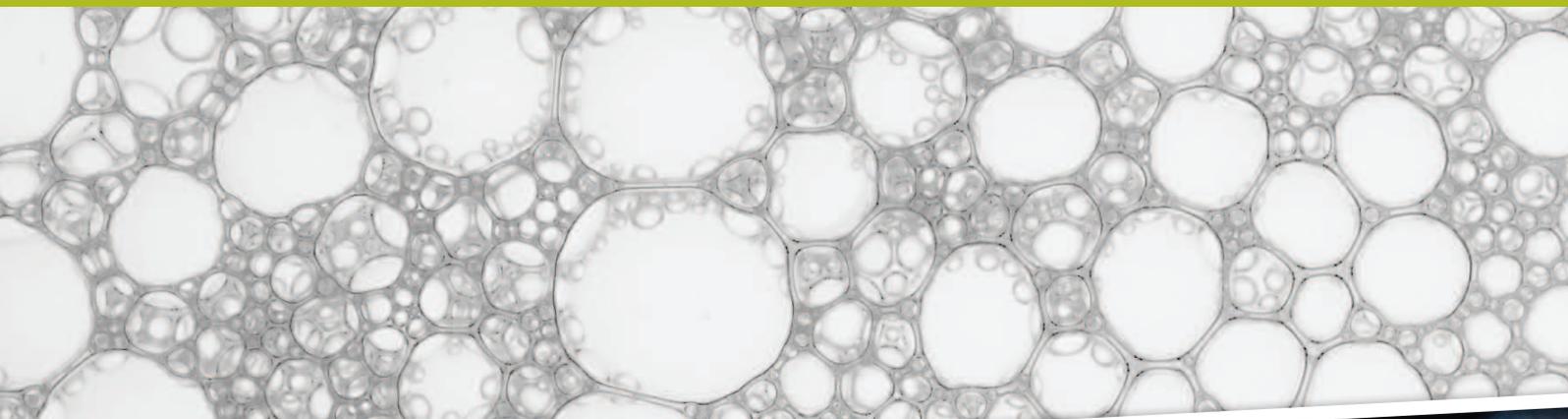


INSIDE IBEC

The newsletter of the Institute for Bioengineering of Catalonia



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IBEC's first Faster Future campaign raises money for muscular dystrophy research



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Mechanics matter, too

A new approach opens doors to personalized, optimized cancer treatments

The last few months of 2017 saw the beginning of a project involving researchers at IBEC and VHIO that will improve cancer diagnosis, treatment and survival by determining how mechanical factors govern cancer invasion, opening the way to personalized treatments that take both the biochemical and mechanical characteristics of tumors into account.

The project, “Understanding and measuring mechanical tumor properties to improve cancer diagnosis, treatment, and survival: Application to liquid biopsies”, will harness the expertise of the IBEC groups of Pere Roca-Cusachs, Xavier Trepac, Lorenzo Albertazzi and Josep Samitier to reveal how the mechanical properties of tissues affect the cancer progression. Armed with this knowledge, the researchers will work with Josep Taberero, Joan Seoane and Paolo Nuciforo from VHIO to carry out analysis of patient samples and data to assess the effect of these mechanical factors on diagnosis and treatment, thereby opening the way to developing personalized, efficient diagnostic approaches and targeted drug delivery strategies.

“Our research so far has shown that cancer depends on more than just molecular factors such as biochemical signaling. Additional, mechanical factors – such as the stiffening of tissues – are coupled with

molecular ones to drive tumor progression,” says Pere Roca-Cusachs, head of the Cellular and Molecular Mechanobiology group at IBEC. “Almost all tumors are stiffer than the surrounding tissue, and we’ve shown that placing healthy mammary cells in substrates stiffer than their real environment is sufficient to induce malignancy.”

While cancer treatment has benefited in recent years from personalized drugs

Liquid biopsies better reflect the changes in tumor dynamics and drug sensitivity which can occur during therapy

targeting specific mutations in signaling pathways, even with the use of such drugs, tumors can develop resistance and continue to grow and spread. With a better understanding of how biochemical signaling interacts with mechanical factors like tissue stiffness – which is also highly variable among patients – to drive the progress of tumors, the collaborators will be able to develop technologies to both measure this interaction and optimize drug delivery.

Concentrating on breast and gastrointestinal cancers, the project will design

therapeutic strategies that consider not only molecular mutations, but also the stiffness of the specific tumor and how those parameters interact. Rather than measuring this using traditional, solid biopsies, however, their approach will harness liquid biopsies – in other words, detecting biomarkers in blood – which can be taken less invasively, and which better reflect the changes in tumor dynamics and drug sensitivity which can occur during therapy.

“Finding new, non-invasive techniques to assess biochemical and mechanical tumor properties, as well as advanced drug delivery methods, can potentially permit fully informed and individualized diagnosis and prognosis, as well as optimized cancer treatment,” says Josep Samitier, director of IBEC and another of the one of the group leaders involved.

