IBEC ANNUAL REPORT 2018

In review

IBEC
Institute for Bioengineering of Catalonia

EXCELENCIA SEVERO OCHOA

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Contents

Introduction

In calendar terms, 2018 was the start of our second decade of activity, and represented another great year in the evolution of IBEC and the first in the deployment of our new 2018-2020 Strategic Plan. The Annual Report is, as ever, our usual round-up of the highlights and statistics that show IBEC's consolidation as a global benchmark in bioengineering.

By 2018, IBEC had produced 146 indexed scientific papers, 76% of them in the first quartile; 5 new patents and 11 PhD theses. Highlights during the year included the successful consolidation by our International Scientific Committee of IBEC junior group leaders Dr. Lorenzo Albertazzi and Dr. Nuria Montserrat, who also obtained an ICREA professorship. Dr. Benedetta Bolognesi joined IBEC as an IBEC junior group leader for the Protein Phase Transitions in Health and Disease group. IBEC group leader Dr. Pere Roca-Cusachs received three awards: the ICREA Acadèmia award, the SBE-40 prize from the *Sociedad de Biofísica de España* and the City of Barcelona Award 2017 for Life Science. IBEC group leader and ICREA professor Xavier Trepat was elected member of the prestigious European Molecular Biology Organization (EMBO).

During this year, the institute boosted its global links by planting the seed for a promising partnership between IBEC and the Eindhoven University of Technology (TU/e). On a national level, IBEC joined forces with the *Federación Española de Enfermedades Raras (FEDER)* to collaborate on solutions for rare diseases, and became a member of the RIS3CAT LLAVOR 3D community for additive manufacturing and 3D printing. We attended the third "IN(3D)USTRY" event, reinforcing our role as a driving force in this sector. We received the *Segell de Qualitat Educativa* (seal of educative quality) from the Consell de Coordinació Pedagògica of Barcelona City Council's Institute of Education in recognition of the quality of IBEC's outreach activities. In addition, this year was the first time that IBEC took part in the *Fundació Catalunya La Pedrera's 'Bojos per la Ciència'*. Furthermore, we carried out IBEC's first Faster Future fundraising campaign. This time, the initiative raised money to support research on muscular dystrophy. With our professional, legal and ethical responsibilities in mind, we launched the Code of Conduct for Research Integrity, a framework for good research practice.

On top of that, in October, an international panel chair from the CERCA institute carried out an evaluation of IBEC's last four years of activity, in which we scored an A, the highest possible rating. This recognition is a source of pride and serves for all of us as a stimulus to continue working with the same effort and dedication.

We also received visits from a number of eminent personalities and organizations who wanted to see at first hand the research being done at the institute: Dr. Teresa Riesgo Alcaide, the new Director General of Research, Development and Innovation of the Spanish Ministry of Science, Innovation and Universities (MINECO), Mr. Cyril Piquemal, the General Consul of France in Barcelona and a delegation of Barcelona Global association members.

In the short term, there are new challenges on the horizon: the new IBEC Strategic Plan, our new translational Openlab initiative, new international alliances, and many other issues to tackle, and always with the same overall goal: to develop excellent research and technology in bioengineering. With such strong global positioning, and thanks to such fantastic efforts being put in year after year by each and every one of IBEC's researchers and staff, we look forward to another successful year in 2019.

Josep Samitier
Director of IBEC

2018 in review: News

Scientific Highlights 2018

JANUARY

NANOMOTORS CAN BE PROPELLED BY LIGHT

Researchers working at IBEC and the Max Planck Institute for Intelligent Systems have developed nanomotors that are powered by a fuel-free, biofriendly and unlimited power source: light.

Nano- and micromotors, man-made devices with huge potential in biomedical situations – as drug delivery systems, for example – have typically focused on catalytic motors to propel them through their surroundings.

Xu Wang et al (2018). Fuel-free nanocap-like motors actuated under visible light Adv.Funct.Mat, (DOI: 10.1002/adfm.201705862)

A MATERIAL THAT ENCOURAGES BLOOD VESSELS TO FORM

In a further step forward in their quest to achieve functional biomaterials for tissue regeneration, IBEC's Biomaterials for Regenerative Therapies group has revealed a new construct that enhances blood vessel formation and maturation in vivo.

In the paper published in Acta Biomaterialia at the end of last year, the group and their collaborators at the Georgia Institute of Technology present a new implantable hydrogel that contains both human mesenchymal stromal cells (hMSCs) and calcium-releasing microparticles.

Navarro-Requena et al (2017). PEG hydrogel containing calcium-releasing particles and mesenchymal stromal cells promote vessel maturation. Acta Biomater. S1742-7061 (17) 30765-1

FEBRUARY

OBESITY STUDY ON FRONT COVER OF PROTEOMICS – CLINICAL APPLICATIONS

Researchers working at the Signal and Information Processing for Sensing Systems group and at the Nestlé Institute of Health Sciences have published a study selected as the front cover of a special issue of the journal Proteomics: *Clinical Applications*.

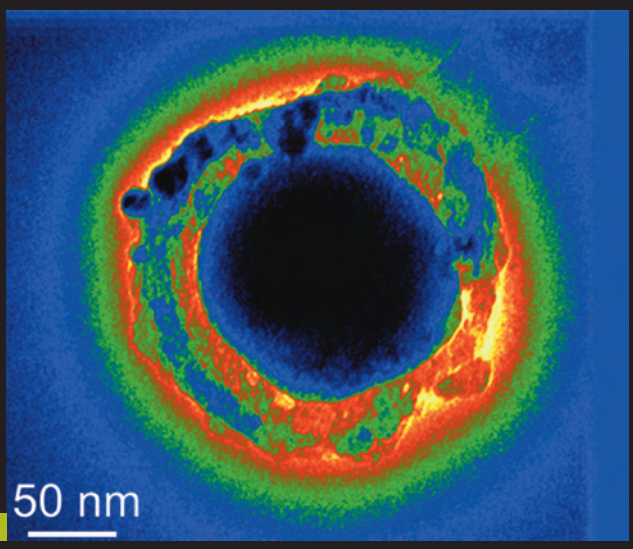
The paper, whose first author is PhD student Sergio Oller, identifies proteins associated with weight loss and maintenance, and explores their relation to body mass index, fat mass, and insulin resistance and sensitivity, identifying potential biomarkers for weight loss and maintenance.

Sergio Oller et al (2018). The differential plasma proteome of obese and overweight individuals undergoing a nutritional weight loss and maintenance intervention. Proteomics – Clinical Applications, Special Issue: Proteomics of Diabetes, Obesity, and Related Disorders, 12, 1

A MECHANISM THAT REGULATES NEUROGENESIS IN THE ADULT BRAIN

Scientists from IBEC's Molecular and Cellular Neurobiotechnology group have discovered a protein and its receptor that control the spread of adult stem cells in the hippocampus, the part of the brain responsible for memory.

The discovery could shed light on the mechanisms involved in memory, the development of neurodegenerative diseases such as Alzheimers, or in the development of brain tumors caused by the uncontrolled proliferation of various cell types.



Energy-filtered TEM image of a single Au/TiO2 nanocap.

The study, with recently awarded doctorate students Ágata Mata and Vanessa Gil as first authors, identified the protein Sema3E and its receptor PlexinD1 (known together as Sema3E-PlexinD1) as regulators of the proliferation of adult stem cells of the hippocampus. This is new role for Sema3E-PlexinD1, which until now has been known for its role in the formation of specific connections and synapses during brain development.

Agata Mata et al (2018). New functions of Semaphorin 3E and its receptor PlexinD1 during developing and adult hippocampal formation. Scientific Reports 8, 1381

OXIDATION NECESSARY FOR RECOVERY AFTER SPINE INJURIES

Researchers at IBEC, in collaboration with Imperial College London, have discovered that oxidizing species – chemicals such as peroxides that form during the metabolism of oxygen – regulate the regeneration of damaged neurons after spinal cord injuries.

Anti-inflammatories and antioxidants: these are the treatments usually given to nerve or spinal injury patients to mitigate the damage. When a nerve is injured, inflammation occurs and the immune system is activated, which sends macrophages – immune cells typically associated with inflammatory processes – to clean up the damaged area.

A. Hervera et al (2018). Reactive oxygen species regulate axonal regeneration through the release of exosomal NADPH2 oxidase complexes into injured axons. Nature Cell Biology, 20, 307–319

SHEDDING LIGHT ON METASTASIS IN THE BRAIN

Researchers have shown for the first time that ion channels that are capable of detecting changes in the physical properties of the cellular environment play a key role in tumor invasion and metastasis.

Metastasis in the brain is common in breast cancer and one of the most common causes of death. To reach the brain, breast cancer cells must migrate from the tumor where they originated. They have to modify their shape and be able to move forward through the small spaces available. They also have to release some proteins that, like a drill, break down the barriers that appear during their journey. And finally, in the case of breast cancer cells that metastasize in the brain, they need proteins – serpins – that overturn the natural defenses of the brain, allowing the growth of the tumor in its new location.

C. Pardo-Pastor et al (2018). Piezo2 channel regulates RhoA and Actin cytoskeleton to promote cell cell mechanobiological responses. Proceedings of the National Academy of Sciences

MARCH

SYNTHETIC ENZYMES FOR CONTROLLED DRUG DELIVERY IN CELLS

The Nanoscopy for Nanomedicine group has studied Single-Chain Polymeric Nanoparticles (SCPNs) mimicking enzymes as possible drug activators in biological environments, like the living cell.

Through their study, published in *JACS*, the researchers have optimized the delivery strategies of dynamic SCPNs so that they retain their catalytic activity at the cellular environment. This paves the way towards the rational design of nanosystems that can perform effective catalysis *in vivo*.

Yiliu Liu et al (2018). Catalytically Active Single-Chain Polymeric Nanoparticles: Exploring Their Functions in Complex Biological Media. J. Am. Chem. Soc., 140(9):3423-3433

Scientific Highlights 2018

APRIL

CELLS COMMUNICATE BY CHANGING THEIR ENVIRONMENT

Researchers at IBEC and MIT have shown that cells could use their environment to mechanically communicate with each other within tissues. It's a bit like when an army cadet pulls some rope netting taut so that his friend can safely ascend.

