E. Martínez, M. Funes, E. Engel, A. Errachid, J. Planell, J. Samitier, C. A. Mills, *Directional alignment of MG63 cells on polymer surfaces containing point microstructures*. *Small*, **3**, 871-879 (2007).

M. Wirth, C. Piana, I. Güll, S. Gerbes, R. Gerdes, C. Mills, J. Samitier, F. Gabor, *Influence of nanostructured surfaces on vitality and differentiation of caco-2 cells*. *Differentiation*, **75**, 308-317 (2007).

C. A. Mills, E. Martínez, A. Errachid, E. Engel, M. Funes, C. Moormann, T. Wahlbrink, G. Gomila, J. Planell, J. Samitier, *Nanoembossed Polymer Substrates for Biomedical Surface Interaction Studies*. *J. Nanosci. Nanotechnol.* **7**, 4588-4594 (2007).

A. Errachid, M. Pla-Roca, F. Bessueille, D. Caballero, E. Crespo, C. A. Mills, F. Teixidor, J. Samitier, *Electropolymerisation of nano-dimensioned polypyrrole micro-ring arrays on gold substrates prepared using submerged micro-contact printing*. *Nanotechnology*, **18**, 485301 (2007).

M. Pla-Roca, J. G. Fernandez, I. Rios, C. A. Mills, E. Martínez, J. Samitier, *Large-area protein patterning using nanoimprint-based contact printing*. *Langmuir*, **23**, 8614-8618 (2007).

C. A. Mills, M. Pla-Roca, C. Martin, M. Lee, M. Kuphal, X. Sisquella, E. Martínez, A. Errachid, J. Samitier, *Structured thin organic active layers and their use in electrochemical biosensors*. *Measurement & Control*, **40**, 8-91 (2007).

J. G. Fernandez, C. A. Mills, M. Pla-Roca, J. Samitier, *Forced Soft Lithography (FSL): Production of micro- and nanostructures in thin freestanding sheets of Chitosan biopolymer*. *Adv. Mater.* **19**, 3696-3701 (2007).

J. Vidic, M. Pla-Roca, J. Grosclaude, M. A. Persuy, R. Monnerie, A. Errachid, Y. Hou, N. Jaffrezic-Renault, R. Salesse, E. Pajot-Augy, J. Samitier. *Gold Surface Functionalization and Patterning for Specific Immobilization of Olfactory Receptors Carried by Nanosomes*. *Anal. Chem.* **79**, 3280-90 (2007).

R. Maalouf, C. Fournier-Wirth, J. Coste, H. Chebib, Y. Saïkali, O. Vittori, A. Errachid, J. P. Cloarec, C. Martelet, N. Jaffrezic-Renault, *Label-free detection of bacteria by electrochemical impedance spectroscopy: comparison to surface plasmon resonance*. *Anal. Chem.* **79**, 4879-86 (2007).

H. Barhoumi, R. Haddad, A. Maaref, J. Bausells, F. Bessueille, D. Léonard, N. Jaffrezic-Renault, C. Martelet, N. Zine, A. Errachid, *Well engineered Na<sup>+</sup>-implanted membrane for a capacitive sodium electrolyte-insulator-semiconductor microsensors*. *Sensor Letters* (Accepted) (2007).

M. Castellarnau, N. Zine, J. Bausells, C. Madrid, A. Juárez, J. Samitier, A. Errachid, *Integrated cell positioning and cell-based ISFET biosensors*. *Sens. Actuators. B Chem.* **120**, 615-620 (2007).

M. Castellarnau, N. Zine, J. Bausells, C. Madrid, A. Juárez, J. Samitier, A. Errachid, *ISFET-based biosensor to monitor sugar metabolism in bacteria*. *Mater. Sci. Eng. C*, doi: 10.1016/j.msec.2007.10.074 (2007).