The project is funded by the Obra Social La Caixa’s Joint Programme with IBEC in Healthy Ageing Research. This initiative funds projects which are expected to contribute to the development of one of IBEC’s focus programmes, Bioengineering for Active Ageing; have a translational approach; and be the seed for innovations to be further translated through EIT Health, the EC’s Knowledge and Innovation Community (KIC) on healthy living and active ageing. //

Come on baby, light my fire

A recent publication by the Signal and Information Processing for Sensing Systems group is an outcome of their work in the European Project SAFESENS. This 21-partner project is led by large corporations active in sensor systems such as AMS, BOSCH and NXP. IBEC’s tasks were to develop signal and data processing algorithms to detect toxic effluents from fires and overheated materials, while being robust against odour emissions from daily activities such as cleaning or cooking.

Indoor fire detection using gas chemical sensing has been a subject of investigation for a couple of decades, because in smouldering fires and materials undergoing

pyrolysis and thermal decomposition, toxic gases and volatile organic compounds appear before smoke particles do. This means that systems based on chemical sensing can provide faster fire alarm responses than conventional smoke-based fire detectors and could provide an additional level of safety, as most casualties are due to the inhalation of these toxic emissions rather than burns.

Santiago Marco (right), Jordi Fonollosa and Ana Solórzano’s *Sensors* paper ‘Chemical Sensor Systems and Associated Algorithms for Fire Detection: A Review’ reflects on the state of the art of these chemical sensor systems. It also surveys the toxic emissions produced in fires, the best sensor



technologies to detect them, and the signal and data processing algorithms.

With a bit more research and extensive tests under different scenarios, taking into account the defined standards for fire detection systems, gas-based fire detectors could begin to penetrate into the market. //

A new site for IBEC

The institute's reach now spans the city from one end of av. Diagonal to the other

IBEC has added to its physical locations, with two groups moving to a new site at the other end of av. Diagonal.

The Campus Diagonal Besòs of the Polytechnic University of Catalonia (UPC) is a new environment for innovation and knowledge, located at the point where Barcelona and the town of Sant Adrià de Besòs meet. Barcelona Est Escola d'Enginyeria (EEBE) is currently the main centre residing there.

IBEC's new spaces – all in all, about 900m² – have been designed according to the specific requirements of their occupants. IBEC's new Synthetic, Perceptive, Emotive and Cognitive Systems (SPECS) research group, led by ICREA Research Professor Paul Verschure, and the Biomedical Signal Processing and Interpretation (BIOSPIN)

group, led by Raimon Jané, have both already finished moving in. As well as their lab spaces, administrative and meeting spaces have also been made available for the use of support staff or visitors. The IBEC groups both occupy Building C: the BIOSPIN group is located on floor 5, and the SPECS group occupies floor 6, with some of their installations in the basements of Building C and I. It's hoped that new collaborations will pop up, since other UPC groups such as IBEC associated researcher Maria Pau Ginebra are also there.

The postal address is Av. d'Eduard Maristany 16, Barcelona 08019, but when sending deliveries, it's best to address them to Ronda Sant Ramon de Penyafort 261-269, Sant Adrià de Besòs 08930, where someone can receive them.

“We're convinced that the new facilities – and the new collaborative university environment – will make it possible for these groups to build on the already impressive level of excellence they've shown so far,” says IBEC director Josep Samitier. “This new location represents a new leap in IBEC's objective to be a first-level centre.”

Seminars and other IBEC activities are about to start there, so if you'd like to visit the new facilities, the number 7 bus goes almost all the way there from Zona Universitària (get off at the 'Diagonal Pl. Llevant' stop), or the closest metro stop is El Maresme | Fòrum on the yellow line.

Be sure to contact the person you're visiting to gain access, as there's no reception desk. //



Sonia Lertxundi is IBEC's new Administrative Assistant at Campus Diagonal Besòs, and she's your first port of call for any queries, as well as the person in charge of supporting IBEC's administration in logistics, administration and dissemination there. Sonia has more than twenty years' coordination experience in different international companies and countries. She holds a masters degree in events and a postgraduate diploma in management from London, and has a solid overview of coordination and the key aspects of talent management. Prior to joining IBEC, she volunteered in Asia for three months, and before that she was Project Coordinator at consulting firm ALG by Indra and Events Coordinator at healthcare company Medtronic.



Shooting the messenger

An IBEC-led project is one of just 16 chosen to be funded by EuroNanoMed III, the new ERA-Net Cofund Action on Nanomedicine under H2020.

Rather than addressing malaria once it gets into the human, the NANOpheles project will design nanocarriers for the delivery of anti-malarials to *Plasmodium* stages in the mosquito. “This is an unusual approach that aims to eradicate the parasite before it even reaches humans,”

explains IBEC/ISGlobal Nanomalaria joint unit leader Xavier Fernández-Busquets, who will coordinate the project.

“We will synthesize different types of polymeric nanovectors that can encapsulate antimalarials without degradation in storage, deliver their contents to *Plasmodium* stages in the *Anopheles* mosquito, and evaluate their effect in reducing mosquito infectiousness.”