To nourish our organs and tissues, cells need to constantly detect and respond to the mechanical stimuli from their environment. Generally, cells that make up the tissues in our bodies are immersed in an extracellular matrix (ECM), a biopolymer made of proteins and glycoproteins such as collagen or fibrin. This ECM provides the cells with a way to interact with other cells, obtain nutrients, eliminate waste and ultimately form an integral and functional tissue.

Yu Long Han et al (2018). Cell contraction induces long-ranged stress stiffening in the extracellular matrix. PNAS, 115 (16) 4075-4080

MAY

YOUNG AT HEART: NOVEL TEMPORAL WINDOW OF CARDIAC REGENERATION

A study carried out at CMR[B] in collaboration with IBEC and the UB has established that the ability of the heart to regenerate after a wound is related to the stiffness of its cellular environment and not only to the proliferative capacity of the cardiac cells, narrowing the window of regeneration to 48 hours after birth.

The research, published in Science Advances, paves the way for the development of therapies based on the pharmacological modification of the extracellular matrix to promote tissue regeneration after a heart attack or stroke.

Mario Notari et al (2018). The local microenvironment limits the regenerative potential of the mouse neonatal heart. Science Advances, Vol. 4, no. 5, eaao5553

IBEC RESEARCH ON COVER OF TRENDS

Alberto Elosegui-Artola, Xavier Trepat and Pere Roca-Cusachs' paper in Trends in *Cell Biology* has made the cover of the latest issue of the Cell-family journal.

In 'Control of Mechanotransduction by Molecular Clutch Dynamics', the IBEC researchers review how cell dynamics and mechanotransduction are driven by molecular clutch dynamics.

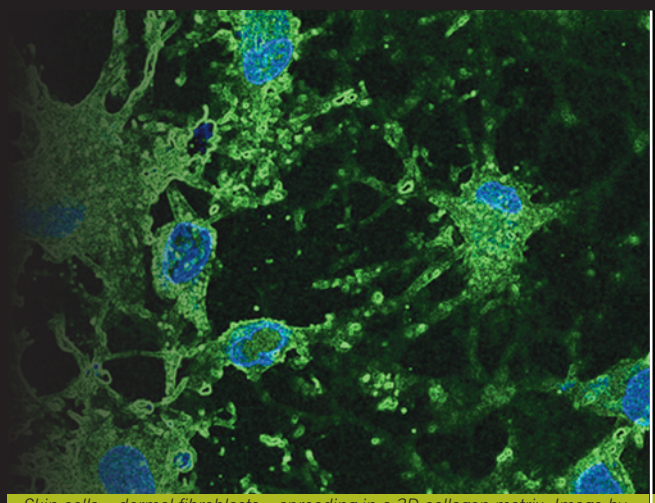
The molecular clutch hypothesis suggests a mechanism of coupling between integrins and actin during cell migration, whereby a series of bonds that dynamically engage and disengage link cells to their microenvironment.

Alberto Elosegui-Artola et al (2018). Control of Mechanotransduction by Molecular Clutch Dynamics. Trends in Cell Biology, 28, 5, p356–367

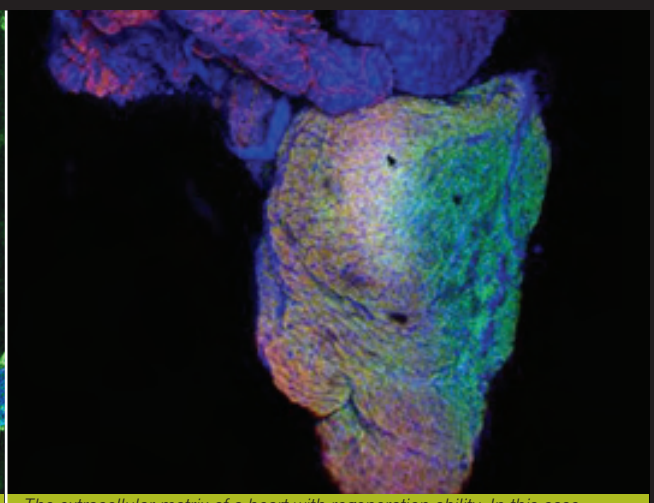
SUPER-RESOLUTION IMAGING GUIDES THE DESIGN OF BIOCOMPATIBLE MICROSWIMMERS

Two IBEC groups have clubbed together to combine their expertise and reveal new knowledge that could advance the design of micro- and nanomotors for applications in health.

By harnessing the unprecedented resolution of Lorenzo Albertazzi's group's STORM microscope, Samuel Sánchez's group – in collaboration with Erik Schäffer's group at the



Skin cells – dermal fibroblasts – spreading in a 3D collagen matrix. Image by Claudia Navarro-Requena.



The extracellular matrix of a heart with regeneration ability. In this case, a zebrafish heart was used for easier visualization. Source: CMR[B] .

University of Tübingen – have been able to reveal new information about how their enzyme-powered nanomotors achieve motion.

Motors that use enzyme catalysis to self-propel are some of Samuel's Smart Nano-Bio-Devices group's most promising nanomachines, as they offer more biocompatibility and versatility than others that use traditional toxic fuels such as hydrogen peroxide, and thus offer potential as safe capsules for targeted drug delivery. The group's recent research has achieved self-propelling nanomotors powered by enzymes such as urease or glucose oxidase, but nevertheless, the key parameters that underlie the moVenzyme-powered machines are still not completely understood.

Tania Patiño et al (2018). Influence of enzyme quantity and distribution on the self-propulsion of non-Janus urease powered micromotors. J. Am. Chem. Soc. 140 (25), pp 7896-7903

JUNE

BACTERIA NEED VITAMINS TOO

IBEC's Bacterial infections: antimicrobial therapies group has revealed the essential role played by a vitamin in the development of a common bacterial biofilm.

This new knowledge could play a part in understanding the spread of these bacteria, which will help towards the better design of targeted antibacterial drugs.

Anna Crespo et al (2018). Aerobic Vitamin B12 Biosynthesis Is Essential for Pseudomonas aeruginosa Class II Ribonucleotide Reductase Activity During Planktonic and Biofilm Growth. Front. Microbiol. 9:986

PHYSICAL FORCES REGULATE CELL DIVISION

Researchers at IBEC have discovered that cell division in epithelial tissues is regulated by mechanical forces.

This revelation could potentially open avenues to a greater understanding of the uncontrolled proliferation of cancer cells in tumors, and their possible regulation by means of physical forces.

Publishing in the June edition of *Nature Cell Biology*, the research group of ICREA professor Xavier Trepat, group leader at IBEC and associate professor at the University of Barcelona (UB), describe how the mechanical state of epithelial tissues – the continuous sheets of cells that cover all the exposed surfaces of the body – is related to the cell cycle and cell division.

Marina Uroz et al (2018). "Regulation of cell cycle progression by cell–cell and cell–matrix forces". Nature Cell Biology, 25 May 2018. Doi:10.1038/s41556-018-0107-2

WATER CAN BE DEAD, ELECTRICALLY SPEAKING

Research led by the University of Manchester's National Graphene Institute, in collaboration with IBEC, reveals that water that's only a few molecules thick – like the water that covers every surface around us – behaves very differently to normal, 'bulk' water.

Water is one of the most fascinating substances on Earth. At the heart of its many unusual properties is its high polarizability – that is, its strong response to an applied electric field.

Now, though, researchers have found that water that's only a few molecules thick – like the water that covers every surface around us – behaves very differently to normal, 'bulk' water. Publishing in *Science*, they reveal that when in thin layers, water loses its polarizability, becoming electrically 'dead'.

L. Fumagalli et al (2018). Anomalously low dielectric constant of confined water. Science, 22 Jun 2018: Vol. 360, Issue 6395, pp. 1339-1342. DOI: 10.1126/science.aat4191

JULY

INSPIRATION FROM A CARPENTER'S TOOLBOX

IBEC's Smart-Nano-Bio-Devices and Nanobioengineering groups have joined forces to solve the problem of random movement of micro- and nanomotors.

Samuel Sanchez's group has been forging ahead with its creation of self-propelling micro- and nanodevices in the last few years. These chemically powered 'swimmers' are self-propelled by catalytic reactions in fluids – which could be the fluids of our body, or water – and have a number of promising applications, such as targeted drug delivery, environmental remediation, or as pick-up and delivery agents in lab-on-a-chip devices.

Jaideep Katuri et al (2018). Directed Flow of Micromotors through Alignment Interactions with Micropatterned Ratchets. ACS Nano, 12 (7), pp 7282-7291

BIOMATERIALS AS SIGNAL-RELEASING PLATFORMS

IBEC's Biomaterials for Regenerative Therapies group has published a review of the state-of-the-art in biomaterials for skin healing that proposes a move towards more personalized, *in situ* therapies.

Skin wound healing repairs and restore tissue through a complex process that involves different cells and signalling molecules that regulate cellular response and the remodelling of the extracellular matrix. Publishing in *Advanced Drug Delivery Reviews*, the article begins by summarizing recent advances in therapies for healing that combine biomolecule signals such as growth factors and cytokines with cells.

Oscar Castaño et al (2018). Instructive microenvironments in skin wound healing: Biomaterials as signal releasing platforms. Advanced Drug Delivery Reviews, 129, 95-117

NATURE PHYSICS' 'INSIGHT' ISSUE FEATURES IBEC/CRICK ARTICLE

A review by IBEC group leader and ICREA research professor Xavier Trepat is one of six featured in *Nature Physics' latest 'Insight'* issue, 'The Physics of Living Systems', in which all the articles have been co-authored by a physicist and a biologist.

Penned together with collaborator Erik Sahai from London's Francis Crick Institute, Xavier's article, 'Mesoscale physical principles of collective cell organization', reviews recent evidence showing that cell and tissue dynamics are governed by mesoscale physical principles – force, density, shape, adhesion and self-propulsion.