O. A. Bilovan, S. V. Dzyadevych, A. V. El'skaya, N. Jaffrezic-Renault, N. Zine, J. Bausells, J. Samitier, A. Errachid, *Development of bi-enzyme microbiosensor based on solid-contact ion-selective microelectrodes for protein detection*. *Sens. Actuators B Chem.* **123**, 1069-1100 (2007).

C. Sabella, E. Faszewski, L. Himic, K. M. Colpitts, J. Kaltenbach, M. M. Burger, X. Fernández-Busquets, *Cyclosporin A suspends transplantation reactions in the marine sponge *Microciona prolifera**. *J. Immunol.* **179**, 5927-5935 (2007).

X. Fernández-Busquets, *The Sponge as a Model of Cellular Recognition* (Invited Review).

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## ■ Bio/non-bio interactions for regenerative medicine

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### ■ Biomechanics and mechanobiology

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### ■ Biomedical signal processing and interpretation

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### ■ Artificial olfaction

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### ■ Neuroengineering

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## 04 COLLABORATIONS WITH OTHER RESEARCH CENTRES

### ■ Microbial biotechnology and host-pathogen interaction

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**Prof. Miquel Pons** Organic Chemistry Dept., University of Barcelona, Spain.

**Prof. Yair Aharonowitz** Molecular Microbiology and Biotechnology Dept., Tel Aviv University, Israel.

### ■ Cellular and respiratory biomechanics

**Prof. R. Farré** Unit of Biophysics and Bioengineering, Physiological Sciences Dept., School of Medicine, University of Barcelona/IDIBAPS, Barcelona, Spain.

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

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**Prof. A. Artigas** Intensive Care Service, Hospital Sabadell, Sabadell, Spain.

**Prof. F. Ritort** Small Biosystems Lab, Fundamental Physics Dept., School of Physics, University of Barcelona, Barcelona, Spain.

**Prof. D. Petrov** Bio-Photonics Group, Institute of Photonic Sciences, Castelldefels, Spain.

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

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

**Prof. A. Pedotti** Bioengineering Dept., Politecnico di Milano, Milan, Italy.

### ■ Nanopronbes and nanoswitchers

**Dr. Carles Solsona i Dr. Artur Llobet** IDIBELL/Pathology and Experimental Therapeutics Dept., Universitat de Barcelona, Spain.

**Dr. Dirk Trauner** Chemistry, UC Berkeley, United States.

**Dr. Joan Torrent** Escola Universitària d'Òptica i Optometria de Terrassa, Spain.

**Dr. Ernest Giralt** Organic Chemistry Dept., Universitat de Barcelona, Spain.

**Dr. Mireia Oliva** Dept. Pharmacy and Pharmaceutical Technology, Universitat de Barcelona, Spain.

**Dr. Jordi Hernández** Dept. Physics and Chemistry, Faculty of Pharmacy, Universitat de Barcelona, Spain.

**Dr. Teresa Montero** Dept. Physics and Chemistry, Faculty of Pharmacy, Universitat de Barcelona, Spain.

**Dr. Ehud Isacoff** Dept. Molecular and Cell Biology, UC Berkeley, United States.

### ■ Nanobioengineering

**Prof. M. Madou** Irvine, University of California, United States.

**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, United States.

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

**Prof. E. Faszewski** Wheelock College, Boston, United States.

**Prof. M. Sampietro** Politecnico di Milano, Italy.

**Prof. L. Reggiani** INFN, Nanotechnology Laboratory, Lecce, Italy.

**Prof. R. Saless** INRA, Jouy-en-Josas, France.

### ■ Single molecule bionanophotonics

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

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

**Dr. Herman Offerhaus** OT group, MESA+, University of Twente, The Netherlands.

**Prof. Vincenzo Cerundolo** The Chancellor, Masters and Scholars of the University of Oxford, Great Britain.

**Dr. Attila Jenei** Dep. Biophysics, University of Debrecen, Hungary.

**Prof. David Reinhoudt** SMCT group, MESA+, University of Twente, The Netherlands.

**Prof. Markus Sauer** Physics Dept., University Bielefeld, Germany.

**Prof. Vinod Subramaniam** BPE group, University of Twente, The Netherlands.

**Prof. Niek van Hulst** Institute of Photonic Sciences (ICFO), Barcelona, Spain.

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### ■ **Nanoscale bioelectrical characterization**

