

Autumn 2014 / Issue 8

INSIDE IBEC

The newsletter of the Institute for Bioengineering of Catalonia

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Seventh heaven



IBEC's 7th Symposium on 29th September welcomed most of the institute's staff and scientists, its ISC members, and many visitors – including, unfortunately, an opportunistic thief – for the day-long event on 'Bioengineering for Future Medicine'.

It was the first time that the annual symposium has had one of the institute's three main areas of application as its theme. The speakers and flash presentations reflected the fact that IBEC's many diverse areas of research are united in their quest to help make personalised medicine, hand-held diagnostic platforms, wearable monitoring devices and other technological advances a reality.

At the opening ceremony, Antoni Castellà i Clavé of the Generalitat's Departament d'Economia i Coneixement congratulated IBEC on the growth of the symposium and on reaching its seventh edition, as well as highlighting the institute's achievement of five ERC grants. Vice Rector of Research at the University of Barcelona Jordi Alberch added that IBEC is making an excellent contribution to research and education in Catalonia.

This year, a new addition to the programme was the Innovation and Clinical Translation session, in which Santi Marco presented the latest news on his group's project to develop a driver drowsiness detector with FICOSA, including some useful tips about working with industry. Luíís Rigat (Nanobioengineering) and Anita Kosmalska (Cellular and respiratory biomechanics) were the winners of the best flash presentation and poster awards.

At the meeting of the International Scientific Committee the same week, the members evaluated all the existing IBEC groups, as well as the five candidates – all of which came from abroad – for the current selection for next year's new tenure track positions. //

IBEC joins network for the promotion and globalization of technology for healthcare

IBEC is a member of a new alliance aimed at promoting and contributing to the competitiveness of the health technology sector in Catalonia.

Following in the footsteps of other such initiatives as Biopol'H and Bionanomed Catalunya, the Clúster de Tecnologies de la Salut brings together research organisations, companies, hospitals and other bodies to compete globally by promoting innovation and internationalization of partners and improving conditions within the sector.

The Clúster is an initiative of ACCIÓ,

the Generalitat's Agency of Competitiveness for Companies in Catalonia. This network will focus particularly on partners that are working on developing technologies for healthcare, rather than basic research.

The other members so far include the Universitat Politècnica de Catalunya (UPC) on the research side, Barcelona's Hospital Clínic among the healthcare bodies, and companies Telstar and the Sibel Group.

There are around 15,000 people currently employed in the health technologies sector in Catalonia. //



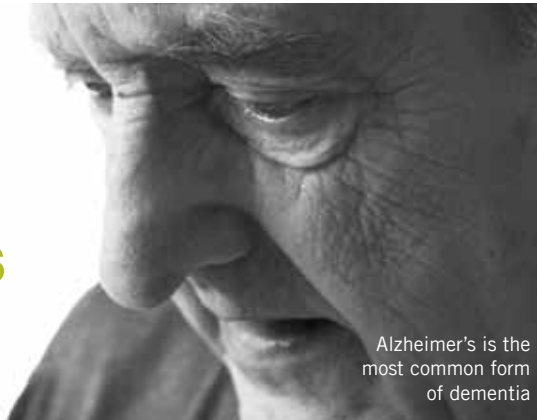
Tools for the trade

Nanotechnology Platform Coordinator Mateu Pla presented IBEC's Nanotechnology Platform at a session entitled 'Present and future of nanomaterials' at Expoquímia on 1st October. The international chemistry trade show attracts 30,000 visitors from the leading companies and organizations in the chemical industry. Mateu's session was co-chaired by IBEC project manager Javier González on behalf of co-organisers Nanomed Spain. //

SCIENTIFIC ROUNDUP

A step towards earlier diagnosis

Why Alzheimer's patients have no memory loss when the disease starts



Alzheimer's is the most common form of dementia

In a paper published in *Molecular Neurobiology* in June, researchers at IBEC and the UB reveal that the nervous system's protective response to the onset of Alzheimer's may contribute to the fact that patients don't suffer memory loss until the disease has progressed to a second phase – which is partly what makes it so hard to diagnose.

Alzheimer's can be attributed to two major events that can happen in the brain; the presence of extracellular aggregates, mostly a compound known as beta-amyloid peptide, which forms plaques; and the accumulation of a very phosphorylated

form of the protein tau, which forms small tangles inside affected neurons. Until now, it was known that the formation of these tau tangles in neurons depends on the toxicity of the beta-amyloid peptide, but the mechanisms of this interaction between the two wasn't understood.