NANOpheles (‘Development of



NANOpheles

nanovectors for the targeted delivery in *Anopheles* mosquitoes of agents blocking transmission of *Plasmodium* parasites), which will receive a share of the total of €14m over three years, has partners in the Netherlands, Belgium, Greece, Portugal and Spain. In total, 126 projects were submitted to EuroNanoMed's 2017 Cofunded Call for ‘European Innovative Research & Technological Development Projects in Nanomedicine’, of which 39 were selected and 16 finally funded. //

Gender and diversity steps

IBEC's second Equal Opportunities and Diversity Management Plan with 34 actions for the next three years was defined and published last June. If the first Plan was a good starting point to lay down some good bases for the promotion of equal opportunities and diversity management, this second Plan is more ambitious, incorporating the gender and diversity perspective transversally at all levels of the institute, and taking an active role to raise awareness and encourage reflection and discussion with trimestral bulletins.

The second plan included action 15, 'Programme for women scientists within the BIST community' to increase the visibility of female researchers and eliminate recruitment, selection and career development barriers for them. As part of this,

IBEC helped define BIST's 'To the Mothers of Science' supporting grant for women scientists in a leading position in research who are fulfilling maternity responsibilities.

Another action already taken was a special seminar in March, 'Mitigating bias: promoting diversity and sustainable excellence in research' by Claartje Vinkenburg PhD, associate professor of organizational behaviour at VU University Amsterdam. Organized alongside IRB Barcelona, the two-hour event explored the concept, causes and consequences of implicit or unconscious bias and how it affects careers, workplace culture and work-family reconciliation in research organizations. The seminar was followed by some time for networking, during which the attendees continued with the discussions and questions. //

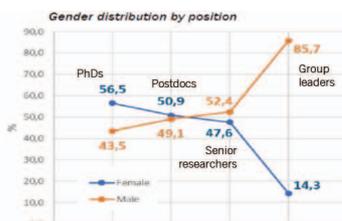
Gender and diversity indicators 2017

International calls and Cofund:

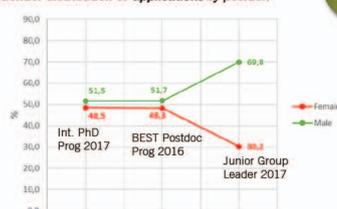


Yoga classes:
IBEC⁹vital

Training actions:



Gender distribution of applications by position



"Bojos per la Ciència" programme:



Empowering Women in Science

IBEC group leader Nuria Montserrat was a panel member at the Barcelona Institute of Science and Technology (BIST)-organized Round Table, 'Empowering Women in Science' on November 28th

Taking place at the Centre Civic

Urgell, the event covered topics including leadership styles, reinforcing professional networks, balancing personal life and work, gender bias in selection process, and barriers to scientific career progression.

The half-day provided an opportunity to gain some insight into what the needs of the BIST research centres are in terms of programmes for supporting women in science, as well as reviewing existing initiatives and success stories within the BIST community.

As well as Nuria, other members of IBEC took part in the proceedings. After the round table, working groups were formed to discuss different topics. Adrica Kyndiah from Gabriel Gomila's lab presented the results of her working group. //



Wonder women

The Communications and Outreach Unit would like to thank all the IBEC women who helped make our International Women's Day 2018 campaign a success.

Agata Nyga, Alicja Kosiorowska, Anna Mura, Berta Gumí, Inmaculada Moreno, Jessica Diaz, Laura Clua, Lucia Selfa, Maider Badiola, Maria Alejandra Ortega, Maria Arista, Nuria Camarero, Núria Jané, Patricia Prado and Vanessa Gil posed for the beautiful photographs, taken by Communications Assistant Pilar Rodríguez, for the images that were shared via social media and displayed in poster form in the run up to and for several days after the event.

"We wanted to do something that reflected the ongoing struggle for women's equality," says Coordinator of Media Relations and Branding Àngels López, who designed the posters. "With the slogan 'I am science', we're not asking permission to be scientific; we're reclaiming the space that we already occupy." //



What do you think?

Why do you think there are still so few leading women in science? Discrimination? Competition? Family reasons? Scan the QR code or go to <https://goo.gl/forms/6zo1gSY2H0uE0kYS2> to cast your vote.



RETIREES

Two of IBEC's group leaders have retired recently. This issue, members of the Nanoprobes and Nanoswitches group pay tribute to their mentor, Fausto Sanz. Next issue, it's George Altankov's turn.

“A modest, generous man”

Fausto Sanz is “guided by curiosity”, according to his former student and mentee Pau Gorostiza, a group leader and ICREA research professor at IBEC. Pau met this pioneer of nanotechnology in the Lawrence Berkeley Laboratory's Molecular Foundry – “in the photocopy room” – in 1992. Fausto was finishing his USA sabbatical and looking for students; he was working with the then emerging technology of the STM microscope with Miquel Salmeron and wanted to implement it in Barcelona, where he would return to his position as professor in the UB's Physical Chemistry Department.

Back in Spain, Fausto bought one of the first commercial electrochemical STMs to visualize reactions on surfaces immersed in liquids. With the addition of an AFM – the 3rd version of very robust commercial device – he soon encountered the limitations of local research dynamics compared to the Molecular Foundry's open, sharing approach.