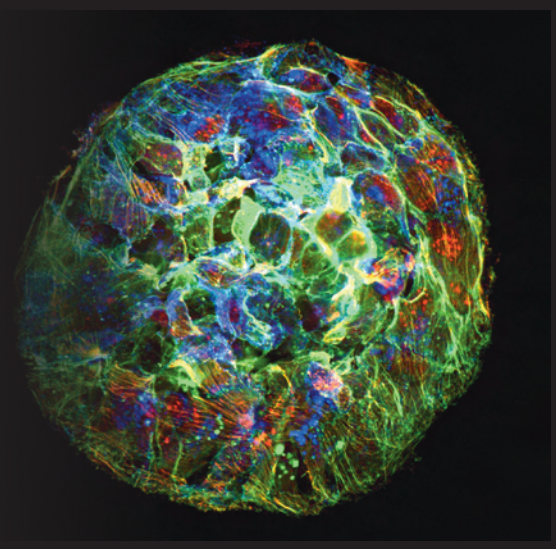
The work described in the review forms part of MECHANOCONTROL, the largest European project ever coordinated at IBEC, which is funded by Horizon 2020's FET Proactive programme

AUGUST

IMPROVING IN VITRO MODELS TO STUDY THE HUMAN INTESTINE

IBEC's Biomimetic Systems for Cell Engineering group has published a review about possible new strategies to study drug absorption in the intestine in the high-ranking journal *Trends in Molecular Medicine*.

Together with their collaborators at the Universidade do Porto, Elena Martinez's group examines the current state-of-the-art of cell-based intestinal models, which have been used for drug absorption and metabolism studies since the 1980s. However, current models, which use Caco-2 cells derived from human intestinal tumors, are not fully representative of the human small intestine.



Breast cancer cells attached to a surface rich in collagen. The actin cytoskeleton can be seen in green, coated with active myosin (ppMLC) in red, and the cell-cell junctions (E-cadherin) in blue.

Maria Helena Macedo et al (2018). iPSC-Derived Enterocyte-like Cells for Drug Absorption and Metabolism Studies. Trends in Molecular Medicine, 24, 8, 696-708

The researchers placed breast tumor cells on a collagen-rich surface and observed how they spread. Technology developed by the IBEC group allowed them to measure the physical forces exerted by the cells during this process, something that had not been achieved until now.

Carlos Pérez-González et al (2018). Active wetting of epithelial tissues. Nature Physics , DOI:10.1038/s41567-018-0279-5

SEPTEMBER

SLEEP APNEA COULD PROMOTE TUMOR GROWTH IN THE YOUNG

A study published in the American Journal of Respiratory and Critical Care Medicine has revealed that sleep apnea could promote the growth of lung cancer in younger individuals.

Researchers from IBEC, the University of Barcelona and Hospital Clinic show that, contrary to expectation, age could be a protective factor against the rapid tumor development induced by this respiratory disturbance of sleep and its immediate consequence, intermittent hypoxia.

Torres, M. et al (2018). "Aging Reduces Intermittent Hypoxia-induced Lung Carcinoma Growth in a Mouse Model of Sleep Apnea". Am J Respir Crit Care Med. DOI: 10.1164/rccm.201805-0892LE

THE WAY TUMOR CELLS EXPAND CHALLENGES CURRENT PHYSICS

Researchers from IBEC and UB have discovered that the way tumor cells expand defies the laws of physics.

In an article published today in *Nature Physics*, the researchers have challenged our current understanding of the discipline and developed a new framework that could help predict the conditions under which tumors initiate metastasis.

OCTOBER

STONE ME!

The Signal and Information Processing for Sensing Systems group have revealed a new analytical technique that can be used to measure cannabinoids in plants and tobacco.

Working with the University of Cordoba, Santiago Marco's group tackled the limitations of current analytical techniques used to determine cannabinoids in *Cannabis sativa L.* plants, which mostly rely on chromatography-based methods, which involve separating the components in fluid.

M. del Mar Contreras et al (2018). Thermal desorption–ion mobility spectrometry: A rapid sensor for the detection of cannabinoids and discrimination of Cannabis sativa L. chemotypes. Sensors and Actuators B: Chemical, 273, 1413-1424

YOUR FACE IS PUSHED FORWARD FROM THE BACK OF YOUR HEAD

The embryonic stem cells that form faces – neural crest cells – use an unexpected mechanism to develop our facial features, according to a new UCL-led study involving IBEC researchers.
By identifying how these cells move, the researchers'

findings could help understand how facial defects, such as cleft palate and facial palsy, occur.

This newly described mechanism is likely to be found in other cell movement processes, such as cancer invasion during metastasis or wound healing, so the findings may pave the way to developing a range of new therapies for these, too.

Adam Shellard et al (2018). Supracellular contraction at the rear of neural crest cell groups drives collective chemotaxis. Science, Vol. 362, Issue 6412, pp. 339-343

SCIENTISTS DISCOVER SUPER-STRETCHY CELLS

One of the most enviable features of superheroes is their ability to stretch their bodies beyond imaginable limits. In a study published in Nature, scientists have discovered that our cells can do just that.

With every beat of the heart and every breath into the lungs, cells in our body are routinely subjected to extreme stretching. This stretching is even more pronounced when cells shape our organs at the embryo stage, and when they invade tissues through narrow pores during cancer metastasis – but how cells undergo such large deformations without breaking has remained a mystery until now.

Ernest Latorre et al (2018). Active superelasticity in three-dimensional epithelia of controlled shape. Nature , 563, 203-208

NOVEMBER

IS THE BOTTOM-UP APPROACH ENOUGH TO UNDERSTAND A WHOLE SYSTEM?

An opinion piece by IBEC group leader Xavier Trepat has appeared in the News and Views section of the current issue of *Nature*, which is devoted to 'Bottom-up biology'.

In his piece 'Bottom does not explain top', Xavier argues that understanding how complex biological structures – or even entire cells – are built can only provide a certain amount of insight into how biological systems function at higher levels of organization.

Good M. et al (2018). Cell parts to complex processes, from the bottom up. Nature, 563(7730):188-189

IBEC RESEARCHERS UNCOVER STRATEGY TO REDUCE CHEMOTHERAPY SIDE EFFECTS

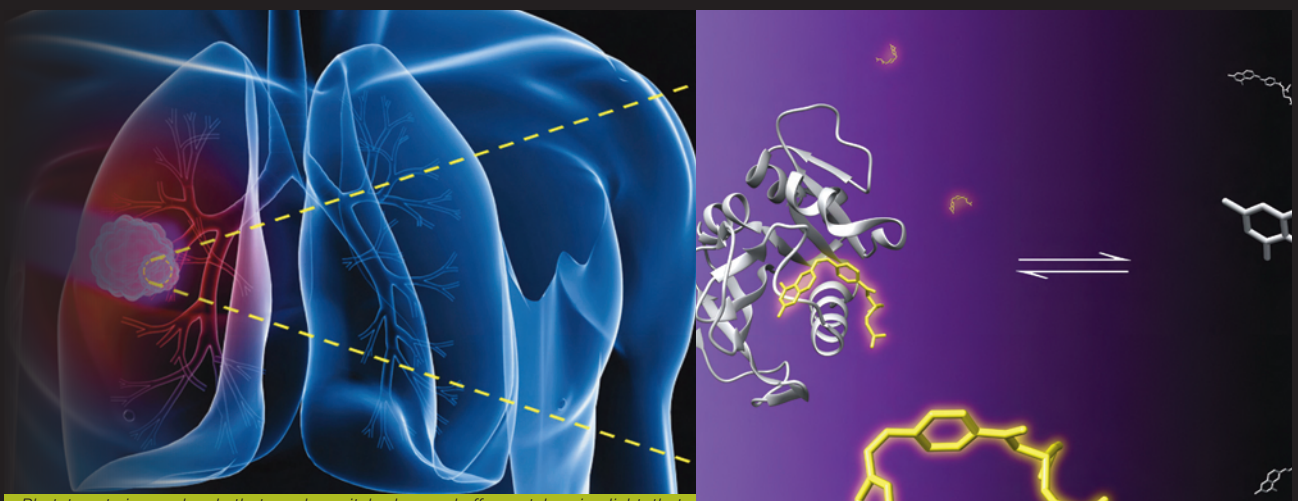
Researchers at IBEC and IDIBELL have developed a light-regulated molecule that could improve chemotherapy treatments by controlling the activity of anticancer agents.

Chemotherapy – the use of cytotoxic agents to kill the rapidly proliferating cells in tumors – is one of our main tools in the fight against cancer. However, its effectiveness and the body's tolerance of it is often dramatically limited: it can affect healthy areas rather than just the cancerous ones, which causes side effects.

Carlo Matera et al (2018). Photoswitchable Antimetabolite for Targeted Photoactivated Chemotherapy. JACS 140 (46), pp 15764-15773

IBEC CELEBRATES COPD BREAKTHROUGHS ON WORLD COPD DAY

IBEC's Biomedical Signal Processing and Interpretation (BIOSPIN) group have published a paper with King's College



Phototrexate is a molecule that can be switched on and off remotely using light, that acts as an inhibitor of the dihydrofolate reductase (DHFR).

London that offers new techniques to monitor COPD patients by non-invasive methods. COPD – chronic obstructive pulmonary disease – is a progressive lung condition with no cure in which the patient's airways become narrowed. Together with other mechanical abnormalities, airways obstruction increases the load on the respiratory muscles. This, in combination with respiratory muscle weakness in COPD patients, increases load-capacity imbalance and contributes to breathlessness.

M. Lozano-García et al (2018). Surface mechanomyography and electromyography provide non-invasive indices of inspiratory muscle force and activation in healthy subjects. Scientific Reports 8, 16921

DECEMBER

PROTEINS CAN TRANSFER ELECTRONS AT A DISTANCE

Collaborating IBEC groups have published a study in *Nature Communications* that reveals that electron transfer can take place while a protein is approaching its partner site, and not only when the proteins are engaged, as was previously thought.

The results open up a new way of thinking about how proteins interact, and can have implications in a better understanding of many processes – such as photosynthesis, respiration and detoxification – in which electron transfer plays an important role.