The researchers – who worked in collaboration with members of CIBERNED, Madrid's Centre for Molecular Biology and the Institute of Neuropathology at IDIBELL – describe the relationship between beta-amyloid peptide oligomers and tau

phosphorylation and the presence of another protein, the cellular prion protein (PrPc), in affected neurons. The results show that when the levels of PrPc are high, the levels of phosphorylated tau protein inside the cell are lower, even if the beta-amyloid peptide oligomers are present.

“Previous studies had looked at the levels of PrPc in advanced stages of the disease,” explains Toni del Río, head of IBEC's Molecular and Cellular Neurobiotechnology group. “But our new study shows, both in mice and human brains, an increase in protein PrPc during the early asymptomatic stages of the disease. However, these levels of PrPc decrease as the disease progresses.”

When PrPc levels are low, the amount of tau – as well as its phosphorylated form that makes the tangles inside the cell – increases, contributing to the brain deterioration observed in Alzheimer's. “As a result, it is reasonable to conclude that the overexpression of PrPc seen at the beginning of the disease is part of the protective response of the nervous system in an attempt to suppress the progress of Alzheimer's,” says Toni. “Consequently, patients with Alzheimer's don't show memory deficits until later.” //

Electric polarizability of DNA and single bacterium measured

This summer the Nanoscale Bioelectrical Characterization group published two papers revealing how they measured the electric polarizability – a fundamental property which directly influences function – of two important biological entities for the first time ever.

In *PNAS*, they described a way to directly measure DNA's electric polarizability, represented by its dielectric constant, which indicates how a material reacts to an applied electric field. They used their own technique, recently developed at IBEC, based on electrostatic force microscopy (EFM). This type of atomic force microscopy allows the exploration of not only the morphology of single biological complexes in their natural environment, but also the measurement of the electrostatic properties that make each object unique. Revealing

this inherent property of DNA will allow the realistic prediction of its functions based on computational tools and help researchers understand the essential roles it plays in our bodies.

Secondly, and in collaboration with IBEC's Microbial Biotechnology and Host-pathogen Interaction group, they revealed in *ACS Nano* how to measure the electric polarizability of a single bacterial cell. Previous electrical studies until now have only been able to be done on bacterial populations involving millions of bacterial cells, and not on single ones. This finding can shed light on the biochemical constituents and internal structure of a particular bacterium, and, as with the DNA, opens up new possibilities for analytical studies and exploration, such as to evaluate properties such as adhesion, virulence or viability. //



In a *Nature Physics* paper, the Integrative Cell and Tissue Dynamics group describe a new way to decipher wound healing mechanisms, revealing a new understanding of how cells move and work together.

The group, together with collaborators at the IRB, UPC and UB and in Paris, Singapore and Canada, pioneered a technique to measure the nanoscale forces behind healing. In doing so, they discovered that the two currently accepted mechanisms – the ‘purse-string’ method, and ‘cell crawling’ – are not sufficient to fully explain the phenomenon. Instead, they showed that cells assemble supracellular-contractile arcs that compress the tissue under the wound, and that contractions arising from these arcs make the wound heal in a quicker and more robust way. //



Putting people first

During the second half of 2014, IBEC has been designing and implementing a new Human Resources Strategy for Researchers according to the principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. The Charter and Code, created in 2005 by the European Commission (EC), describe the rights and responsibilities of researchers and their employers, and contribute to the creation of a transparent, attractive and open labour market, as well as promoting research as a career option.

Like all the other CERCA centres, IBEC already adheres to the values outlined in the Charter and Code, but this will be the first time that the principles and processes will be laid out in an official Action Plan, which

will consist of specific actions to be carried out. The principles cover the following four areas: 1. Ethics and professional aspects; 2. Recruitment; 3. Working conditions and Social Security; and 4. Training.

The completed Action Plan, which is being coordinated by the HR Unit, will eventually be presented to the EC in order to be evaluated to receive their 'HR Excellence in Research' accreditation, and for periodic review by EC assessment committees. Obtaining this stamp of approval and meeting these principles in our daily activity will be vital for our successful participation in HR-based calls such as Marie Skłodowska Curie or Cofunds, and the plan will form the basis of a continuous improvement process.