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### ■ **Bio/non-bio interactions for regenerative medicine**

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**Dr. Nick Rhodes** Dept. of Clinical Engineering, University of Liverpool, Great Britain.

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**Institute for Biophysics Bulgarian Academy of Sciences** Sofia, Bulgaria.

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## ■ Biomedical signal processing and interpretation

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**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.

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**Prof. Leif Sörnmo** Signal processing group, Lund University, Sweden.

## ■ Artificial olfaction

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**Dr. F. P. Gómez** Hospital Clínic de Barcelona, Spain.

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

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**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, Great Britain.

**Dr. D. Martinez** Cortex Group, LORIA, Nancy, France.

**Prof. Dr. Gerhard Müller** EADS Innovation Works, Munich, Germany.

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## ■ Neuroengineering

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**University de Nottingham**, United Kingdom.

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## ■ Robotics

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## 05 SCIENTIFIC EQUIPMENT

### ■ Microbial biotechnology and host-pathogen interaction

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

### ■ 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
- Asylum Research Molecular Force Probe

### ■ Nanobioengineering

- Chemical functionalization
- Soft lithography
- Electrochemical sensor characterization equipment (impedance analysis, voltammetry, flow cell system)
- Surface Plasmon Resonance
- Quartz crystal microbalance
- Atomic Force Microscopy
- Nanoplotter equipment
- Microfluidics laboratory

### ■ Single molecule bionanophotonics

- Aperture type near-field optical microscopy (NSOM) for working under aqueous conditions
- Single molecule detection sensitive scanning confocal microscopy: imaging, polarisation and wavelength sensitive
- Dual colour total internal reflection fluorescence microscopy (TIRF): polarisation 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 software
- High performance computing serve
- Constant head permeameter
- Strain gauges data acquisition system
- Perfusion bioreactor system
- Image reconstruction software (Mimics)
- Universal mechanical testing machine (MTS)

## ■ Biomedical signal processing and interpretation

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

## ■ Artificial olfaction

- VocMeter Electronic Nose
- Infrared Camera
- NST 3320 Electronic Nose
- Climatic Chamber adapted for atmosphere modification
- Computing and General Purpose Electronic Instrumentation
- Gas sensor test station, with associated equipment for excitation, data logging and mixture generation

## ■ Neuroengineering

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

## ■ Robotics

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





- 01 NANOMEDICINE STRATEGIC LINE
  - 01.1 SPANISH NANOMEDICINE PLATFORM
  - 01.2 NANO2LIFE AND NANODIALOGUE PROJECTS
  - 01.3 NANOARACAT
  - 01.4 TECHNISCHE UNIVERSITÄT KAISERSLAUTERN ON-CAMPUS WEEKEND
- 02 STRATEGIC ALLIANCES
- 03 INVITED SPEAKERS AND SEMINARS
- 04 ORGANIZATION OF CONFERENCES AND MEETINGS

# Networking Activities



## Networking Activities

01 NANOMEDICINE  
STRATEGIC LINE

### 01.1 Spanish Nanomedicine Platform

The Spanish NanoMedicine Platform is an initiative aimed at bringing together the main Spanish players in research, industry and public administration, with the intention of boosting the implementation of strategic lines in the multidisciplinary field of nanomedicine.

Created in March 2005, the Spanish biomedical and biotechnological industry plays a key role in this Platform, with the support of numerous technological and research centres, universities, hospitals and public administrations.