A. Lagunas et al (2018). Long distance electron transfer through the aqueous solution between redox partner proteins. Nature Communications, 9, 5157

TWO PROMISING AVENUES IN THE FIGHT AGAINST ANTIBIOTIC RESISTANCE

IBEC's Bacterial infections: antimicrobial therapies group have published two papers offering new hope in the urgent search for antimicrobials.

"We desperately need antimicrobials," says Eduard Torrents. "Antibiotic resistance is one of the greatest threats to human health today, and the time is fast approaching when routine procedures will be much more risky."
Not only have some common infections or illnesses become resistant to the antibiotics usually used to treat them, a really pressing medical problem now is the rapid rise of 'superbugs' or multidrug-resistant bacteria, which are immune to almost all of the antibiotics that are currently available.

Laia Miret-Casals et al (2018). Hydroxylamine Derivatives as a New Paradigm in the Search of Antibacterial Agents. ACS Omega 3 (12), pp 17057–17069

3D BIOPRINTED ROBOTS

IBEC's Smart Nano-Bio-Devices group – the institute's experts in micro- and nanorobots – have used 3D bioprinting to produce 'biorobots' made of biological elements such as muscle tissue.

These bio-inspired soft robotic devices could offer many more capabilities for movement and performance – such as real-time bio-sensing, self-organization, adaptability, or self-healing – than existing systems, which use solely artificial materials.

Rafael Mestre et al (2018). Force Modulation and Adaptability of 3D - Bioprinted Biological Actuators Based on Skeletal Muscle Tissue. Advanced Mat. Technologies, DOI: 10.1002/admt.201800631

2018 in review: News

Other Highlights 2018

JANUARY

IBEC A KEY PLAYER IN FET FLAGSHIP PROPOSAL

IBEC is on the Steering Committee of a Future Emerging Technologies (FET) Flagship proposal, the Personalised Health Care Initiative in Europe.

The large-scale initiative, if granted, will address the grand challenges of developing regenerative, precision and personalized medicine to improve the quality of life of billions of patients worldwide.

Coordinated from the University of Minho in Portugal, Personalised Health Care has a huge partner and supporter base of more than 125 academia and health institutes, 35 research institutes, 85 industry and associations, and 20 authority representatives. IBEC Director Josep Samitier and group leader Elisabeth Engel are among the 17 members of the steering committee, which includes academics and industry leaders from ten European countries, and the only ones from a partner located in Spain.

IBEC PROJECT WINS FUNDING FROM THE AECC

An IBEC group's project was granted funding from the Fundación Científica de la Asociación Española Contra el Cáncer in their 2017 Ayudas LAB AECC call.

Nuria Montserrat's group will work together with researchers from other Barcelona institutes and one of the city's major hospitals on the project 'Generation of Isogenic Models of Clear Cell Renal Cell Carcinoma using CRISPR-engineered Kidney Organoids, for the identification of diagnostic biomarkers'. They will receive support over a three-year period from the AECC Scientific Foundation, whose *Ayudas LAB* funds emerging groups to carry out projects in cancer that have obvious translational possibilities.

The project will develop a human model to study clear cell renal cancer, the most common type of kidney cancer. At present, there are no human models for this cancer, nor for the identification of early biomarkers, which would shed light on the molecular mechanisms of how the cancer starts and allow doctors to diagnose it and start treatments earlier.

FEBRUARY

A NEW SITE FOR IBEC

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.

JOINING FORCES WITH FEDER TO COLLABORATE ON SOLUTIONS FOR RARE DISEASES

IBEC has signed a collaboration agreement with the *Federación Española de Enfermedades Raras (FEDER)*, a non-profit organization that represents the three million people suffering from rare diseases throughout the country.

Rare diseases are those that affect fewer than 5 out of every 10,000 inhabitants. According to the WHO, there are about 7,000 such diseases affecting 7% of the world's population, so altogether they affect a huge number of people – and

Pere Roca-Cusachs wins the City of Barcelona Award.

they can appear at any stage of life. The agreement with IBEC will connect the institute with patients' associations to develop projects together that have a direct application according to the needs of sufferers.

PERE ROCA-CUSACHS WINS THE CITY OF BARCELONA AWARD

Pere Roca-Cusachs, group leader at IBEC and assistant professor at the University of Barcelona, won the 2017 City of Barcelona Award for the life sciences.

The prize comes after the publication of his study in *Cell* last year, where he identified a mechanism by which tissue rigidity regulates cell survival and proliferation, as well as its implications in diseases such as cancer and liver and lung fibrosis.

The City of Barcelona Awards are granted by Barcelona City Council, and the jury – Patrick Aloy, Juan Valcárcel, Cristina Subidas, Elena Casacuberta, and Neus Agell – were unanimous in their choice of Pere for the prize.

MARCH

LAUNCH OF SOMMA FOCUSES ON SAFEGUARDING THE COMPETITIVENESS OF SCIENCE IN SPAIN

SOMMa, the alliance of Spain's 25 Severo Ochoa centres – including IBEC – and 16 María de Maeztu units that aims to raise the national and international profile of science in the country, held a press launch on Monday at the Ministry of Economy, Industry and Competitiveness in Madrid.

At the event, the representatives of SOMMa, together with the Secretary of State for R&D&I Carmen Vela, presented the new alliance. "Joining this alliance allows us to join forces, increase our impact and encourage collaboration and networking," said Teresa García-Milà, vice-president of SOMMa and director of the Barcelona Graduate School of Economics (BGSE). "In short, we are enriching the R&D system of this country in the long term."

APRIL

TWO IBEC PROJECTS WIN IGNITE FUNDING FROM BIST

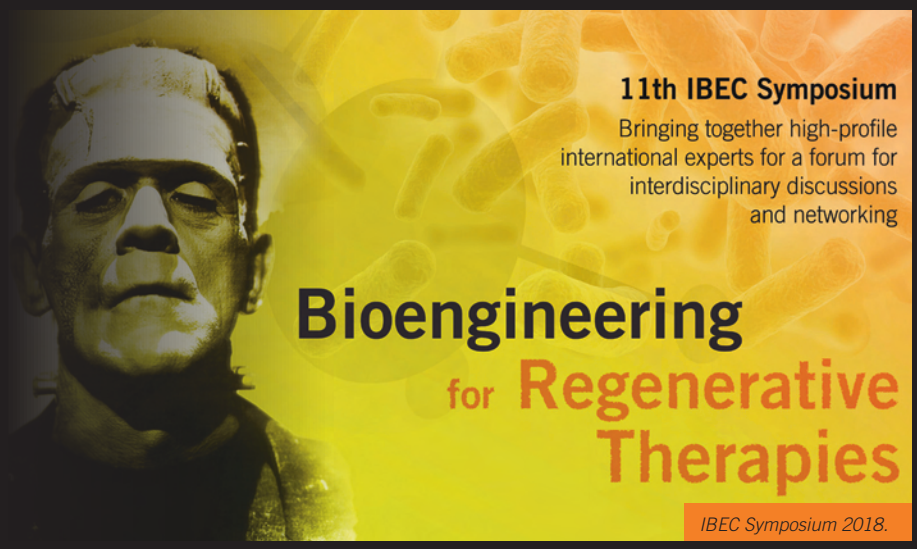
Two projects coordinated by IBEC group leaders have been successful in gaining funding through the Barcelona Institute of Science and Technology's IGNITE call, which promotes the initiation of new collaborations among BIST researchers and accelerate multidisciplinary research.

The projects were two of just five that were selected in the 2017 call to be funded through IGNITE's seed phase. The researchers will have eight months to develop them, after which, in a second phase, an additional award for a further 12 months is given to the two best projects from the five selected during the seed phase.

Observing photosynthesis is at the heart of the Quantum-controlled Single Protein Electron Transport (Q-SPET) project, coordinated by IBEC Group Leader and ICREA research professor Pau Gorostiza and Niek van Hulst at ICFO, which aims to measure quantum effects in photosynthetic protein complexes.

The other IBEC project, Engineered models of intestinal epithelial tissue: assessing in vivo-like functional properties (ENGUT), is led by IBEC's Elena Martínez and Emilio Gualda of ICFO. The project aims to come up with a new cell culture method that allows for in vitro production of epithelial tissue like that covering the inside walls of the intestine for use in basic research, diagnostics, drug assessment and for transplants and personalised regenerative medicine.

Other Highlights 2018



IBEC Symposium 2018.

PERE ROCA-CUSACHS WINNER OF THE SBE-40 PRIZE 2018

The Executive Council of the *Sociedad de Biofísica de España* has awarded the 2018 Enrique Pérez-Payá SBE-40 prize to Pere Roca-Cusachs, IBEC group leader and associate professor at the UB, for his outstanding contributions to uncovering the physical basis of cellular responses to mechanical signals.

The prize has been awarded every year since 2010 and is in memory of Dr. Enrique Pérez-Payá, who contributed to the development, translation and internationalization of biophysics in Spain.

Pere will deliver a talk and receive his award at the 6th Iberian / 10th Iberoamerican Biophysics Congress in Castellón on 20th-22nd June.

MIT-SPAIN GRANT FOR IBEC PROJECT, BIOENGINEERING AGAINST CANCER

IBEC is the recipient of one of twelve MIT-Spain "la Caixa" Foundation Seed Fund grants under a brand new funding programme in collaboration with the Massachusetts Institute of Technology.

The media presentation of the grants at Palau Macaya took place this morning, when IBEC Director Josep Samitier took part in a press conference. During the presentation Angel Font, Corporate Director of Research and Strategy at the "la Caixa" Banking Foundation, remarked particularly on IBEC's strong capacity for gaining competitive funding.

The "la Caixa" and MIT grants will aim to support research projects carried out jointly between Spanish universities and research groups and MIT research groups, boosting cooperation between faculty, researchers and students. The inititative is part of the MISTI Global Seed Funds programme, which promotes collaborations between MIT faculty and researchers and their counterparts abroad.

MAY

IT'S A WRAP! – IBEC'S FASTER FUTURE CAMPAIGN ENDS WITH A NIGHT AT THE MOVIES

To round off its first Faster Future fundraising campaign, IBEC is organizing an exclusive European film première of "I'll Push You", the inspiring story of Justin Skeesuck and Patrick Gray, the first people to complete the *Camino de Santiago* in a wheelchair.

