Promotion of activities related to doctoral programmes and BKC initiatives

In the academic year 2012-2013, various events were organized within the framework of doctoral programmes in areas of specialization covered by the BKC. The aim was to attract talent, particularly students in the final stages of undergraduate degrees, and to boost transfer to the production sector through the participation of companies. Such events have increased the practical content of the work undertaken by the International Doctoral School. The main events are described below:

- **Presentation of the SATLANTIS initiative**

  On 21 December 2012, Barcelona Science Park (PCB) hosted the presentation of the SATLANTIS initiative. The event was promoted by the Institute of Cosmos Sciences of the University of Barcelona (ICC-UB) and the Castelldefels School of Telecommunications and Aerospace Engineering (EETAC-UPC), a recent addition to the BKC alliance. The presentation was sponsored and organized by the Barcelona Knowledge Campus (BKC).

  The event was attended by over 60 people, including representatives from companies in the field and from Barcelona City Council (a member of the BKC alliance), which has expressed its interest in the Initiative.

  Spain and Florida agreed to create the joint venture ATLANSAT at the Kennedy Space Center, to ensure world leadership in nanosatellites by 2015. The company offers a wide range of services, particularly in relation to the five key areas of this new industry: nanosatellites, technological-scientific loads, launchers, launch platforms and operations from Earth. A second company established in Spain, SATLANTIS, will be dedicated to providing a pre-and post-launch services for users, developing new technological and scientific tools for this new technology, and training specialists. The BKC is interested in participating in scientific, technology and transfer aspects.

- **First Interdisciplinary Meeting of Predoctoral Researchers (JIPI-BKC) supported by the BKC**

  The First Interdisciplinary Meeting of Predoctoral Researchers (JIPI-BKC) was held on Thursday 7 February, in association with the BKC’s International Doctoral School. The event was organized by young researchers from several faculties within the BKC framework. It was open to any member of the scientific community, but was
particularly focused on researchers in mathematics, physics, chemistry and other related fields.

The meeting was jointly funded and organized by the BKC and its doctoral schools, and was supported by all the institutions on the campus: the University of Barcelona (UB), the Universitat Politècnica de Catalunya (UPC) and the Spanish National Research Council (CSIC). Contributions were also made by the Catalan societies of Chemistry, Mathematics and Physics.

The meeting, which was held in the Aula Magna of the UB’s Historic Building, was attended by Manuel Barranco, Rector’s Delegate for the BKC at the UB; Lluís Calvo, the institutional coordinator of the CSIC in Catalonia; and Jordi Quer, Dean of the Faculty of Mathematics and Statistics of the UPC. The closing ceremony was attended by Dídac Ramírez, Rector of the University of Barcelona; Antoni Castellà, Secretary for Universities and Research of the Catalan Ministry of Economy and Knowledge; Atilà Herms, Dean of the Faculty of Physics of the UB; and Carme Cascante, Dean of the Faculty of Mathematics of the UB.

A total of 150 people from Catalan research institutions were present at the meeting. Some seventy “flash talks” were given and broadcast live on UBTV. Various sessions on entrepreneurship and networking were organized, and two open debates were conducted.

The following presentations were given:

**Session I.** From black holes to cookie dunking: theory is in the air

- **Xumeu Planells.** Study of parity breaking in a hot/dense nuclear medium
- **Daniel Fernández.** Properties of holographic superfluids
- **Adriana Di Dato.** Black holes in higher dimensions
- **Marina Martínez.** Black holes with different shapes
- **Guillem Perarnau.** Permutations that avoid certain patterns
- **Martí Perarnau.** Work Extraction and Entanglement
- **Elsa Passaro.** Quantum correlations for information processing
- **Gonzalo de la Torre.** Do completely unpredictable events really exist in nature?
- **Alejandro Turpin.** Conical refraction: phenomenon and applications
- **Marc Suñé.** Anomalous transport and diffusion of overdamped Brownian particles in totally disordered potentials
- **Xavier Clotet.** The breakfast experiment: understanding kinetic roughening
- **Jose Manuel López.** Convective instabilities in rotating fluids