"The aim of the Action Plan is to

in our internal procedures and practices, by matching them to the principles described in the Charter and Code. It's a collaborative exercise, so we have contacted people in the organization to invite them to participate."

A survey has been sent out to IBEC staff, and focus groups involving researchers at all career stages are working on various aspects. One of these, the Gender and Diversity Committee, is devoted to analysing equality and diversity topics and has already produced the 'IBEC Equal Opportunities and Diversity Management Plan', which has been made available to IBEC staff on the Public Information server.

"The implementation of the HR Strategy for Researchers is one of the first steps in rolling out the IBEC Strategic Plan for

Obtaining the 'HR Excellence in Research' accreditation will be vital for our successful participation in HR-based calls

improve on HR issues that directly affect researchers," explains Carol Marí, Head of Human Resources at IBEC. "We have been performing some internal analysis to identify the areas in need of improvement

2014-2017," says director Josep Samitier. "It's important not only to maintain the standards of quality required in Europe, but also to create a favourable environment for excellent research." //

Stopping silent killers in their tracks

IBEC researchers are involved in a new project that aims to improve building safety, both for occupants and for emergency response teams, in case of fire or other uncontrolled combustions.

The Signal and Information Processing for Sensing Systems group are partners in "Sensor Technologies for Enhanced Safety and Security of Buildings and their Occupants" (SAFESENS), a project that involves both industry and academic partners from several countries.

"Usually buildings are fitted with smoke alarms, but in fact, combustion gases such as carbon monoxide (CO) are produced and dispersed much faster than smoke," explains Santiago Marco, group leader at

IBEC, whose group will contribute their expertise in gas sensor algorithms. "CO is a very serious public health issue, being odourless and colorless, and it is widely known as the 'silent killer'."

Once CO is in the blood, it prevents oxygen binding, hampering the amount of oxygen delivered to the tissues and organs. Some sources of CO are engine exhausts, faulty gas boilers and ovens or smouldering fires. For fire fighters, many working environments contain high levels of CO, levels may range from 50ppm, which may cause mild neurological impairment after several hours of exposure, to several thousand ppm, which can be fatal in a few minutes. "The SAFESENS project will aim to develop low-cost and low-power safety systems that

are not only equipped with ultra-sensitive, reliable gas sensors for early fire detection, but that are also able to count the remaining occupants in the building, thanks to accurate presence detection technology," says Santi.

Systems will be developed that can measure multiple gases such as volatile organic compounds, carbon dioxide or CO, with increased fire detection reliability by interpreting the data measured with sensor fusion algorithms. The gas sensors will be co-integrated with presence detection technology able to generate fire propagation and building occupancy maps for efficient evacuations. SAFESENS will also create wearable localized gas detectors, such as personal health monitors for rescue workers. //

IBEC awarded funds to help researchers towards H2020 success

IBEC is one of 34 organisations in the entire country to be awarded funding under the 2013 'Acciones de Dinamización Europa Redes y Gestores' programme of MINECO, Spain's Ministry of Economy and Competitivity, to increase the capabilities of its Project Management Office (PMO). Not only that, but the institute was ranked top among the applicants, meaning it will receive one of the two largest portions of the total grant money, the other going to the ISCIII.

The programme has earmarked €5.3m to finance actions aimed at establishing or strengthening management structures that promote and facilitate the participation of Spanish research groups in international R & D projects. IBEC's proposal, 'Internationalization strategy of the Institute for Bioengineering of Catalonia: Towards better health through Bioengineering and Nanomedicine', will aim, at an institutional

level, to increase the support it offers to researchers in applying to European competitive projects under Horizon 2020, the EC's successor to FP7.

To do this, the PMO, which belongs to the Research Affairs Unit, will recruit a further project manager, with the result that all of IBEC's project managers will have more time to devote to each of their groups. As well as providing guidance and support with H2020 applications, they'll try to help to increase the number of coordinated projects at IBEC, as well as exploring other funding avenues such as NIH calls.