“Then came one of Fausto's most brilliant ideas,” says Pau. “He had this robust technology and he wanted to share it, and to learn from other researchers working in different fields. He persuaded management to provide space in the scientific-technical service of the UB to start and maintain a nanotechnology service. He got the money himself from the Generalitat. The first technician, actually, was Maria García-Parajo, who went on to be a group leader at IBEC.”

Soon chemists, physicists, geologists, biologists – everyone was coming to use the technology. “We even drew the tiniest ‘UB’ logos using nanoscale indentation and local oxidation,” remembers Pau. “It was *the* nanotechnology tool in Barcelona.”

Pau says it was indicative of Fausto's generosity. “He doesn't mind complicating his life if it benefits other people. The AFM

service wasn't the easiest path to take, but it was helping hundreds of people.”

The biggest – and most unexpected – benefit of this altruism was that it generated a nanotechnology pool in Barcelona. “Daniel Navajas and Josep Samitier were using

other fields. Fausto made it really easy for me to learn and get into the new area. He was very father-like, which was especially comforting as I was far away from my family. He was always taking care of me.”

“Those years, the mid-2000s, were incredible for publications in so many new disciplines that were booming onto the research scene. It was a great time to be a young researcher and for learning new techniques,” remembers Pau. “Fausto was a great mentor because he took a soft approach and gave us a lot of freedom. He was always doing the right thing to make everything all right for everybody, but he didn't want any recognition for it. He's very modest. Even when he retired he was working tirelessly behind the scenes to make sure everyone would be OK.”

Despite being a mover and shaker in the science scene in Spain, Fausto didn't

always agree with the way things were done. “His points of reference were always more liberal places like the USA and the Netherlands, where the question was never ‘what are you going to do?’. He follows the rules and regulations, but expects some level of freedom in return.”

Nevertheless, the results of his leadership are testament to his success as a boss and mentor. “Fausto supervised many scientists that are now university professors, in some cases with high management responsibilities,” says Pau. “No fewer than three of his former students have won ERC grants.”

Pau describes Fausto as a ‘revolutionary’. “He fought restrictions and antiquated attitudes to bring an amazing machine – one that could look at atoms! – to countless people,” he says. “He's full of brilliant ideas, and always chooses the path with the most long-term benefits instead of going for the easiest option.” //



A younger Pau and Fausto with one of the earliest designs of a commercial AFM, designed by Paul K. Hansma

the AFM; there was a flow of people from the electronics, as well as other departments at the UB and even other universities in Barcelona and beyond” says Pau. “In a way, it contributed some of the groundwork for the beginnings of IBEC.”

A later recruit in Fausto's group was now-senior researcher Marina Giannotti,

“He doesn't mind complicating his life if it benefits other people”

when IBEC was already established. “I was the first one – with Isabel (Oliveira, head of Core Facilities) – in the Hélix building,” she says. “I came from the Netherlands because my partner got a job here. I was working in polymer elasticity with AFM but I was interested in Fausto's research because I thought it would lead to expertise in lots of

NEWS from the GROUPS

This issue, we're showcasing Samuel Sánchez's Smart nano-bio-devices group. If you'd like your group to be showcased in "News from the Groups", please contact vleigh@ibebarcelona.eu

Samuel's group

Samuel Sánchez has bumped IBEC's all-time ERC record up to 13 with a Proof of Concept grant won in 2017, which will start in the coming weeks.

LABPATCH will develop an integrated, compact, user friendly and non-invasive device for the self-assessment of PKU, a congenital metabolic disease related to high levels of phenylalanine in blood that can lead to intellectual disability, behavioural problems and mental disorders.

160 of the top-up grants that enable researchers to explore the innovation potential of their scientific discoveries were awarded to the 532 ERC grantees that applied to the 2017 calls. Only 14 went to researchers working in Spain.

Meanwhile, the group has also been as busy as ever published papers about their self-propelling micromotors. One of the most important in the field of bioengineering in recent months was an *ACS Nano* paper with Diana Vilela as first author,



"Medical Imaging for the Tracking of Micromotors", in which the group describes, for the first time, the tracking of micromotors using positron emission tomography-computed tomography (PET-CT), which combines two scanners to get sequential images. This was a collaboration with CIC Biomagune. Other papers have been published in *Science Advances*, *RSC Advances*, *Advanced Functional Materials*, *Applied Materials Today*, *Angewandte Chemie*, and

several other leading journals.

In recent months Samuel's group members have netted several prizes at international meetings and conferences. Ana Hortelao and Rafael Mestre got a poster award at November's Nanobio&Med Spain conference in Barcelona. In December, Xavi Arqué and Rafael went to the 2nd Biomed PhD Day and Xavi got the best talk award of the Immunology and Nanobiotechnology Session. They also went to the 6th Jornada d'Investigadors Predoctorals Interdisciplinària where Rafael got the best flash talk award of the session. Back in the summer, Jemish Parmar went to the International Conference on Micro/nanomachines in China and won first prize for the best poster (pictured left).

Finally, Samuel and his research had media coverage in *El País*, with a long article in the newspaper's *Retina* magazine about the Spain-based scientists who are making the health technologies of the future a reality. //

Make your own little plastic bits at IBEC



How annoying is it when you've got a perfectly serviceable piece of equipment in the lab, except that some essential plastic bit – a nozzle, perhaps – has broken off?