Over the past 20 years, a progressive neuromuscular disease has slowly taken away Justin's ability to use his arms and legs. He requires daily assistance in every aspect of life such as eating, bathing and getting dressed. In the spring of 2012, Justin asked his best friend Patrick if he would help him complete the *Camino de Santiago,* the 500-mile pilgrimage trail in Northern Spain. Patrick's response was simple and direct: "I'll push you."

IBEC GROUP LEADER ELECTED MEMBER OF EMBO

IBEC group leader and ICREA research professor Xavier Trepat has been elected as a Member of EMBO, the European Molecular Biology Organisation.

EMBO's members are 1,800 leading researchers that promotes excellence in the life sciences, and new ones

are elected annually in recognition of their contributions to scientific excellence. Of the 62 researchers from 24 countries to receive membership this year, Xavier is one of the only two researchers in Spain.

The Integrative Cell and Tissue Dynamics group leader is IBEC's first full EMBO Member, and one of just 79 based in Spain. In 2016 IBEC group leader Pere Roca-Cusachs was accepted into the EMBO Young Investigator Programme.

JUNE

IBEC RESEARCHER PRESENTS THE STATE-OF-THE-ART OF ADVANCED MATERIALS FOR 3D BIOPRINTING

IBEC group leader Javier Ramón presented the state-of-the-art in 3D printing of biomaterials at a workshop organised by CatalunyaBio & HealthTech last week.

At 'IDEACIÓ: Connecting CataloniaBio & HealthTech and Advanced Materials' held at the headquarters of INNOVAMED in Barberà del Vallès on Friday, Javier presented the new and potential advanced materials being used in 3D bioprinting in the area of regenerative medicine.

JULY

TACKLING CHALLENGES TO RESEARCH EXCELLENCE

Last month IBEC Director Josep Samitier was one of the panelists in a round table organised by the Cercle de Salut, an association devoted to improving the health system so that it may respond adequately to the challenges posed by society.

In the discussion at the *Parc de Recerca Biomèdica de Barcelona (PRBB)* entitled 'L'excel·lència en la recerca, reptes immediats', Josep and the other participants – ISGlobal director Antoni Plasencia and IrsiCaixa director Bonaventura Clotet – discussed the current situation of biomedical research in Catalonia. In particular, the hot topic under discussion was the impact that recent regulatory and administrative changes may have on its competitiveness.

BBVA FUNDS IBEC RESEARCH INTO MORE EFFICIENT CANCER DRUG DELIVERY SYSTEMS

An IBEC project has won funding from the BBVA Foundation under its *Ayudas a Equipos de Investigación en Biomedicina* funding programme.

ICREA research professor Samuel Sánchez's Smart Nano-Bio-Devices group will receive the support for three years to develop their project 'MEDIROBOTS: Precision nanobotomy against tumors'.

The project will develop biocompatible robots driven by enzymes with applications as drug release systems whose progress in vitro and in vivo can be traced using advanced molecular imaging techniques such as super-resolution microscopy.

IBEC AN 'OUTSTANDING' EXAMPLE OF H2020 SUCCESS

IBEC is listed as an 'outstanding' Spanish research centre for Horizon 2020 funding in a recent report published by the *Centro para el Desarrollo Tecnológico Industrial (CDTI)*.

The institute, which coordinates eight H2020 projects and is a partner in two more, appears in the table '20 asociaciones de investigación más destacadas por retorno en H2020' (pictured) in the CDTI's 'Participación española en Horizonte 2020: Resultados provisionales (2014-2017)'. This report presents the facts and figures behind the participation of Spanish universities, research centres, companies and other organisations in the EU's current framework programme, which took over from FP7 in 2014.

SEPTEMBER

BIOFILM PROJECT IS SIXTH CAIXAIMPULSE SUCCESS FOR IBEC

IBEC is celebrating its sixth Caixaimpulse success, with Eduard Torrents' project 'BiofilmChip: personalized treatment for biofilm infections' winning support in the programme's fourth round.

Working in collaboration with Josep Samitier's Nanobioengineering group, BiofilmChip will develop an easy-to-use device that allows biofilm-forming bacteria to be grown in vitro, enabling clinicians to evaluate the efficency of various antibiotics and determine the best individualized treatment for biofilm-infected patients. 20 projects from all over Spain and Portugal were awarded in this fourth round, selected from a total of 85 submissions.

Other Highlights 2018

Ben Feringa, Nobel Prize in Chemistry winner in 2016, will be one of the speakers at the second International Symposium on Photopharmacology.

NEW IBEC GROUP CREATES 'FITNESS HEATMAPS' OF GENE MUTATIONS

The start of the autumn semester finds a new face in IBEC's research community, with Dr. Benedetta Bolognesi joining the institute as junior group leader.

Benedetta has come from Barcelona's Centre for Genomic Regulation, where she was a postdoc in Ben Lehner's and Gian Gaetano Tartaglia's groups. At IBEC she will launch and lead the Protein Phase Transitions in Health and Disease group.

During her postdoc, Benedetta focused on why certain genes are toxic when over-expressed. She found that, in some cases, they cause toxicity because the proteins they code for end up forming a different liquid phase in the cytoplasm.

TWO PROJECTS FOR IBEC AT AECC CEREMONY

On Monday IBEC junior group leader Nuria Montserrat and senior researcher Aranzazu Villasante were two of the researchers awarded funding at the *Asociación Española de Investigación sobre el Cáncer (AECC)*'s ceremony in Madrid.

The AECC has bestowed 160 grants on cancer researchers during the past year, a total of €17.6m. The association made the official presentations of these awards at an event presided over by Her Majesty Queen Letizia on World Cancer Research Day, 24th September 2018.

OCTOBER

INTERNATIONAL EXPERTS IN TISSUE ENGINEERING EN ROUTE TO BARCELONA FOR 11TH IBEC SYMPOSIUM

Tuesday 2nd October will see the Institute for Bioengineering of Catalonia's 11th Annual Symposium take place at Barcelona's AXA Auditoritum, the first symposium in the insitute's second decade of activity.

Focusing this year on the topic of Bioengineering for Regenerative Therapies – one of IBEC's three areas of application, with its expertise in 3D bioprinting, biomaterials, nanomedicine, stem cells and biomechanics – the symposium will welcome expert speakers in tissue engineering and regeneration from all over the world.

LEADING INTERNATIONAL PHOTOPHARMACOLOGY FIGURES TO MEET FOR SYMPOSIUM IN VIC

Ben Feringa, Nobel Prize in Chemistry winner in 2016, will be one of the speakers at the second International Symposium on Photopharmacology (ISPP2018) on 1st-2nd November.

Co-organised by IBEC, UVic-UCC and IQAC-CISC, the symposium took place in the Torre dels Frares building at the UVic and will be attended by more than 120 people, the vast majority of whom will be coming from countries other than Spain.

Introducing a drug into the human body that remains inactive inside it and only acts when, where and how we tell it to will be possible within a few years with

the application of photopharmacology, a new branch of science that uses light to control the activity of medication.

IBEC PROJECTS AWARDED MARATO 2017 FUNDING

Projects led by IBEC group leader Xavier Fernandez-Busquets and Associated Researcher Antonio Juarez have received funds from 2017's La Marató de TV3 fundraising campaign.

These and 34 other winning projects were announced at an awards ceremony tonight at the Academia de Ciencias Médicas de Cataluña y Baleares in Barcelona of the 2017 edition of the telethon, which was dedicated to infectious diseases.

La Marató de TV3, together with Catalunya Ràdio, broadcasts its annual telethon to raise funds for scientific research into various diseases with a different theme each year. The 2017 edition of La Marató ran from December 17th until March 31st and raised €9,758,075 for the 36 projects and 55 teams awarded.

NOVEMBER

FIVE IBEC RESEARCHERS AWARDED "LA CAIXA" GRANTS AT CEREMONY

IBEC researchers were in the limelight at the awards ceremony for the "la Caixa" fellowships and grants for research and innovation calls.

Anna Labernadie and Irene Marco, postdocs in the Integrative Cell and Tissue Dynamics and Biosensors for bioengineering groups respectively, won fellowships under the first Junior Leader "la Caixa" call, which helps excellent researchers of any nationality who wish to continue their research career in Spanish or Portuguese territory. Anna was one of 10 postdocs to win a 'Retaining' grant for candidates who are already residing in the countries, and Irene was awarded one of 20 'Incoming' positions for those coming from elsewhere.

DECEMBER

IBEC PROJECT TO DEFY BLOOD-BRAIN BARRIER AWARDED IN HIGHLY COMPETITIVE CALL

IBEC group leader Silvia Muro has been granted funding in MINECO's 'Explora Ciencia' and 'Explora Tecnología' 2017 call.

It's the first competitive grant for Silvia and her group since she joined IBEC at the end of 2017, and one of only 97 research projects to be financed out of the 1594 applications submitted – a success rate of only 6%.

The project, 'Controlling the differential transport of therapeutic cargoes into versus across the BBB (BBB2GATE)' will aim to develop drug vehicles that can cross the blood-brain barrier using the natural routes that the body's substances use to circumvent this obstruction.

THIRD IBEC STUDENT WINS *PIONER* PRIZE FOR THESIS

Jemish Parmar from IBEC's Smart Nano-Bio-Devices group has been awarded a *Premi Pioner* from CERCA for his Doctoral Thesis "Micromotors for Environmental Applications".

Since their launch in 2014, the prizes recognize researchers who present a doctoral thesis with results that are clearly aimed at commercial exploitation. The third IBEC winner of one of these prestigious awards, Jemish was honoured alongside the three other winners – from ICFO, CTFC and IGTP – at a ceremony yesterday.

The jury in this fifth edition of the Premis Pioner was made up of Eduard Balbuena (Enterprise Department at UAB), Josep Maria Pujals (IP lawyer at Oficina Ponti), Melba Navarro (Knowledge Transfer Technology Manager at CIMNE Tecnologia), Anna López Lozano (IP expert), Miquel Sierra (Innovation Manager at INIA Uruguay), Manuel Palacín (The Collider Program at Mobile World Capital Barcelona), and Roger Cabezas (KTT Project Manager at CERCA).