The IBEC is one of the 108 organizations that make up this platform and its role is not merely symbolic as its director is a member of the Coordination Committee and in charge of the Education and Communication working group.

One of the actions carried out by the Platform has been the drafting of a report entitled *Strategic Vision of Nanomedicine in Spain*, presented in Barcelona in September 2006. This document outlines the current health of nanomedicine in Spain, and makes suggestions for strategic actions to improve cooperation and coordination, and to promote synergies between groups, and scientific, industrial, educational activities, etc.



### 01.2 Projectes Nano2Life and Nanodialogue

Nano2Life is the first European Network of Excellence in nanobiotechnology. Its objective is to make Europe a leader in this field by merging existing expertise and knowledge. Founded in 2004, Nano2Life comprises 23 major European nanobiotechnology organizations.



### 01.3 Nanoaracat

According to the general protocol establishing a collaboration agreement between the autonomous communities of Aragon and Catalonia to foster and coordinate a joint venture in R+D+i in nanoscience, the IBEC is a member of the Scientific Committee and the Follow-up Commission for this action.

### 01.4 Technische Universität Kaiserslautern on-campus weekend

The Distance Education Programme in Nano-biotechnology run by the Technical University of Kaiserslautern (Germany) is a two-semester, online programme aimed at those who have already obtained a university or technical college qualification in the natural sciences or engineering. Its high degree of interdisciplinarity, combined with the range of potential applications, make it essential for all scientists and engineers to gain additional knowledge in nano-pattern technology and biotechnology.

The course consists of a combination of autonomous learning phases (with written materials provided) and a residential phase each semester (weekend event). IBEC organised one of these weekend events in Barcelona on March 10-11, 2007

## 02 STRATEGIC ALLIANCES



### ■ IBEC Associated Groups from UB and UPC

An agreement between IBEC and the universities of the UB and UPC was signed at the end of 2006 to promote collaboration between the research groups from IBEC and the 10 units that formed part of the CREBEC, Catalan Reference Centre for Bioengineering (2003-2005). IBEC agreed to fund 10 PhD student grants each year, one for each IBEC Associated Group. The IBEC 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 Centros de Investigación Biomédica en Red) created 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 based in different regions around the country. The idea underlying the CIBERs is to create large 'virtual' research centres with a multidisciplinary and multi-institutional character where 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 different centre in Zaragoza. For further information regarding this CIBER, please visit: <http://www.ciber-bbn.es/>.



### ■ Fundació Clínic – Hospital Clínic

Together with the Clinic Foundation and the Barcelona Clinic Hospital, IBEC aims to promote translational research within the three institutions.



### ■ ICREA

ICREA, the Catalan Institution for Research and Advanced Studies, is a foundation promoted jointly by the Catalan Government through the 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 them are ICREA Research Professors, while the third is an ICREA Researcher.



### ■ The BioRegion of Catalonia Forum

The BioRegion of Catalonia is a new regional development model that has been set up with the aim of improving people's quality of life through better coordination of the biotechnology activity being carried out in Catalonia. The aim is to make Catalonia an international point of reference with a reputation for top quality research, a competitive business network and a robust and dynamic knowledge transfer system.

IBEC forms part of the BioRegion, through the Forum of the BioRegion. The Forum is the consultancy and participatory body of the organisations that collaborate with the Foundation.

IBEC has actively participated in the initiative in creating a Medical Technologies Cluster in Catalonia, led by BIOCAT.