Now, IBEC's Core Facilities team can help. Their latest acquisition, a Solus DLP 3D printer – which can be found in MicroFabSpace, IBEC's clean room – uses photopolymerizable resins to fab-

ricate plastic parts. "For example, if you need to customize a small plastic piece, such as a tube fitting or a small part that has broken from a piece of your equipment, you can make it using the Solus," says Mateu Pla, Core Facilities' Scientific Coordinator. "Usually, obtaining small parts from third parties is difficult because companies don't like to make small batches of parts, or they charge a lot."

The Solus works with HD DLP® projectors to print with a resolution as fine as 25 microns with a 48x27x80mm build area or at 41 microns with a larger 80x45x80mm build area. This projector resolution allows the fabrication of features as small as 100 microns wide and parts with a smooth finish, so it's perfect for recreating the various little machine bits that are always the first parts to give up the ghost.

All IBEC's researchers are welcome to train to use the Solus. "MicroFabSpace technicians will train users on the equipment, but I'm afraid you're on your own when it comes to designing your part," says Mateu. "But there's plenty of open-source software that allows the required .stl files; we recommend FreeCAD." Mateu also advises users to follow YouTube tutorials to help design the parts, especially if they are not very complex. "The learning curve it is pretty fast," he says.

The photopolymerizable resins that the printer uses as 'ink' are not provided at MicroFabSpace since there are plenty available from Solus manufacturer REIFY-3D, although there are other resin distributors such as Spot-A-Materials.

For more information, contact Core Facilities at microfab@ibebarcelona.eu. //

Synchrotron light for biomedical research

Andrea Esteban, a masters student at IBEC, has just finished an industrial placement at ALBA. She found out that their characterization techniques could have many applications in biomedicine

There are no more than about 60 active synchrotrons in the world, the most famous being the Large Hadron Collider, and Catalonia is lucky enough to have one of them. ALBA, which is in Cerdanyola del Vallés, has 8 beamlines comprising soft and hard X-rays and infrared energy ranges, which study matter at the nanoscale and determine its chemical, electronic and magnetic structure.

Synchrotron light is electromagnetic radiation emitted when electrons, moving at velocities close to the speed of light, are forced to change direction under the action of a magnetic field. It is unique in its intensity and brilliance, and has great advantages over conventional analytical techniques: it provides lower detection limits, higher resolution, faster experiments, wide variety of sample environments and the possibility of obtaining chemical mapping and determining oxidation states.

ALBA currently has X-ray powder diffraction, infrared microspectroscopy,



soft X-ray microscopy, X-ray absorption and emission spectroscopy, macromolecular crystallography, small and wide angle X-ray scattering photoemission spectroscopy and microscopy, and X-ray resonant absorption and scattering. Some of these techniques can have a huge impact on biomedical research, for example to study the 3D structure of single cells and tissues, elucidate the atomic structure of macromolecules, determine distribution and penetration of biomolecules in tissues, monitor structural changes in situ or to evaluate the efficiency of drug delivery systems. Outstanding results

have been obtained with soft X-ray microscopy at ALBA's MISTRAL beamline, including the 3D structure of hepatitis C-infected cells. The powerful technique can show how the virus greatly degrade the inner structures of the cell and how the drugs repair the structure that has been damaged by the virus (Perez-Berná et al., 2016, *ACS Nano*). Another study was carried out at the NCD-SWEET beamline using

small and wide angle X-ray scattering by researchers from the Polytechnic Institute of Leiria. They studied the structure of 3D scaffolds used for the regeneration of tissues and development of new biomaterials, and characterized a biomaterial used for bone regeneration beyond deformations simulating real life conditions.

There are two ways to access ALBA: the academic and the industrial. The academic has two public calls to obtain beam time, while the industrial is open all year offering scientific-technical support.

- Andrea Esteban, *Nanobioengineering*



(Spic Macay) and student volunteers and administrative representatives from IBEC, IRB the PCB, was supported by the Indian Embassy in Madrid, The Indian Council for Cultural Relations (ICCR) and Casa de la India. Second Secretary Sneha Bahuguna from the embassy was in attendance, and spoke about the promotion of Indian cultural diversity and heritage by the embassy before presenting a bouquet of flowers to the artists. The directors of the scientific institutes – Joan Guinovart, Josep Samitier and Ignasi Belda – were also guests of honor, who inaugurated the event.

The night was just the beginning of what's hoped to be an ongoing series of similar events focussing on cultures and nationalities represented by the hundreds of students and workers from various countries that are located in the various organisations that call the PCB home.

- Harishankar Balakrishnan
(IBEC) and Madhulika Rai (IRB)

February 1st saw the PCB's Dolors Aleu room transformed into a riot of colour and sound when the Manipuri Dance Group from India took over the stage.

The nine-person group performed traditional Indian dance from the north-eastern part of India known as Manipur, accompanied by descriptions about the region, its art and culture by group member Dharmadas Sharma Gurumayum.

The event started with a slow rhythmic dance for a fluted lullaby music and the tempo increased as the show progressed. The dancers used number of props including bass drums, which turned out to be the highlight of the night. Lastly, everyone was served Indian snacks and drinks.