2018 in review: News

Technology Transfer

Effective translation of knowledge and discoveries to patients and to the market is an strategic goal at IBEC. Our institute is committed to the market-driven technology transfer and has a fruiful relationship with industry, based on the needs of the companies and the determination of IBEC's researchers to find real solutions.

OPEN INNOVATION LAB, THE NEW IBEC INITIATIVE LAUNCHED TO REINFORCE THE TRANSLATION OF RESEARCH RESULTS TO THE INDUSTRY AND TO THE PATIENTS

The Open Innovation Lab offers companies and investors a platform to reach patients and the market faster by nurturing IBEC's cutting edge research community. The Open Innovation Lab provides co-working lab and office space to companies and investors for high-potential and market-oriented research projects. Capital partners can invest directly in research and development units to accelerate their work and drive it towards the market.

"This is a new initiative where investors or companies can invest directly in research units at IBEC that are exclusively focused on reaching patients and market faster, while maximizing capital efficiency," says Xavier Rubies, Head of Technology Transfer at IBEC. "Open Innovation Lab units can take advantage of the rich environment of knowledge and science at IBEC, its high-tech facilities, and its national and international networks and strategic alliances with hospitals and industrial partners, while being boosted by external investment capital to bring their solutions, products or health-related technologies to society faster." IBEC's initiative is based on a new wave of 'innovative ecosystems' being pioneered at Princeton and in Norway, to name just two. "The Open Innovation Lab is one of the most important initiatives of IBEC's new Strategic Plan and fully aligned with our mission to foster translation, collaboration and entrepreneurship by supporting early stage high-potential projects and bringing our basic and applied research results more quickly to the society," says IBEC Director Josep Samitier.

IBEC IN BOSTON (USA) TO BOOST HEALTH APPLICATIONS OF 3D PRINTING

Representatives from IBEC were in Boston, Massachusetts taking part in a business mission to accelerate the application of 3D printing to health, alongside companies Avinent, Diopma, Mastertec, Neos Surgery, Servocad Microtronics, Tractivus and Ventura Medical, as well as the Althaia Foundation, Fira de Barcelona and Hospital Clínic.

IBEC and the companies and hospitals met with institutions such as MIT and Harvard, Massachusetts is the main technology generation hub in the U.S. and is consolidating itself as the country's epicenter of the application of 3D printing to health.

Organised by the Generalitat de Catalunya's ACCIÓ agency, CataloniaBio and the HealthTech cluster, the mission met with entities such as the Massachusetts General Hospital, the Tufts Medical Center, the Boston Scientific company, Harvard's Weitz Laboratory and Johnson & Johnson DePuy Synthe, as well as participating in networking events with experts in investment, regulation and other American companies interested in getting acquainted with the Catalan delegation.

The mission coincided with one of the main events of the sector, the BIOMEDevice congress, which will bring together more than 4,500 participants in the field of medical technology in Boston. The congress also encompasses the annual conference of the Massachusetts Medical Device Industry Council (MassMEDIC).

IBEC in Boston (USA).

Presenting IBEC's 3D bioprinting capabilities at the third IN(3D)USTRY event.

IBEC AND ONCOKIDS BIOSCIENCES SIGN A COLLABORATION AGREEMENT IN ONCOLOGY

Oncokids is the first-in-class company exclusively devoted to find therapeutic solutions for pediatric oncology. Our strategy is moving forward from incorporated start-up to IPO, since the founders committed themselves in the long-term to fight against childhood cancers, accelerating the finding of solutions and creating exit opportunities as well as diminishing monetization risk for shareholders. Founded at Boston, the company has at Barcelona the European headquarters and the discovery labs for the research of novel targets and molecules. The company collaborate wit Dr. Joan Montero, from the Nanobioengineering research group at IBEC.

IBEC AND SCRANTON ENTERPRISES JOIN FORCES FOR TRANSLATIONAL RESEARCH IN A 1.4 M € CONTRACT RESEARCH AGREEMENT

IBEC and Scranton Enterprises B.V., an investment association based in the Netherlands, have signed a long-term research agreement to develop a system to predict the success rate of embryos for implantation. The unit will develop a new system for in vitro fertilization to predict the success rate of embryos for implantation. Selecting embryos is a critical aspect of this treatment, which at the moment is left largely to subjective criteria, leading to unsuccessful pregnancies and suffering for many patients. The agreement is the first to be established within the framework of the institute's new initiative, Open Innovation Lab, which offers companies and investors a platform to reach patients and the market faster by nurturing IBEC's cutting edge research community. The first Open Innovation Lab research unit at IBEC will be Bioengineering in Reproductive Health, led by Dr. Samuel Ojosnegros, with four years of financing to the tune of €1.4m from Scranton Enterprises B.V.

PRESENTING IBEC'S 3D BIOPRINTING CAPABILITIES AT THE THIRD IN(3D)USTRY EVENT

IBEC attended the third edition of "IN(3D)USTRY: From Needs to Solutions", the international meeting devoted to 3D printing. IBEC has been present in the event since the first edition in 2016. The institute had a stand in the exhibition area, where Head of Technology Transfer Xavier Rubies and Technology Transfer manager Xavier Puñet welcomed visitors interested in finding out more about IBEC's 3D bioprinting capabilities.

The Generalitat de Catalunya's Minister of Enterprise and Knowledge, Àngels Chacón (right), was interested to hear about IBEC's medical solutions using 3D bioprinting for bone, cartilage, skin, diagnostic, cardiology and muscle.

IN(3D)USTRY, which was founded by Fira Barcelona and HP, is a platform for leading companies and other organisations to showcase the innovations and opportunities that the new technology can offer to countless projects and processes. It attracts professionals working in areas as diverse as autos and aeronautics, architecture and habitat, retail and consumer goods and, of course, healthcare.

Technology Tranfer 2018

BIOFILMCHIP PROJECT BECOME THE SIXTH CAIXAIMPULSE SUCCESS FOR IBEC

IBEC received its sixth Caixaimpulse success, with Eduard Torrents' project 'BiofilmChip: personalized treatment for biofilm infections' winning support in the programme's fourth round. Working in collaboration with Josep Samitier's Nanobioengineering group, BiofilmChip will develop an easy-to-use device that allows biofilm-forming bacteria to be grown in vitro, enabling clinicians to evaluate the efficiency of various antibiotics and determine the best individualized treatment for biofilm-infected patients. Besides allowing the growth and quantification of bacterial biofilms in vitro, BiofilmChip's microfluidic device will also serve as a high-throughput platform to screen for new antibiofilm molecules.

20 projects from all over Spain and Portugal were awarded in this fourth round, selected from a total of 85 submissions. It's the second time Eduard has won support from Caixaimpulse, which is promoted by the *Obra Social "la Caixa"* and organized jointly with Caixa Capital Risc, and aims to promote technology transfer in science.

THREE YEARS CONSECUTIVES WHERE IBEC PHD STUDENT'S WIN *PIONER* PRIZE

Since their launch in 2014, PIONER prizes awarded by CERCA recognize researchers who present a doctoral thesis with results that are clearly aimed at commercial exploitation. IBEC is one of the most successful institutes, in five editions IBEC's PhD students were awarded in three occasions. Last year 2018, Jemish Parmar from IBEC's Smart Nano-Bio-Devices group, leaded by Dr. Samuel Sánchez, has been awarded for his Doctoral Thesis "Micromotors for Environmental Applications".

IBEC PART OF RIS3CAT COMMUNITY TO ACCELERATE 3D PRINTING PROJECTS

RIS3CAT LLAVOR 3D Community, a partnership of Catalan entities – including IBEC – which will develop projects in additive manufacturing and 3D printing. Coordinated by Leitat, and part of the RIS3CAT strategy of research and innovation for the smart specialization of Catalonia, the Community will bring together 31 SMEs, large companies, research centres and universities. Together they'll work on four projects, ultimately accelerating their development and adoption by the industrial sector to improve competitiveness.
These projects will develop new software tools, new materials, more efficient and versatile production processes, new post processes and surface treatments, and new 3D printing applications.

IBEC's Elisabeth Engel will participate in one of the projects, QuirofAM, which will produce biodegradable and bioactive 3D printed scaffolds as osteocondral and maxilofacial substitutes.

The LLAVOR 3D Community, whose overall budget is almost € 11m, is co-financed by the Generalitat de Catalunya (ACCIÓ).

IPROTEOS, IBEC AND VHIR TO DEVELOP AN INNOVATIVE THERAPY AGAINST SOLID TUMORS

The biotechnology company Iproteos, IBEC and the Vall d'Hebron Research Institute (VHIR) are set to develop

Iproteos, IBEC and VHIR to develop an innovative therapy against solid tumors.

Jemish Parmar from Smart Nano-Bio-Devides group receiving the Pioner Prize awared by CERCA.

an innovative treatment to slow down, stop and even reverse the growth of solid tumors, which represent more than 90% of cancer cases.

It's a family of molecules based on a first-in class anti-tumor action mechanism, the result of several years of research by Pere Roca-Cusachs' group at IBEC.

The project, which received €935,000 in MINECO's 2017 Retos Colaboración call, will focus in its first phase on two of the most common solid tumors in children and adolescents, rhabdomyosarcoma and neuroblastoma, as well as in lung and colon cancer, which have the highest mortality rate in adults.

A FIRST-IN CLASS ANTI-TUMOUR ACTION MECHANISM

Researchers from IBEC's Cellular and Molecular Mechanobiology group, led by Pere Roca-Cusachs, discovered that the binding of proteins talin and vinculin – triggered by mechanical forces exerted by cells in response to an increase in rigidity of the surrounding tissue – triggers the activation of an important oncogen called YAP, present in most solid tumors. The results of the research – published in *Nature Cell Biology* in 2016 – revealed that the inhibition of the interaction of both proteins prevents activation of YAP, and has the potential to slow down, stop or even reverse tumor growth.

"Instead of focusing on genetic mutations or biochemical factors, we intend to attack tumors based on their mechanical properties, which undergo major changes," explains Pere. "This represents a completely new strategy in cancer therapy that could potentially be revolutionary, and be used in combination with other more conventional therapies."