## 03 INVITED SPEAKERS AND SEMINARS

### ■ Invited Speakers

29 November 2007

*Neurobiology on a chip*

**Dr. Albert Folch** Department of Bioengineering  
University of Washington, USA

21 November 2007

*Perspective of electrospinning for biomedical applications*

**Dr. Gyeong Kim** Department of Physics  
University of Halle, Germany

16 July 2007

*Supramolecular architectures on surfaces: self-organization and nanoscale electronic properties*

**Dr. Matteo Palma** Institut de Science et d'Ingénierie  
Supramoléculaires (ISIS)  
Université Louis Pasteur, Strasbourg, France

### ■ IBEC PhD Discussion Seminars

3 December 2007

*Opening of the IBEC PhD Discussion Seminars*

**Prof. Maria Garcia-Parajo**  
**Dr. Pastora Martínez**

17 December 2007

*From the crab to the lab: studies about micro and nano fabrication with chitosan*

**Javier G. Fernández**  
Nanobioengineering

## 04 ORGANIZATION OF CONFERENCES AND MEETINGS

### ■ **IBEC Bioengineering and Nanomedicine Symposium 2007**

The Institute for Bioengineering of Catalonia celebrated its coming-out party in early November at the Barcelona Science Park with the organization of the first IBEC Bioengineering and Nanomedicine Symposium, an international meeting debating issues from the fields of bioengineering and nanomedicine.

With the participation of leading national and international experts in these fields, most of them members of the International Scientific Committee of the Institute, and with the presentation of 29 posters in a parallel session, the event proved to be a great success, attracting around 180 professionals from many different fields.

Detailed information is available at the Symposium website:  
<http://www.ibecbarcelona.eu/~symposium2007>

### ■ **Second European Meeting on Cell Mechanics (CellMech-2007)**

The European Meeting on Cell Mechanics is a multidisciplinary forum designed to discuss ongoing research in this rapidly growing scientific field. It is a biennial meeting whose first and highly successful event was held in Paris in September 2005. Topics discussed in this Meeting include Cell rheology, Nanobiomechanics, Cell adhesion, Cell contraction, Cell motility and Mechanotransduction.

In 2007, this meeting, organized by IBEC and with the support of the University of Barcelona, was held on September 26-28 at CosmoCaixa Barcelona. For further information and to consult the full programme, please see the CellMech website at:

<http://www.pcb.ub.es/ibec/cellmech/index.php>

### ■ **AFM BioMed Conference, European Meeting on AFM in Life Sciences and Medicine (Barcelona 2007)**

At the first AFM BioMed conference, held in April in Barcelona, leading international life science researchers came together to share ideas and to investigate how atomic force microscopy (AFM) technology can be used to solve biological bottlenecks and provide innovative solutions for healthcare. Over the three day conference, held at the CosmoCaixa science museum, around 30 oral presentations and 130 posters were presented to 220 scientists. Topics covered cellular interactions, single molecular recognition, affinity, unfolding force measurements.

This meeting was organised by Veeco, Leica, and Telstar and supported by IBEC, UB and CEA (France). For further information and to consult the full programme, please see the AFM BioMed website at:

<http://www.afmbiomed.org/opencms/afmbiomed/barcelona2007>

### ■ **13th European Congress on Biotechnology**

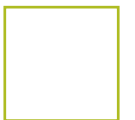
The 13th European Congress on Biotechnology took place in Barcelona between 16 and 19 September 2007.