The event, which was organised by the Society for the Promotion of Indian Classical Music And Culture Amongst Youth

IBEC ALUMNI: News, updates and achievements

In our regular section, we'll bring you news from IBEC's former researchers, students and staff. If you've got a story for the Alumni Section, please let us know!

“Go abroad – and don't forget the fun”

Marc Castellarnau, once Josep Samitier's PhD student and a postdoc at IBEC, is now CEO of Fuelium, a start-up that has developed a bio-friendly paper battery that activates when it comes into contact with liquid.

“I had no clue I would go on to do something like this,” he says. “As a PhD student I was working in microfluidics, and with Antonio Juárez on metabolic studies for fermentation. It wasn't until I was writing up my PhD that I first had an idea that there might be a career path outside academia.”

Marc went to work at a consulting company, where he was exposed to the complicated and nuanced world of technology transfer. “It was an eye-opening transition from basic to applied research,” he recalls, but it wasn't yet the moment for him to move into



Marc with Fuelium's paper batteries

industry. Having defended his PhD in 2008, he went to the then fledgling IBEC to do a year's postdoc with Josep Samitier before taking up a senior postdoc position at MIT working on a high-throughput single cell analysis platform for immunobiology. “When I came back I went to ISGlobal to do another postdoc that was more focused on producing technology.”

This second foray into the world of technology transfer was the clincher. “I realized that TT is more than just applying research to the market,” he says. “It's

“It's so much easier when you have a pool of people you already trust”

a completely different world. The people are business people; they have MBAs.”

As luck would have it, some former collaborators were on the verge of launching a start-up. “We'd worked together on batteries and fuel cells applied to analytical systems, and we'd had a cover of *Lab on a Chip* in 2011,” he says. “The idea was to produce a ‘paper battery’ which works in a similar way as a test paper for analytics: they're activated by a sample on one end,

and energy is produced. It's an environmentally friendly alternative to power sources in single-use devices such as pregnancy or drug tests.”

Marc came on board at Fuelium as CTO in 2015 and is now CEO. “Luckily we had an acceleration grant from Fundació Repsol that included training,” he remembers. “We went from a prototype to a product and now we're in contact with a company that wants to scale it up.”

Marc's advice for young scientists hoping to take a similar path is to treasure your contacts. “At the beginning, even if you have a great idea, it's difficult to attract good people,” he says. “But at Fuelium we've got another IBEC alumnus, Oscar Castillo, and a former IRB colleague, Sílvia Vilaprinyó—and we've just stolen Mateu Pla from IBEC, too! It's so much easier when you have a pool of people you already trust.”

Marc's other advice stems from his time at MIT. “If you can, as early as you can, go abroad,” he says. “Do your PhD in another country. Do your undergrad studies there, if you can. It's never too early. I was amazed at the level of the PhD students in the USA.”

Finally, he says, don't forget to have fun. “When I was doing my PhD we felt privileged to be part of a time when bioengineering was just emerging and we were building everything up, including the first steps towards the creation of IBEC,” he says. “We had a sort of freedom to operate that you don't have once everything is set up and all the infrastructures are in place. Everything took longer, but we were learning so much. Now it's just publish or perish.

“Don't get frustrated, though, because there are many other options apart from academia,” he adds. //

Locating the lost

Spread the word among your former group members and colleagues about IBEC's Alumni Network. Open to anybody who's spent more than three months at IBEC, the Network offers free access to IBEC events (symposia, training courses, etc); speaker and networking opportunities at alumni seminars throughout the year; alumni workshops; the IBEC Alumni Association mailing list; an associated LinkedIn network with up-to-date profiles of alumni, as well as IBEC information such as news and jobs; an IBEC alumni webpage with information on the association and people profiles; and a way to hear about alumni news and success stories, and keep in contact.

Visit <http://alumni.ibecbarcelona.eu> for more details, or to sign up. //

Faster Future raises €19,360

Faster Future, a new IBEC initiative that aims to help accelerate research projects that are close to tackling major challenges in health, was open for donations from November to February.

Generous donors gave a total of €19,360 via the initiative, which was launched in time for 2017's Giving Tuesday.

The focus of this first round was a 'muscle-on-a-chip' being developed by Javier Ramon's Biosensors for Bioengineering group which will use a patient's own cells to study muscular dystrophy. As well as modelling the patient's disease in a personalized way, the platform will also allow



Above: Javier Ramon's muscle-on-a-chip for MD was the focus of IBEC's first Faster Future campaign. Below: the Faster Future website



the study of different drugs or treatments in conditions that mimic the body as closely as possible, as well as offering a more reliable alternative to animal models.

"We had a tremendous response to our first Faster Future campaign, especially as we only had a month to put it all together," says David Badia, IBEC's Managing Director. "I'm extremely grateful to all the donors, be they individuals or companies, who helped us make this project a reality."