**Session II.** The Truman’s show paradox: distinguishing the real world from the model using simulations. Modelling, simulation and computational science

- **Arturo Valdivia.** A Swiss knife for interdisciplinary studies
- **Toni Vallès Català.** Identifying significant node groups in complex networks
- **Andrés Aragoneses.** Distinguishing signatures of determinism and stochasticity in spiking complex systems
- **Hernán Pino.** Calculate or simulate?
- **Elena Tamayo-Mas.** Can maths help to predict degradation of materials?
Igor Barahona Torres. The level of adoption of analytical tools in Barcelona, Spain
Oriol Lamiel Garcia. What do nanoparticles look like?
Sergey Kozlov. Computational chemistry for nanostructuring effects in heterogeneous Catalysis
Marc Mulet Gas. Computational chemistry applied to endohedral fullerenes
Abel Carreras Conill. Theoretical study of the mestranol rotor
Narcís Miguel. Diffusion in applications that preserve area

Session III. The Devil’s kitchen: cooking materials using nano-ingredients. Synthesis and characterization of materials
Sònia Estradé. Signal analysis methods applied to electron energy loss spectroscopy
Lluís Yedra. EEL spectroscopic tomography: 3D chemical information in nanomaterial analysis
Raquel Cumeras. A gas sensor: the ion mobility spectrometer
Victor Manuel Freire. Synthesizing graphene by chemical vapor deposition
Abel Fontserè. High power electronics HEMT GaN based devices
Stefanos Chaitoglou. Arc-discharge synthesis of Fe@C nanoparticles for general applications
Jordi Prat-Camps. Shaping static magnetic fields
Víctor López. Colossal reduction in Curie temperature due to finite-size effects in nanoparticles
Carlos Heras. Synthesis and study of new organic molecules that show magnetic properties
Marina Mariano. Efficient fabrication of organic solar cells by the dip-coating method
Anna May. Synthesis of functionalized nanoparticles for the control of internal haemorrhage
Estefanía Lopez. An experimental and theoretical point of view of ion-molecule reactions
Claudia Trejo Soto. Fluid interfaces in microchannels

Session IV. The legacy of captain Lettuce: are small changes powerful? Environmental Sciences
Mercè Bermejo & Patricia Povea. Past climate changes: from millions to tens of years
Daniel Seco. Mathematical analysis for Antarctic ice
Jagos Radovic. Tracking the deepwater horizon oil spill
Albert Ossó. The mystery of recent stratospheric temperature trends
Jordi Baró. Earthquakes inside a thimble-sized porous glass
Aitor Rumín, Oriol Veres & Rut Pedrosa. Marine sedimentary particles as drivers of the deep marine ecosystem

Session V. Once Upon a Time... Life. Research in Biological systems
Esther Ibáñez. Evolutionary dynamics of populations with genotype-phenotype map
Daniel Sánchez. Optimal transition paths of stochastic cell differentiation systems
Joan Atcher. The emergence of halophilic evolutionary patterns from a dynamic combinatorial library of macrocyclic pseudopeptides
Juan Camilo Luna. Mathematical modelling of regulatory processes during development
Pau Formosa-Jordan. Feedbacks, competition and cellular patterning
David Palau-Ortín. Dynamics and stability of cellular decision-making driven by biochemical signals
David Frigola. Stochasticity, cell state switching and gene network architecture
Maria Martí. Single-molecule methods in biophysics
Laura González. Quartz tuning fork-based nanosensors for biological scanning probe microscopy
Tomás Luque. Local micromechanical properties of decellularized lung scaffolds measured with atomic force microscopy
Laura Orellana. Revealing cancer mechanisms by simulations - a bridge between physics and medicine
Xavier Just. Total synthesis of antibiotics of marine origin
Susana Pérez-Alvarez. Understanding HIV diversity: impact on vaccine development and treatment options

Session VI. The social atom: modelling la Vida Loca. Science applied to social interactions

Juan Alvarez de Lara. Crowdfunding, new option for funding
Pol Colomer. Complex networks
David Mateo. Research in search to search in research
Antonia Godoy. Long-term evolution of email communication networks
Michele Starnini. Modelling human dynamics of face-to-face interaction networks
Mario Gutiérrez. Global thoughts vs. local actions: financial markets case study
Alexis Pérez-Bellido. Embracing the world: our brain combines optimally information from the different sensory modalities

The closing address was given by Antoni Castellà, Secretary for Universities and Research of the Catalan Ministry of Economy and Knowledge, and Dídac Ramírez, Rector of the University of Barcelona.