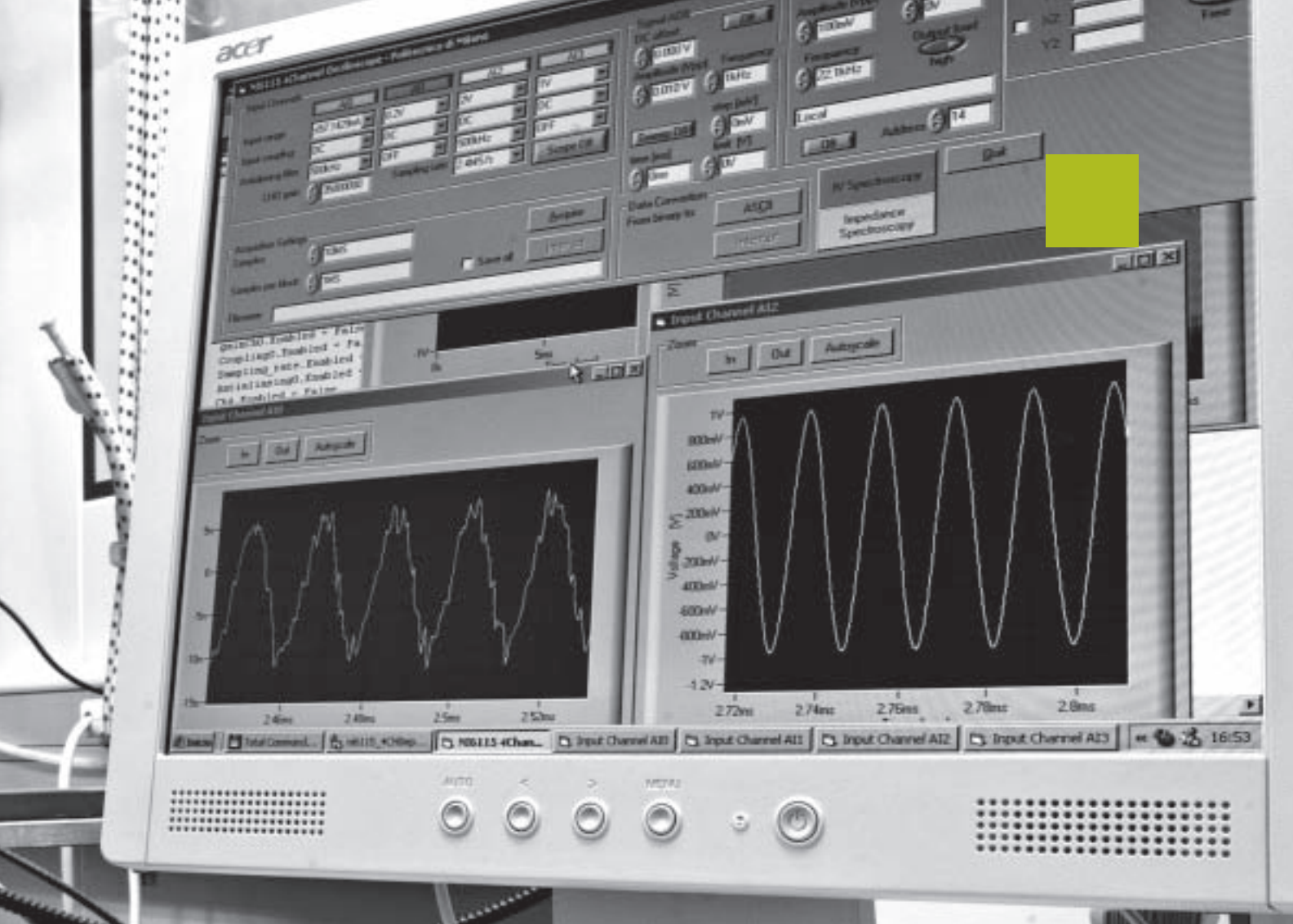
Organized by the European Federation of Biotechnology in collaboration with the IBEC among other institutions, this Congress is the longest running international and multidisciplinary biotechnology congress in Europe.

The 13th edition of this Congress, entitled "Symbiosis (Science, Industry & Society)", focused on an analysis of the crucial impact that the life sciences industry has had in addressing humanity's great challenges, examining society to identify remaining and emerging needs, and presenting the cutting-edge science that will address these new challenges.