"We're delighted to have been successful in obtaining this grant, which will allow us to take on a crucial new staff member to share the work of supporting the researchers with their proposals," says Javier Adrián, coordinator of the PMO. "It's also very gratifying to have our proposal ranked at the top alongside that of the ISCIII." //



Image © Mattana

Opening minds

The two don't often mix, but science met religion on 8th May when Integrative Cell and Tissue Dynamics group leader Xavier Trepat took part in the 2014 Spring Conference at the Monestir de Santa Maria de Poblet, a working monastery near Tarragona dating from the 12th century.

The conference, on Geopolitics and New Values, was part of the monastery's 'Rethinking the XXI Century' series of events, which are organised by the Fundació Poblet and open to the public. Xavier was one of three scientists invited to take part in a round table discussion entitled 'Construint el futur: tendència predeterminada o capacitat de vertebrar?' //

NEWS from the PhD COMMITTEE



IBEC's PhD Student Committee has been busy adding new activities to its programme this summer and autumn.

Having begun with Bowling Fridays and other networking and social events, the committee has branched out into organizing and co-organizing courses and workshops. The first was a well-attended session on ImageJ, the scientific image processing program developed at the National Institutes of Health, which was given by junior group leader Pere Roca-Cusachs on 9th July (pictured right). Then, on 26th

Committee events in full swing!

September, we co-organized the PhD Discussions Complementary Skills Session given by Marta García Sánchez, Research Librarian at the UPC, which covered Reference Management Software such as Endnote.

In addition, the committee also carried out a satisfaction survey to monitor morale among PhD students at the institute and identify common problems or issues.

Of course, that doesn't mean the more informal activities have stopped! The committee's first big event in collaboration with the IRB was Swing Night al Parc on 4th June. Then, to celebrate the start of summer, there was a party at the beach on 11th July, including the second amateur beach volley tournament.

If you'd like to get involved in the committee, please contact us at phdcommittee@ibecbarcelona.eu.

— IBEC PhD Students Committee



Welcome to the paperless office

In the next few weeks, many of our day-to-day work processes and protocols will be revolutionized by the new intranet, IBECnet

Gone will be the days when IBEC staff and researchers have to hunt around for the correct form to make a purchase or request a day off! No longer will they have a bunch of old salary statements cluttering up their desks! IBEC's new intranet, IBECnet, is set to replace all those annoying forms and bits of paper cluttering up the office.

IBECnet will be divided into several sections, accessible depending on the user. There will be an Employee module for HR procedures such as requesting holidays,

and supervisors will approve them online as well. In the same module, there will be a payroll section that will allow users to check and download their monthly payslips within a secure password-protected area.

The Shopping module will allow users to place orders in a shopping cart that can be immediately approved by the PI of the project to which the items will be charged. In addition, the system will provide tracking information about the status of the orders placed. Other modules will include Research Affairs, where PIs can control their ongoing scientific activities; Finance, for the online financial follow-up of projects; and the Indicators module for management.

IBECnet is a direct response to a clear objective of IBEC's Strategic Plan for 2014-2017 and a response to requests made in the internal survey for a way to speed up processes and help units to be better integrated. It will also provide useful information for institutional decision-making.

Left: IBECnet's user-friendly interface



CASEIB 2014

The annual congress of the Sociedad Española de Ingeniería Biomédica (CASEIB 2014) is this year being organized by IBEC, where SEIB President Raimon Jané is a group leader, and will take place at CosmoCaixa Barcelona on 26th-28th November.

CASEIB 2014 is a forum for scientists, industry professionals and biomedical and clinical engineers interested in learning about and discussing the research, education, and clinical and industrial applications in the field of biomedical engineering.

Visit www.ibecbarcelona.eu/events/Caseib2014 for more details. //



The new tool will be accessible internally but also via the internet when users are outside. To encourage more participation and continuous improvement in all aspects of life at the institute, IBECnet will also incorporate a Suggestions Box.

Before the end of 2014, everybody will be invited to attend an IBECnet training session. //

OUTREACH NEWS

Activities old and new

A first for outreach this year was IBEC's participation in *La Nit de la Recerca* on 26th September. The 'night of research' is organized by the European Commission

in collaboration with a range of public and private institutions, and offers a programme of science-related activities. The IBEC contributors were Luís Rigat and Roberto

Paoli (pictured) from the Nanobio-engineering group, who contributed with face-to-face interview sessions to explain what being a scientist is really like, and a poster about organs on a chip.