The biotechnology company Iproteos will address the design, synthesis and characterization of molecules that inhibit the interaction of talin and vinculin using its IPROTech platform, a state-of-the-art technology that combines computational (in silico) chemistry tools with biotechnology (in vitro) to accelerate the design of a new generation of peptide-based drugs.

PRIZE FOR IBEC IN TECHNOLOGY TRANSFER COMPETITION

An IBEC project pitch won third prize in a Technology Transfer Competition at last week's Onco Emergence Forum.

The project, which is the brainchild of IBEC group leader Pere Roca-Cusachs and proposes the targeting of tumor mechanics to develop new drugs for oncology, specifically with pancreatic cancer in mind, was pitched by IBEC Technology Transfer manager Diana Gonzalez at the meeting on Friday.

Diana, involved in the project from its onset, was one of twelve finalists chosen to present in six-minute pitches to a panel of judges. The project was shortlisted because of its solid focus on an unmet medical, market or patient need, and because it proposed using innovative technology to create a product or service.

The Onco Emergence Forum is a networking conference aiming to set up transnational collaboration projects in oncology by promoting interaction among research institutes, companies and hospitals across southwestern Europe. Hosted by BIOCAT and organized by Onconet Sudoe – part of the Interreg Sudoe transnational programme that aims to establish a permanent network of excellence in oncology through prevention, diagnosis, care and translational research – the meeting attracted more than 260 attendees from 11 different countries.

The second prize in the Technology Transfer Competition was won by VHIO's PARPiPRED project, and the first prize went to Nanoligent, a UAB start-up.

2018 in review: News

Clinical Translation

DETECTING CLEAR CELL RENAL CARCINOMA

IBEC started a new project to generate a list of validated, stage-specific biomarkers, that could be reliably implemented in clinic for detecting clear cell renal cell carcinoma (ccRCC).

Nuria Montserrat's group work together with researchers from other Barcelona institutes, and one of the city's major hospitals, on the project Generation of Isogenic Models of Clear Cell Renal Cell Carcinoma using CRISPR-engineered Kidney Organoids, for the identification of diagnostic biomarkers. They received support over a three-year period from the AECC Scientific Foundation, whose Ayudas LAB funds emerging groups to carry out projects in cancer that have obvious translational possibilities.

The project aims to develop a human model to study clear cell renal cancer, the most common type of kidney cancer. At present, there are no human models for this cancer, nor for the identification of early biomarkers, which would shed light on the molecular mechanisms of how the cancer starts and allow doctors to diagnose it and start treatments earlier.

To develop the disease model, the IBEC group – together with their collaborators at Vall d'Hebron Institut d'Oncologia, ICO-IDIBELL and Hospital Clinic de Barcelona – created a 3D-organoid – a kidney-on-a-chip – from human pluripotent stem cells, which demonstrated how the tissue in the organ develops, as well as how it reacts when other changes take place, such as disease. Within this model, the researchers will be able use a gene editing method, CRISPR-Cas9, to manipulate those genes related to the appearance of disease and identify possible early signs that cancer might develop.

"The idea is that the model will be able to analysis urine and blood samples from patients, which are easy and painless to obtain, and enable early intervention before the disease develops further," explains Nuria. "Up till now, the vast majority of cases are diagnosed at an advanced stage and by chance during ultrasound or imaging tests in the abdomen."

The project was granted funding from the Fundación Científica de la Asociación Española Contra el Cáncer in their 2017 Ayudas LAB AECC call.

The AECC Scientific Foundation praised the 'great scientific quality' of the project, and the 'extraordinary contribution it can make to the fight against cancer'.

PROMOTING DERMAL REGENERATION

Dr. Elisabeth Engel from the Biomaterials for regenerative therapies group was selected by the Era-Net Europanomed III to develop the project nAngioDerm "Ion-release materials to promote angiogenesis on dermal regeneration", in collaboration with Joan Pere Barret, Head of the Plastic Surgery Department of the University Hospital *Vall d'Hebron*.

nAngioDerm will develop nanostructured ion-release platforms and devices that promote the in situ regeneration of damaged skin without the need of cells or growth factors. nAngioDerm's innovative approach is based on the controlled release of bioactive ions (Zn2+, Ag+, Ca2+) from biodegradable polymeric nanocarriers, which will be developed using a nano-precipitation technique. These bioactive ions will promote cell recruitment and colonization and provide an antibacterial effect, as well as triggering the synthesis of angiogenic factors and extracellular matrix components that will facilitate wound healing. Depending on the type of skin injury, the ion-releasing nanocarriers will be: 1) combined with 3D printed collagen-based scaffolds as filling and guiding biomaterials for chronic wounds such as diabetic or pressure ulcers; or 2) dispersed in a spray based on a thermos-responsive collagen gel for acute wounds related to burns. The devices and platforms proposed here will be assessed in vitro and in suitable preclinical in vivo models as per EMA guidelines, bringing them to technology readiness level 4-5, close to clinical translation and market transferability stages. In the long-term, the technologies developed will be implemented in other clinical areas.

The consortium includes the University of Ioannina, Universitè Grenoble Alpes and Microlight SAS.

NEUROREHABILITATION AFTER STROKE

The SPECS group, a new group lead by Paul Verschure that was incorporated to IBEC at the end of 2017, has developed and commercialized (through the spin-off Eodyne) the Rehabilitation Gaming System (RGS), a science-based ICT solution for neurorehabilitation combining brain theory, AI, cloud computing and virtual reality and targeting motor and cognitive recovery after stroke. RGS provides a continuum of diagnostic and therapeutic solutions that accompany the patient from the clinic to the therapy center. RGS has been clinically validated showing its superiority over other methods and products with reduced cost also through its use of standard off-the-shelf hardware and a Software as a Service model (SaaS). Commercial evaluations have shown that RGS is viable because it acts as a workforce multiplier while delivering a higher quality of care at hospitals and rehabilitation centers. However, in order to realize significant benefits in healthy life expectancy of stroke patients it is essential that RGS becomes an at home solution providing 24/7 monitoring, diagnostics and care.

For this reason, researchers are working on the RGS@HOME project, which will investigate different models the support the adoption of advanced ICT personalized medicine solutions considering the high variability in Europe of both clinical practice and guidelines and reimbursement models. A proposal was submitted to

The Rehabilitation Gaming System (RGS) is a science-based ICT solution for neurorehabilitation developed by the SPECS group through the spin-off Eodyne.

the EIT Health call for Innovation by Design projects on April 2018. The consortium spans the whole spectrum of public and industrial stakeholders from different European regions with both public and mixed private/public reimbursement models (Sweden, Netherlands, France, Spain) including Parc Sanitari Sant Joan de Déu, and *Fondation de l'Avenir pour la Recherche Médicale Appliquée*. The proposal has been funded with 2'7M€ for 2019-2021.

JOINING FORCES WITH FEDER TO COLLABORATE ON SOLUTIONS FOR RARE DISEASES

IBEC has signed a collaboration agreement with the *Federación Española de Enfermedades Raras (FEDER)*, a non-profit organization that represents the three million people suffering from rare diseases throughout the country.

Rare diseases are those that affect fewer than 5 out of every 10,000 inhabitants. According to the WHO, there are about 7,000 such diseases affecting 7% of the world's population, so altogether they affect a huge number of people – and they can appear at any stage of life. The agreement with IBEC will connect the institute with patients' associations to develop projects together that have a direct application according to the needs of sufferers.

FEDER brings together more than 330 associations representing over 1500 distinct diseases, as well as helping represent the interests, defend the rights and promote the full social inclusion of the rare diseases' community in Spain. The two organizations will also participate in and promote each other's relevant events and initiatives and help raise awareness about rare diseases and the research that's focused on finding new solutions for them.

At IBEC, these include muscular dystrophy (Javier Ramon's group); prionopathies such as Creutzfeldt-Jakob Disease (José Antonio del Rio); congenital nephrotic syndrome (Nuria Montserrat); cystic fibrosis (Eduard Torrents); Sickle Cell Anemia (Josep Samitier, with Hospital Clinic); Osteochondritis Dissecans (Elisabeth Engel); Dent disease (Elena Martínez); pulmonary hypertension (Daniel Navajas); and PKU (Samuel Sánchez).

"With this new agreement, we hope that FEDER can help us accelerate our ongoing research into these diseases," says David Badia, Managing Director of IBEC. "Our close association will also offer a broader reach and new possibilities for raising awareness about the many different pathologies and the patients that are affected."

IBEC INTERNAL TEAMWORK TO FIGHT CANCER IN COLLABORATION WITH VALL D'HEBRON HOSPITAL

IBEC groups of Prof. Xavier Trepat, Pere Roca-Cusachs, Lorenzo Albertazzi and Josep Samitier have joined forces to develop a project on "Understanding and measuring mechanical tumor properties to improve cancer diagnosis, treatment, and survival: Application to liquid biopsies" in collaboration with Joan Seoane, Paolo Nuciforo and Josep Tabernero from Vall d'Hebron Institute of Oncology.

The project has obtained 1,5M€ funding from L*a Caixa Foundation*.

Cancer treatment has benefited in recent years from the implementation of personalized therapeutic drugs targeting specific mutations in signaling pathways. However, even with the use of such personalized drugs tumors develop resistance and progress, often leading to high mortality rates. We therefore require a better understanding of how biochemical signaling interacts with additional factors to drive tumor progression. Increasing evidence suggests that biochemical signaling could be coupled to a purely mechanical factor – the stiffening of tissues – to drive tumor progression.

The aim is to unravel how cell function and tumor progression and therapy is determined by the interaction between tissue stiffness and biochemical signaling, and to develop technologies to both measure this interaction and optimize therapeutic drug delivery. By combining molecular biology and advanced biophysical techniques, we will first unravel the molecular mechanisms by which cells detect and respond to tissue stiffness. Second, we will determine how mechanical factors govern cancer invasion. Third, we will use exhaustive analysis on patient samples and data to evaluate the crosstalk between mechanical factors, cancer diagnosis, and treatment. This will potentially lead to the discovery of new biomarkers and allow for more selective therapies. The knowledge obtained will be used to develop targeted drug delivery strategies that maximize therapeutic efficacy.