The campaign isn't over yet, though. Still to come is a special event to thank the donors and invite a fresh round of giving to help bring the total up to €25,000, which will mean that the project can now enter its last stages: equipping the chip's muscle tissue with biosensors, validating the platform, and drug testing. //

IBEC active in Spain's preparation for FP9



In January, IBEC group leader Elena Martínez (far right) presented IBEC and its position on the next EU Framework Programme for Research and Innovation, FP9, at a meeting in Madrid.

The 'Jornada informativa sobre los trabajos preparatorios del 9º Programa Marco de Investigación e Innovación de la UE 2021-2027', which took place at the Ministerio de Economía, Industria y Competitividad (MINECO) on 22nd January, was one of MINECO's actions to define the position of Spain in the face of FP9, which will run from 2021 to 2027.

Secretary of State for Research, Development and Innovation Carmen Vela (second from left) opened the meeting, which was a welcome opportunity for IBEC and other major national players in the research arena – including CSIC,

CDTI, and various academic and industry representatives – to prepare for FP9 and present a united front for Spain.

"Participating in a day like this has been a good opportunity to position IBEC as a benchmark in the Spanish R+D+i strategy," says project manager Javier Selva. "In fact, the CEO of CDTI, Francisco Marín, who was moderating the round table, presented IBEC as 'a flagship in our R+D+i system, a centre to watch, and one of the centres where they have been able to innovate'."

Not only that, but IBEC is one of the national entities participating in the definition and outline of the Spanish Roadmap as a selected participant in the periodic planning meetings. The appointment was made at the last assembly on 15th March at MINECO. //

Steering a health flagship

IBEC is one of 16 European organisations that make up the steering committee of a FET Flagship proposal, Trans4mMED, on personalised and patient-centred healthcare.

Under the leadership of Rui L. Reis, Vice-Rector of Research and Innovation at the University of Minho in Portugal, Trans4mMED (Transformative Patient Centred Personalised Medicine Initiative) proposes that current research efforts be restructured to move from a multidisciplinary to a transdisciplinary approach, and that stakeholders converge to achieve healthcare that is more predictive than reactive.

FET Flagships are one of the most prestigious, highly-funded, strongest and game-changing instruments of EU research. So far only two FET Flagships have been approved: Graphene and the Human Brain Project.

More than 380 stakeholders, including academia, research, industry, associations and societies,

and authorities including ministries, are supporting the ambitious and large-scale proposal. If approved, Trans4mMED will start by designing a scientific and technological roadmap covering basic and applied research on tissue engineering, biomaterials, biofabrication, biosensors, stem cells, nanotechnology, multi-omics, big data, imaging and other fields, and sets out ways to overcome fragmentation by converging these fields in four patient-centred healthcare pillars. //





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NEWS from the PhD COMMITTEE



Maintaining the work-fun balance

IBEC's PhD committee keeps everyone – from new master students to postdocs and from technical assistants to core facilities members – glued together with their social and intellectual activities, and recent months have been no different. In October, the committee organized another bowling day, at which Carlos Perez from Xavier Trepas's group won by a huge margin. This was followed by a lab tour during November, and the 'Architecturing' team-building event and best Christmas decorations competition at the IBEC Christmas party, won

by Helena Lozano and Andrés Marco.

Fast forward to this year, when a 'Cineforum' showing of Ridley Scott's *Bladerunner* was organized during February, and March's annual calçotada was attended by more than 60 people, with 400-500 calçots devoured.

In other news, the committee saw the exit of a few old members, which was balanced by the entry of some enthusiastic new ones. Despite the changes, it is of little doubt that the PhD committee will carry on keeping us entertained! - *Harishankar Balakrishnan*

OUTREACH NEWS

Going crazy

2018 is the first year that IBEC is taking part in "Bojos per la Ciència" (Crazy about Science), the Fundació Catalunya-La Pedrera initiative that aims to encourage scientific vocation.

First launched in 2013, Bojos offers courses to selected high school students who show aptitude in science. IBEC's course on bioengineering has 25 people enrolled, and 43 researchers and 3 support staff will contribute to the 21 theoretical-



practical sessions on Saturdays from January to October. //

BIOSPINners London-bound

Two members of IBEC's Biomedical signal processing and interpretation (BIOSPIN) group have been awarded Long-Term Research Fellowships from the European Respiratory Society (ERS), an international organisation that brings together physicians, scientists and other experts working in respiratory medicine.

The fellowships are enabling post-docs Manuel Lozano and Luis Estrada to spend research stays at King's College London in the framework of a joint project to develop new tools for the assessment of respiratory muscle activity led by BIOSPIN group leader Raimon Jané and KCL researchers Caroline Jolley and John Moxham.

Manuel's work involves studying the relationship between invasive and non-invasive measures in healthy subjects and analysing how these measures improve the evaluation of respiratory muscle function in chronic obstructive pulmonary disease (COPD) patients. Luis' research involves the study of COPD patients with and without left heart failure comorbidity to provide novel knowledge from biomedical signals to address the limitations of current diagnostic and health monitoring systems of clinical status in these patients. BIOSPIN members Abel Torres and Leonardo Sarlabous are also participating in the project.