Entrepreneurship and networking sessions

The organizers of the meeting aimed to create spaces where researchers and Spain’s social agents could meet. Consequently, they included a session on entrepreneurship and knowledge transfer, given by three scientists who are currently directors of biotechnology start-ups, entitled:

“De la bata a la corbata: de como transferir conocimiento y acabar siendo abducido en el intento, tres historias personales”

Luis Ruiz Ávila, Managing Partner and CEO of Janus Developments.
Clara Campàs-Moya, Managing Director of Advancell.
Judit Anido Folgueira, CEO of Mosaic Biomedicals.

In addition, a speed networking session was organized, at which all of the researchers spoke about their work together in five-minute sessions. The aim was to discover possible channels of future collaboration.

Social debate, open to the public
During the meeting, two open debates were held on topics of general interest:

“Interdisciplinariedad en investigación” (Interdisciplinarity in research) and “Ciencia y fe” (Science and faith), which were moderated by the lecturers Jorge Wagensberg (UB) and David Jou (UAB), respectively.

- “Cata de la investigación” (Research tasting)

As part of the “Cata de la Investigación” (Research tasting) programme, educational sessions were organized between March and May 2013 on the topics of knowledge transfer and valorization of research results. The cycle of sessions was promoted by the CSIC, the UB and the UPC to narrow the gap between students and research groups, and to give students the opportunity to find out first-hand about the work of lecturers and researchers from different laboratories and departments.

The sessions were organized with the support of EADA Business School Barcelona, whose extensive experience in the business field helped to focus the topic on the most relevant aspects for a target audience of undergraduate and graduate students. Sessions were given by professionals from participating centres, based on their own experiences and real examples. As a result, students had the opportunity to learn about activities related to exploiting research directly from the source.

The first session, on the exploitation of research technologies, was titled “Valorización de tecnologías universitarias. De la investigación al mercado”. One of the cornerstones of university technology transfer is the valorization of new technologies generated within the universities themselves for transfer to industry. The aim of the session was to give an in-depth explanation of how to promote university technologies that have a high commercial value so that they reach the market.

The second BKC session, on the importance of patents in university research, was entitled “¿Por qué es necesario patentar? La importancia de las patentes en la investigación universitaria”. The aim was to describe essential concepts in the management of industrial and intellectual property rights for university research results. As a result of the current recession, globalization and high competitiveness patents have become increasingly important intangible assets for companies.

During the first part of the session, the basic concepts of patents were presented and some of the following questions were answered to introduce students to the topic: What is a patent? Can my results be patented? Does it affect the publication of an article? Are article authors the same as patent inventors? If I work with other centres outside the university, what effect does it have? In the second part of the session, aspects related to the marketing of patents were explained and some of the following issues were discussed: What can I do now that I have a patent? How can I help my patent reach companies? Can a patent make my research more profitable? License or transfer? If the patent generates profits, how are they distributed?

Finally, the last session, “¿Cómo te puede ayudar una spin-off a dar salida a los resultados de tu investigación?”, provided a general overview how to create university spin-offs. A description was given of how spin-offs can be an effective technology transfer mechanism, making university research results available to the market.
In the first part of the third session, answers were given to questions on the entrepreneurial world, including: What is a spin-off? What are the differences between a start-up and a spin-off? What contribution do spin-offs make to the production sector? When is a good time to start a company? Who can launch a start-up? What is the legal framework around creating a spin-off? During the second block, a range of questions about the process of creating a start-up were addressed. Where do I start? Who can help me? What should my business plan contain? How can I obtain funding for my project?