In addition, IBEC was one of 13 research centres to be chosen to take part in Fundació Catalunya-La Pedrera's 2014 edition of *Professors i Ciència*, a programme for the specialized training for secondary school science teachers. IBEC's day-

long course held in May was run by Vanessa Gil and Ariadna Pérez, researchers from the Molecular and Cellular Neurobiotechnology group, and provided an opportunity for 15 teachers to receive specific training to take back to their classrooms.

As in other years, IBEC took part in the Barcelona-wide *Festa de la Ciència* on 4th-20th June, when Elisabet Martí (Nanomalaria), Rosa Letizia Zaffino (Nanobioengineering) and Laura Casares and Pilar Rodríguez (Integrative Cell and Tissue Dynamics) contributed their time and expertise.

Other activities over the summer included the placements of students in labs to complete projects as part of the PCB's *Passa l'estiu al Parc!* programme and the usual group visits, including some students from Roeselare, Belgium. //

Roberto Paoli and Luís Rigat at La Nit de la Recerca

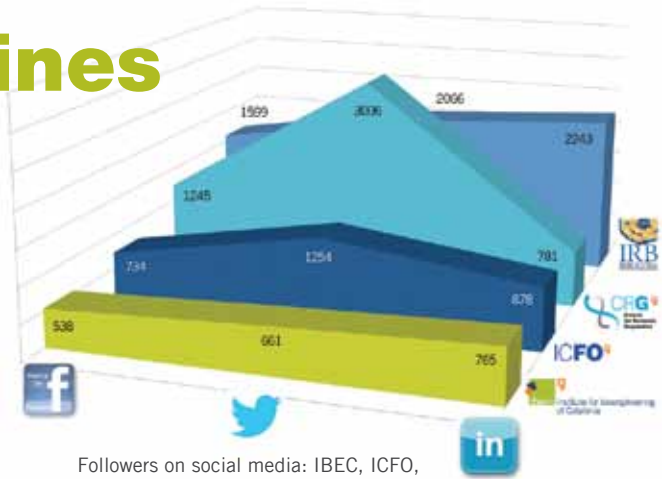


Hitting the headlines

IBEC has seen a notable increase in press coverage in the general media this year, with 39 appearances in print newspapers – that is, top-ranking dailies such as *El Mundo*, *La Vanguardia*, *El País* and *El Periódico* – by the end of June, compared to 25 during the whole of 2013. This year's coverage represents an advertising equivalency of €252,386; in other words, if IBEC had paid for the page space instead of getting it free via editorial means, it would have cost us more than a quarter of a million euros!

The boost is in part due to the proper establishment of a 'Press Office' in the Communications and Outreach Unit. "There wasn't really a protocol when I started here in 2010, but already by 2011

we had jumped to 13 appearances as opposed to seven," explains Vienna Leigh, Head of Communications and Outreach. "Now Angels (López, Coordinator of Media Relations and Branding) and I are working together as the IBEC Press Office within the unit – I write the releases and deal with international distribution, while Angels is the point of contact for local journalists. It helps, also, that we have some very good quality science coming out of IBEC to sell!"



Followers on social media: IBEC, ICFO, CRG and IRB

But IBEC scientists can help by contacting the Communications Unit as early as possible when they have some news. "It's really important that researchers let us know as soon as they have a paper accepted by a journal. Please send us the manuscript then, even if it's not the final version," says Vienna. "This gives us time to prepare a

"It's really important that researchers let us know as soon as they have a paper accepted"

press release and the translations, and to coordinate with other centres if necessary."

IBEC is also holding its own alongside the other CERCA centres in the social media stakes (see graph). "These tools are playing a major part in helping us reach even bigger audiences and help society understand the importance of research," says Angels. "Their hands-on approach helps users feel more involved with the institute." //



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// The first class of students from the University of Barcelona's **Master programme in Biomedical Engineering**, which is coordinated by IBEC Director Josep Samitier, graduated in June.

// An IBEC proposal will be included in the **2015 programme of Barcelona International Center for Scientific Debate (B-Debate)** activities. "Future Tools for Biomedical Research: *in vitro*, *in silico* and *in vivo* disease modeling" was positively evaluated by the selection committee for B-Debate, which is a Biocat initiative

supported by the Obra Social "la Caixa" that stages exclusive events and discussions between scientific experts from all over the world.