It's hoped that the collaboration will form the foundation for a long-term cooperation between the IBEC and KCL groups, combining their expertise in biomedical signal processing and clinical respiratory physiology. //

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// On February 14th, Managing Director David Badia, Coordinator of Events & Outreach Pilar Jiménez and Head of Strategic Initiatives Teresa Sanchis presented **IBEC's 1071€ cheque to Amics de La Gent Gran**, a non-profit organization that works to improve quality of life for the elderly. The money was raised by partygoers at the IBEC Christmas Party 2017.

// **Samuel Sánchez** and **Nuria Montserrat** were two of the 'important personalities in biotechnology and nanotechnology' – the third was ICFO's Romain Quidant – who gave talks at a Health and Research Day, "Tecnologia per a la Medicina del Futur", at Bellvitge Hospital on 15th February, part of the Mobile World Congress 2018. Albert Barberà, Director de Recerca i

Innovació in GENCAT's Departament de Salut, was the moderator.

// In February **Silvia Muro** gave a talk, 'Mechanistic Parameters Ruling Receptor-Mediated Transport of Nanotherapeutics', at the U.S. National Institute of Standards and Technologies. A NIST group plans to team up with Silvia to test their organs-on-a-chip with targeted nanomedicines.

IBEC PEOPLE



Silvia Muro, who joined IBEC at the end of 2017 as an ICREA research professor, will carry out research into macromolecular nano-assemblies which can be loaded with drugs to target chronic conditions such as neurodegenerative, cardiovascular or metabolic diseases. She received her PhD in Molecular Biology from the University Autònoma of Madrid, after which she took up fellowships and postdoctoral appointments in Spain, Canada, Denmark and the USA. She received the UMD Outstanding Life Sciences Invention of the Year award in 2011 and the Junior Faculty Outstanding Engineering Research award in 2012, and is a standing member of the NIH Nanotechnology (NANO) Study Section. She spent the last twelve years as faculty first at the University of Pennsylvania and then the University of Maryland.

AWARDS AND HONOURS

Nanomalaria joint unit head **Xavier Fernández-Busquets** and artist Marc Cirera's cryo-transmission electron microscope image 'Paisaje helado 1' (right) was chosen as Image of the Month for the Pinacoteca de la Ciencia, a competition run by the Spanish Society for Biochemistry and Molecular Biology (SEBBM). Another of their images won last April.

Maria Valls from IBEC's Biomimetic Systems for Cell Engineering group won a PIONER prize from CERCA for her doctoral thesis in 2017. She's the second ever IBEC winner of one of these prestigious prizes, which since their launch in 2014 have recognised theses with results that are clearly aimed at commercial exploitation.



One of IBEC's mentees under the BATX2LAB programme was a prize winner in March for the best research project. In BATX2LAB, organised by the PCB and CatalunyaCaixa, researchers are assigned as tutors to secondary school pupils who are starting their A-level/Baccalaureate research projects. Winner Samira Boumediane, who goes to school at the Instituto Joaquim Rubió i Ors, carried out her project under the supervision of **Davia Prischich**, a PhD student in IBEC's

Nanoprobes and Nanoswitches group (second from right, with Samira, her teacher, and PCB director Ignasi Belda).

Former Biomaterials for Regenerative Therapies PhD student **Aitor Aguirre** has obtained a Tenure Track in the Department of Biomedical Engineering of Michigan State University's Institute for Quantitative Health Science, one of the world's top 50 biomedical institutions.

Santiago Marco, group leader of IBEC's Signal and Information Processing for Sensing Systems group, has been selected to be on the editorial board of *Sensors*, a first quartile journal on instrumentation.



HAVE YOUR SAY

Have Your Say poses a question to the community in the weeks preceding the publication of *InsideIBEC*, where the top three answers are published.

In Have your Say #1, we asked: **What do you think about Artificial Intelligence (AI) as the future of science? Will it be positive, as Isaac Asimov expected, or could it be harmful, as portrayed in the movies?**

"AI will permeate most aspects of society in the future, and science will be no exception. I expect the consequences to be mainly positive: AI could help us to advance science further than we could on our own." *Héctor López Carral, SPECS*

"If we work on the right questions, AI has enormous potential for improving quality of life. But if we misuse the capacity of the devices to extract and analyse data in a massive way, it can bring devastating consequences. So the problem is not with AI itself, but with humanity!" *Ester Sánchez, Assistant to the Director*

"AI has immense potential to be the science of tomorrow. An attempt to create 'intelligence' artificially may be mankind's ultimate 'self-reflection'. It could aid in culmination of centuries of thinking about philosophy, religion, psychology, physics, biology, chemistry and millions of other fragmented sciences and non-sciences that we have developed to explain ourselves and the world that we live in." *Madhura Murar, Nanoscopy for Nanomedicine*

These commenters win a T10 metro ticket each. Many thanks to everyone who wrote in, and keep your eyes peeled for the next edition of Have your Say!



IBEC in pictures

This was the moment that IBEC group leader Pere Roca-Cusachs received the City of Barcelona Award 2017 for the life sciences from Barcelona mayor Ada Colau. The prizes, now in their 17th edition, recognize outstanding creativity and research carried out in Barcelona that contribute to culture and society in the city. IBEC director Josep Samitier also holds a City of Barcelona Award, which he won for technology in 2003.