- Meeting of CITA-UB and CIT UPC research groups

In April 2013, a work meeting took place between research groups from the UB’s Centre for Innovation and Advanced Technologies (CITA-UB) and the UPC’s Technology Center (CIT UPC). Both centres are members of the Regional Government of Catalonia’s TECNIO network. The meeting was part of the Barcelona Knowledge Campus project. The aim was to foster knowledge exchange and create a shared space for collaboration, in order to launch joint research, development and innovation projects in the areas of medical and health technology and quality of life. The meeting was extremely positive and optimistic. Clear opportunities for collaboration and complementary areas were identified by the research groups from both institutions.

The following groups participated from the University of Barcelona: Science and Technology Centres (CCiTUB); Cellular and Molecular Technology Research Centre (CELLTEC UB); Microsystems Engineering Centre (CEMIC); Toxicology Research Centre (CERETOX); Thermal Spray Centre (CPT) and the Drug Development Service (SDM). The Universitat Politècnica de Catalunya (UPC) was represented by: the biomedical signals and systems, instrumentation and bioengineering, biomaterials, biomechanics and textile engineering areas of the Biomedical Engineering Research Centre (CREB UPC), and the recently created Innotex Center (technology development, toxicology and environmental aspects of the textile sector).

The research groups seek to identify topics of shared interest that could be converted into projects with marketable applications. Subsequently, a meeting would take place with companies in the sector that could be interested in innovations and applications resulting from interactions between groups from the two universities.

Medical and health technology and quality of life are the starting point of future meetings that will cover the fields of materials and production technologies, information, communication and knowledge technologies, energy and the environment. The strategy of collaboration and joint work is key to the actions that both universities carry out together as members of the BKC Campus of International Excellence, to increase the added value of their experience in specific subject areas.

- Conference on geological storage at the Faculty of Geology
The Barcelona Knowledge Campus funded and contributed directly to the organization of the 2nd Conference on Geological Storage, held at the Faculty of Geology on 17 May. In a world in which the population is exploding and the demand for energy and natural resources is increasing at an unprecedented rate, the subsoil plays an essential role and is a natural resource in itself. The subsoil provides natural resources on which we are all dependent: the water that we consume and the hydrocarbons that are essential to our energy model. However, it can also be used as a strategic store for managing natural resources and nuclear waste.

As subsoil storage is highly complex, numerous professionals from the fields of geology, engineering, law, economic sciences, physics, chemistry, biology and environmental sciences, among others, must work together to design and implement the projects discussed during the conference. In particular, projects on the geological storage of natural gas and radioactive waste were described, which are in different stages of implementation in Spain.

The following presentations were given:

1. “Proyecto de almacenamiento de gas en rocas evaporíticas en la comarca del Bages”. Angel Merino González. GAS NATURAL-FENOSA.
2. “Proyecto CASTOR. Almacenaje geológico de gas en un yacimiento de hidrocarbonos agotado”. Recaredo del Potro. ESCAL-UGS.
3. “Proyectos de almacenamiento geológico de residuos radiactivos en España” Julio Astudillo. ENRESA.
4. “Horizonte 2025, tres almacenes geológicos de residuos nucleares de alta actividad en funcionamiento en Europa (Suecia, Finlandia y Francia)” Jordi Bruno. AMPHOS XXI.

- **Conference on Quality in Research**

On 23 May the BKC organized a conference on the different aspects of quality processes in research. The conference was held in the former auditorium of the Faculty of Physics and was attended by 90 people, including researchers and quality managers from the UB, the UPC and the CSIC and from other universities such as the URV Tarragona and the University of Minnesota, as well as BKC technicians and doctoral students. Examples were given of how research groups from different institutions have developed work systems that contribute to the quality of the results and, consequently, to the quality of science.