// Nanoprobes and Nanoswitches group leader Pau Gorostiza is one of four scientists to be invited to participate in an event to be organised in Madrid by Fundación la Caixa, "**Diálogos por la Ciencia**". The event, which will form part of the International Year of Light activities in 2015, will consist of live interviews of prestigious Spanish investigators by

renowned journalists. Pau and the other interviewees, who are Caterina Biscari (ALBA), Lluís Torné (ICFO) and Agustín González Cano (UCM), will each give a short presentation followed by the interview and questions from the general public.

// Recently graduating PhD students are invited to apply for the **CERCA PIO-NEER Awards**, which recognise theses with a clear aim towards clearly aimed at commercial exploitation. See <http://cerca.cat/en/ktt-area/premis-pioner> for details.

IBEC PEOPLE



Mateu Pla-Roca has returned to IBEC as Nanotechnology Platform Coordinator. He got his PhD in Chemistry in 2004 at the UAB, after which he did a postdoc at IBEC before moving to McGill's University, Montreal in 2007. From 2009 to 2011 he was at the Laboratory for Surface Science and Technology at ETH Zürich. In 2013, back at IBEC, he was one of 12 fellows selected for the first MOEBIO Design Health Barcelona programme.

AWARDS AND HONOURS

// **Víctor González** (pictured right, far left of group), a masters student in the Cellular and Respiratory Biomechanics group, won third prize in the 2014 Gemma Rosell i Romero Students' Research Award for his study 'Unveiling the mechanical interaction between tight junction protein ZO-1 and integrin $\alpha 5 \beta 1$ in cell adhesion and migration' in May. The Gemma Rosell i Romero award recognises students who devote part of their time at university to doing biomedical research.



// **Claudia Navarro**, a PhD student in the Biomaterials for Regenerative Therapies group, was awarded the EWMA First-Time Presenter Award 2014 at the European Wound Management Association-Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas (EWMA-GNEAUPP) congress in Madrid in May. The title of her oral presentation was 'The Effect of Extracellular Calcium on Dermal Fibroblasts with Potential Applications in Skin Wound Healing'.

// **Santiago Marco**, head of IBEC's Signal and Information Processing for Sensing Systems group, has been invited to be a member of the Eurosensors steering committee. Eurosensors is the major conference on sensors in Europe, with annual attendance of around 700 people.

Want to get involved?

If you have an idea for an article for *InsideIBEC* or would like to write one yourself, please contact us. Is your group starting or finishing a project? Is there an important change in procedure that people should know about, or a deadline coming up? Perhaps something interesting has happened in your area of research, or perhaps you've had an interesting visitor. Maybe you'd just like to find out what the IBEC community thinks about something, or you have a request for help.

Send your ideas to
vleigh@ibecbarcelona.eu.

UPCOMING EVENTS

Friday 24th October

IBEC Seminar: Short and long time-scale rheology in suspended monolayers
Guillaume Charras, London Centre for Nanotechnology

Wednesday 29th October

IBEC Seminar: Buenas prácticas de uso de bombas de vacío
Edwards Ibérica Vacuum

Friday 31st October

PhD Discussion Sessions
Themis Tomanidou / Isil Tekeli

Friday 31st October

IBEC Extra Seminar, Bellvitge:
Astrocytes modulate visual selectivity features of cortical neurons in vivo
Gertrudis Perea, Cajal Institute-CSIC, Madrid

Tuesday 18th–Friday 21st November NanoBio&Med 2014

Faculty of Medicine (Universitat de Barcelona), Campus Hospital Clínic Pi i Sunyer, c/Casanova 143, Barcelona
Co-organised by IBEC, BOKU (Austria) and the Phantoms Foundation (Spain)

Friday 21st November

PhD Discussion Sessions
Eduard Bergés / Marc Van Der Hofstad

Weds 26th–Fri 28th November

CASEIB 2014, hosted by IBEC
CosmoCaixa, Barcelona

More events at www.ibecbarcelona.eu

More news on the web...

You can keep up-to-date with news and events at IBEC by visiting
www.ibecbarcelona.eu



IBEC in pictures

You know you've made it when your research appears in *Pronto*, Spain's biggest-selling weekly magazine. Pau Gorostiza's work on light-controlled drugs managed to find some space in the mag back in April, even though there was a lot of other essential news to report, such as Belén Esteban going on holiday with her new beau and the Duchess of Alba postponing her 88th birthday party.