For more detailed information, please visit the Congress web page at:

<http://www.ecb13.eu>





# Communication Activities

- 01 MEDIA SUMMARY
- 02 EXPERIMENTAL WORKSHOPS  
OPEN TO THE GENERAL PUBLIC

## Communication Activities

### 01 MEDIA SUMMARY



- DATE 21/01/2007  
PUBLICATION LA VANGUARDIA (1)  
TEMAS DE DEBATE *Convergencia de tecnologías ¿Sistemas bioinspirados?* **Josep Samitier**



- DATE 23/02/2007  
PUBLICATION EL PAÍS (CATALUÑA) (2)  
*Hereu entrega los premios Ciutat de Barcelona*

The jury agreed unanimously to award the **Investigació Tecnològica** prize to **Maria Pau Ginebra, Josep Anton Planell, Conrado Aparicio, Elisabeth Engel and Damien Lacroix** from the Department of Materials Science and Metallurgical Engineering at the Universitat Politècnica de Catalunya, for the development of a new material, consisting of a calcium phosphate foam, which can be injected into patients suffering bone degeneration, resulting either from a trauma or various pathologies including cancer. The foam hardens inside the bone, creating a highly porous structure which ensures rapid regeneration, while avoiding the side effects produced by other materials.

<http://www.bcn.es/cultura/premisciutatbcn/#investtecno>



- DATE 28/02/07  
PUBLICATION AVUI  
L'Institut d'Estudis Catalants aprova l'ingrés d'**Alicia Casals** com a acadèmica numerària.  
<http://paper.avui.cat/article/cultura/48486/iecc/aprova/ingres.html>

- DATE 04/04/2007  
PUBLICATION DIARIO METRO (3)  
*Un experto catalán abre la puerta a crear fármacos anticáncer*

- DATE 03/04/2007  
PUBLICATION EL PERIÓDICO DIGITAL (4)  
*Un descubrimiento sobre la evolución del ADN abre una nueva vía para los fármacos contra el cáncer*







- DATE 16/09/2007  
PUBLICATION EL MUNDO (ESPECIAL BIOTECNOLOGIA) (5)  
«El panorama de la investigación ha cambiado notablemente en los últimos tiempos»  
(Interview with **Josep A. Planell**)

- DATE 08/11/2007  
PUBLICATION LA VANGUARDIA (6)  
*Nuevo centro de bioingeniería en Barcelona*

- DATE 08/11/2007  
PUBLICATION DIARIO EXPANSIÓN (7)  
*El Institut de Bioenginyeria tendrá 150 investigadores*

- DATE 07/11/2007  
DIGITAL PUBLICATION LA OPINIÓN DE TENERIFE  
*El Instituto de Bioingeniería de Cataluña cuenta con un equipo de 150 investigadores*  
[http://www.laopinion.es/secciones/noticiajsp?pRef=2947\\_18\\_112644\\_Ciencia-y-Tecnologia-Instituto-Bioingenieria-cuenta-equipo-investigadores](http://www.laopinion.es/secciones/noticiajsp?pRef=2947_18_112644_Ciencia-y-Tecnologia-Instituto-Bioingenieria-cuenta-equipo-investigadores)

- DATE 26/11/2007  
DIGITAL PUBLICATION TELENOTÍCIES CATALUNYA INFORMACIÓ  
*L'Institut de Bioenginyeria es traslladarà al Biopol de l'Hospitalet d'aquí a tres anys*  
<http://www.noticies.cat/pnoticies/notItem.jsp?item=noticia&idint=227463>

- DATE 12/11/2007  
DIGITAL PUBLICATION AVUI.cat  
*L'Institut de Bioenginyeria es traslladarà al Biopol de l'Hospitalet d'aquí a tres anys*  
Online edition of AVUI newspaper  
[http://www.avui.cat/article/tec\\_ciencia/11476/linstitut/bioenginyeria/es/traslladara/biopol/lhospitalet/daqui/tres/anys.html](http://www.avui.cat/article/tec_ciencia/11476/linstitut/bioenginyeria/es/traslladara/biopol/lhospitalet/daqui/tres/anys.html)





## 02 EXPERIMENTAL WORKSHOPS OPEN TO THE GENERAL PUBLIC

“Research!” is a series of experimental workshops organised 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 the 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 the IBEC and the University of Barcelona and to promote careers in the sciences.





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