The following presentations were given:

1. Prof. Rebecca Davis, University of Minnesota
   *Committing to Good Research Practices (GRP) is simply sound science*
2. Carme Navarro, head of the Research Quality Service at the UB’s Agency for Policy and Quality.
   *What can the UB offer to the researchers who want to implement quality systems?*
3. Arturo Vargas, Head of Quality at the Institute of Energy Technologies, UPC.  
   *INTE_UPC. Experience in ISO 17025 Accreditation of Laboratories*
4. José J. Llerena, Head of Quality in Research, CID-CSIC.  
   *Implementing quality in a public research center*
5. Sara Gimeno, coordinator of the Quality and Planning Unit, Technical Office, URV  
   *Enhancing R&D activities using Quality Management*
6. Prof. Miquel Llobera, head of the Lipid Metabolism-LPL research group.  
   *ISO 9001: To be or not to be. Analysis of our experience*
7. Sònia Segura, Quality and Communication Manager at the LITEM Specific Research Centre.  
   *LITEM & ISO 9001. A strategic approach for technology transfer*
8. Prof. Albert Bosch, Head of the Enterovirus Research Group.  
   *Research on Viral Safety at the Enteric Virus Laboratory*
   *Good Quality Data at the University under Pharmaceutical Perspective (GMP)*

- **BKC Conference on Science and Technology in the Food Sector**

On 4 June, the Barcelona Knowledge Campus held a conference to present the food science and technology activity that is carried out on the campus. The conference included a general presentation given by an expert from one of the EU programmes.

The contributions of the conference speakers illustrated the great importance of food, agriculture and human nutrition at the BKC, considering all of the activities undertaken at the University of Barcelona’s Diagonal Campus and at the UPC’s School of Agricultural Engineering of Barcelona (ESAB), which is on the Castelldefels campus and associated with the BKC, as well as recent activities at the Food and Nutrition Torribera Campus of Santa Coloma de Gramenet, where the Faculty of Pharmacy runs courses on Human Nutrition and Dietetics and Food Science and Technology.

The following presentations were given:

1. “Integración entre tecnología y sector agroalimentario en la UPC: El Clúster Agroalimentario”, Prof. Lourdes Reig, UPC.
2. “La ciencia de los alimentos en la UB”, Prof. Miquel Moretó, UB.
5. A closing address by Prof. Marius Rubiralta, Rector’s Delegate for the BKC and director of the Food and Nutrition Torribera Campus of the UB.

- **Presentation of the BKC’s materials science and technology activity.**

On 13 June, the Barcelona Knowledge Campus organized a conference on aspects of materials science and technology. The event, held in the auditorium of the UPC’s Vèrtex
Building, was aimed at researchers, postgraduate and doctoral students, and final-year students graduating in 2013.

The main aims were:

1) To foster and strengthen collaborations between BKC researchers as part of the Materials-BKC initiative, which involves the UB, the UPC and the CSIC centres on the campus.
2) To provide students interested in basic and applied research with information on the potential to develop their ideas at the BKC.
3) To give an overview of the different areas of materials science and technology at the BKC, through presentations on different sectors by BKC researchers.

The event was attended by more than 60 people.

The following presentations were given:


BKC collaboration success stories:
• Mechanical properties of advanced ceramics. Prof. Joan Josep Roa.
• New functional materials for greener refrigeration. Prof. Lluis Mañosa.
• Reappraisal of industrial and natural by-products for use in construction. Prof. Laia Haurie.
• Production and characterization of materials with a nanometric and ultrafine grain size. Prof. Josep A. Benito.
• Organic solar cells. Prof. Joaquim Puigdollers González.
• New bactericidal mechanisms in dental implants. Prof. Xavier Gil.

• Joint conference with the Catalan Society of Mathematics and Presentation of the Graduate School of Mathematics

The event was held on 17 June at the headquarters of the Institute of Catalan Studies and was co-funded and co-organized by the BKC. The conference, which was aimed at potential doctoral students and researchers of mathematics from Catalan universities, addressed aspects of mathematics and its study.

The event also saw the official unveiling of the Barcelona Graduate School of Mathematics (BGSMath), a joint initiative between all of the Catalan public universities to house a range of scientific activities for doctoral students.

The general goals of BGSMath dovetail perfectly with those of the BKC:
To provide high-quality doctoral training with international reach.
To attract talented doctoral students to Catalonia.
To increase the presence of mathematics in industry and in other non-academic spheres.
To serve as a platform for collaborative work between various agents involved in mathematics research.

In this context, BGSMath and the activities planned for the next academic year were presented to current and future doctoral students. Of particular note was the talk given by Prof. Cédric Villani titled “Of triangles, gases, prices and men”. Professor Villani is a French mathematician who specializes in partial derivative equations and mathematical physics and has received the Fields Medal in 2010, the Herbrand Award (from the French Academy of Sciences) in 2007, the European Mathematical Society Prize (2008), the Fermat Prize (2009) and the Henri Poincaré Prize (2009).

The following presentations were given:

1. Idescat y los caminos de la estadística pública. Frederic Udina, Director of IDESCAT.
3. Una generalización de la convexidad basada en rectas secantes. Prof. Ferran Hurtado (UPC).
4. Presentation of BGSMath. Prof. Joan de Solà-Morales (SCM), Prof. Lluís Alsedà (BGSMath), Prof. Claudi Alsina (Secretary General of the Inter-university Council of Catalonia).
5. Of triangles, gases, prices and men. Prof. Cédric Villani (University of Lyon and Director of the Henri Poincaré Institute, Paris).

**Conference on the Industrial Doctorate initiative**

On 19 June the new Industrial Doctorate in Materials, Nanotechnology and Industrial Processes was presented at a special session co-funded and co-organized by the BKC. The conference was attended by around thirty companies, who were given detailed information about the advantages of joining the project, and on opportunities to collaborate on a doctoral programme of these characteristics. The presentation was aimed at the Catalan industrial sector, including manufacturing, chemical and metal companies as well as new, technology-based firms. Contributions to the event were made by the Catalan Ministry of Economy and Knowledge and ACC1Ó.

**Programme:**

1. Opening address. Prof. Lluís Jofre, Director General of Universities; Prof. Albert Cirera, IN2UB.
2. Presentation of the Industrial Doctorate initiative.
   Speakers: Joan Francesc Córdoba Pérez, Executive Committee for the Industrial Doctorate Plan; Prof. Albert Cirera, UB, IN2UB, Coordinator of the Industrial Doctorate in Materials, Nanotechnology and Industrial Processes.
3. Round table: Company and Doctorate  
Speakers: Juan-Carlos Dürsteler, Chief Innovation Officer, INDO LENS GROUP; Jordi Fernández Urbán, UMB R&D Manager, Nubiola; Carlos López Gándara, R&D New Materials Researcher, FAE; Francisco Ramos Pérez, Head of R&D New Materials, FAE.  
Moderator: Esteve Juanola, CEMIC

4. Industrial Doctorate and University-Business Collaborations in Belgium.  
Speaker: Brigitte Verkinderen, Director of the Belgium Luxemburg Chamber of Commerce in Catalonia.

5. Presentation of the research groups participating in the Industrial Doctorate initiative.  
Speakers: Prof. Xavier Obradors, ICMAB, CSIC; Prof. Francesc Pérez-Murano, IMB-CNMM, CSIC; Prof. Maria Lluïsa Maspoch Rulduà, CCP, UPC.

5. Industry and Innovation: Current Perspectives  
Speaker: Joan Majó, European Commission Advisor on Telecommunications and Information Technology, former Spanish Minister of Industry and Energy.

6. Closing address.  
Prof. Amilcar Labarta, Director of the Institute of Nanoscience and Nanotechnology of the University of Barcelona.

- **BKC talks on specific topics**

The series of informative talks on specific topics called *Xerrades BKC*, which began in 2011, continued to receive funding through this reporting period, with talks aimed specifically at doctoral students. A wide variety of topics were addressed this year and the talks were given by different faculties of the BKC. The most recent include:

- **El medicamento: ¿un derecho secuestrado?** (Emili Esteve, Director of the Technical Department of Farmaindustria; and Josep Guasch, collaborator for Farmamundi and former Research and Development Director at Alcon Spain laboratories. Faculty of Pharmacy, 18 October 2012).
- **La singularidad de la lluvia en la Península Ibérica y el cambio climático** (Prof. Javier Martin-Vide, UB Faculty of Biology, 19 December 2012).
- **Seguridad energética de Cataluña a corto plazo** (Prof. Mariano Marzo, UB Faculty of Geology, 8 May 2013).