Cancer is one of the main causes of death across Europe, with 1.75 million deaths and 3.45 million new cases reported for instance among the 500 million EU inhabitants in 2012. The associated annual costs are estimated at 126 B€, corresponding to 102 € per citizen. Among those cases, the most prevalent cancer types are precisely those targeted in this project: breast cancer (464.000 cases/year) and colorectal cancer (447.000 cases/year). By understanding how cancer progression depends not only on molecular factors but also on the mechanical properties of tissues, we will be able to improve current therapy approaches and potentially develop new ones. Further, new non-invasive techniques to assess biochemical and mechanical tumor properties, and advanced delivery methods, can potentially permit fully informed and individualized diagnosis, prognosis, and optimized treatment.

Dr. Javier Ramon from IBEC (left) shows the a platform to perform drug screening analysis in human engineered micro tissues for myotonic dystrophy to Bernardo Gámez president of ASEM Catalonia (right).

Clinical Translation 2018

DEVELOPING INNOVATIVE TREATMENTS FOR MYOTONIC DYSTROPHY

The project Therapeutic targeting of MBNL microRNAs as innovative treatments for myotonic dystrophy, led by the professor of Genetics of the UV and researcher of Instituto de *Investigaciones Clínicas de Valencia Incliva* Rubén Artero, and with the participation of medical doctor Vílchez from Hospital de la Fe (Valencia) has received 1m€ euros from the *La Caixa Banking Foundation*. The consortium also includes the University of Oxford, the Institute of Bioengineering of Catalonia, the Imagine Institute of France, the Biodonostia Institute, Aemn and the Myotonic Dystrophy Foundation.

Myotonic dystrophy is a rare incurable neuromuscular disease without specific treatment. The molecules discovered could provide, in the medium term, solutions to numerous diseases that are currently untreatable.

Dr. Javier Ramon from IBEC is developing a platform to perform drug screening analysis in human engineered microtissues. Different variants will also be tested in two different animal models, both at the Universitat de València and in France. The next step will be to try to validate these molecules with patients of dystrophy and to carry out a clinical trial within three or four years.

NEW CLINICAL TRANSLATION AND INNOVATION COMMITTEE

Given its translational orientation, IBEC has set up a Clinical Translation & Innovation Committee (CT&IC). The CT&IC is responsible for advising IBEC on how the institute can help to meet the needs and challenges of the hospital sector by establishing a permanent forum for interdisciplinary dialogue with the sector. It is composed of Pedro García-Barreno (Chair former director of *Hospital Gregorio Marañon*), Ramon Gomis (Vice-Chair former director of IDIBAPS-*Hospital Clínic*)), Carmen Vela (former Secretary of State of R&D), Josep M. Campistol (*Hospital Clínic* Director), Josep Tabernero (VHIO), Pere Santamaria (U. Calgary), Jorge Ferrer Marrades (Imperial College–CRG), and Juan C. Lasheras (U. California San Diego).

NEW ADVANCES IN THE DEVELOPMENT OF A CARDIAC GRAFT READY FOR HUMAN TRANSPLANTATION

In the framework of a collaboration with the Hospital German Trias i Pujol to develop a biomatrix to regenerate the post-heart attack scar, we developed two engineered cardiac grafts, based on decellularized scaffolds from myocardial and pericardial tissues and repopulated them with adipose tissue mesenchymal stem cells (ATMSCs). The structure, macromechanical and micromechanical scaffold properties were preserved upon the decellularization and recellularization processes, except for recellularized myocardium micromechanics that was -2-fold stiffer than native tissue and decellularized scaffolds. Proteome characterization of the two acellular matrices showed enrichment of matrisome proteins and major cardiac extracellular matrix components, considerably higher for the recellularized pericardium. Moreover, the pericardial scaffold demonstrated better cell penetrance and retention, as well as a bigger pore size. Both engineered cardiac grafts were further evaluated in pre-clinical MI swine models. Forty days after graft implantation, swine treated with the engineered cardiac grafts showed significant ventricular function recovery. Irrespective of the scaffold origin or cell recolonization, all scaffolds integrated with the underlying myocardium and showed signs of neovascularization and nerve sprouting. Collectively, engineered cardiac grafts -with pericardial or myocardial scaffolds- were effective in restoring cardiac function post-MI, and pericardial scaffolds showed better structural integrity and recolonization capability.

The project is funded by an ambitious translational programme of the Department of Health of Catalonia, the objective of the project is to arrive to a first in-man trial.

AGREEMENT WITH DANA-FARBER CANCER INSTITUTE TO FIGHT MELANOMA

IBEC has signed an agreement with Dana-Farber Cancer Institute to collaborate in the personalization of melanoma treatment Using Dynamic BH3 Profiling.

Dr. Joan Montero, *Ramon y Cajal* researcher in the group of Josep Samitier, will continue the work which he began at the Dana-Farber Cancer Institute (DFCI) under the mentorship of Dr. Anthony G. Letai. Dr. Montero Boronat's project aims to combine genomic analyses, gene expression profiling and Dynamic BH3 Profiling (DBP) to analyze melanoma and breast cancer cells, understand how they respond to chemotherapy, to find novel ways to treat this type of cancer when resistance to first-line therapy arises.

The research carried out by Joan Montero has also received support from the Foundation for Oncological research (FERO) and from the Cellex Foundation to apply the Dynamic BH3 Profiling test to personalize pediatric cancer treatment

2018 in review: Governance

The IBEC Foundation

The Institute for Bioengineering of Catalonia is a research centre set up to conduct inter-disciplinary research at the cutting edge of knowledge in the bioengineering field which, through the talent it attracts, the creativity associated with scientific progress and the translation thereof, helps to improve health and quality of life for people and generate prosperity in science.
IBEC is a non-profit foundation established at the end of 2005 by the Generalitat of Catalonia (Autonomous Government of Catalonia), the University of Barcelona (UB) and the Technical University of Catalonia (UPC).

IBEC's relationship with the universities

IBEC's forerunner, the Research Centre for Biomedical Engineering (CREB) of the Technical University of Catalonia (UPC), was founded in 1992 by six research groups from five different departments with the aim of collaborating on research and industrial projects in the broader area of bioengineering. IBEC's first director, Prof. Josep A. Planell, was director of CREB from 1997 and led the process that resulted in the creation, in 2003, of the Catalan Reference Centre for Bioengineering (CREBEC), composed of different divisions from the above-mentioned CREB and the Research Centre on Bioelectronics and Nanobioscience (CBEN) of the University of Barcelona (UB). CREBEC, which aimed to coordinate the multidisciplinary research activities in biomedical engineering carried out in Catalonia, was transformed at the end of December 2005 into the Institute for Bioengineering of Catalonia (IBEC).

The research groups affiliated with the University of Barcelona which are seconded at IBEC are:

- Nanoscale Bioelectrical Characterization, led by Gabriel Gomila
- Nanoprobes and Nanoswitches, Fausto Sanz (until February 2018) / Pau Gorostiza
- Signal and Information Processing for Sensing Systems, Santiago Marco
- Cellular and Respiratory Biomechanics, Daniel Navajas
- Molecular and Cellular Neurobiotechnology, José Antonio Del Río
- Nanobioengineering, Josep Samitier
- Cellular and molecular mechanobiology, Pere Roca-Cusachs

Those affiliated with the UPC are:

- Biomaterials for Regenerative Therapies, Elisabeth Engel
- Biomedical Signal Processing and Interpretation, Raimon Jané

IBEC's PhD students are able to pursue their doctoral courses at the universities, which offer degrees in physics, chemistry, biology, materials science and engineering, among others, and Master's courses related to bioengineering and nanomedicine, attracting students from all over the world. Several others on IBEC's research staff are also involved in the

Members of IBEC's Board of Trustees form the panel for the opening ceremony of the institute's annual symposium.

doctoral programs, particularly in the joint Biomedical Engineering Program. Moreover, as they are located on the same campus, the relationship with both universities and access to their facilities – library, scientific services, etc – is very fruitful.

IBEC's current director, Josep Samitier, was Vice-Rector of Research and Innovation and Acting Rector of the University of Barcelona (UB) from 2005 to 2008. He remains Full Professor of Electronics in the university's Physics Faculty.

Currently IBEC and its research groups are mainly located in campuses that belong to both universities: the Barcelona Science Park, the Clinic and Bellvitge Health Sciences Campus (UB) and the Diagonal-Besós Campus (UPC).

BOARD OF TRUSTEES (on 31.12.2018)

The main governing body of IBEC is its Board of Trustees, with representatives from the Catalan ministries of Health and Research, the UB and UPC. The Board of Trustees meets twice a year to approve IBEC's annual budget and monitor its activities to ensure that it pursues scientific excellence with a societal impact. For executive purposes, an Standing Committee (chosen from the Board) monitors IBEC's activities through ad hoc meetings with the Director and Managing Director.

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Minister of Business and Knowledge Generalitat of Catalonia

FIRST VICE-PRESIDENT

Ms. **Sra. Alba Vergés i Bosch**
Minister of Health Generalitat of Catalonia

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Rector University of Barcelona (UB)

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Director General for Research and Innovation, Ministry of Health, Generalitat of Catalonia

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Vice-Rector of Research University of Barcelona

Dr. **Francisco Ciruela Alferez**
Vice-Rector of Scientific Policies UB

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Mr. **Josep Maria Alcoberro Pericay**
CERCA, Ministry of Economy and Knowledge, Generalitat of Catalonia

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Vice-Rector of Research Policies UPC

SECRETARY

Mr. **Josep Maria Alcoberro Pericay**
CERCA, Ministry of Economy and Knowledge, Generalitat of Catalonia

INTERNATIONAL SCIENTIFIC COMMITTEE

The Board's decisions are guided by an independent International Scientific Committee (ISC). This committee ensures practices and criteria are implemented in accordance with international standards of excellence in research.

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Director Institute for Bionanotechnology in Medicine, Northwestern University, Evanston, IL, USA

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Director Departamento de Células Troncales, Centro Andaluz de Biología Molecular (CABIMER), Seville, Spain

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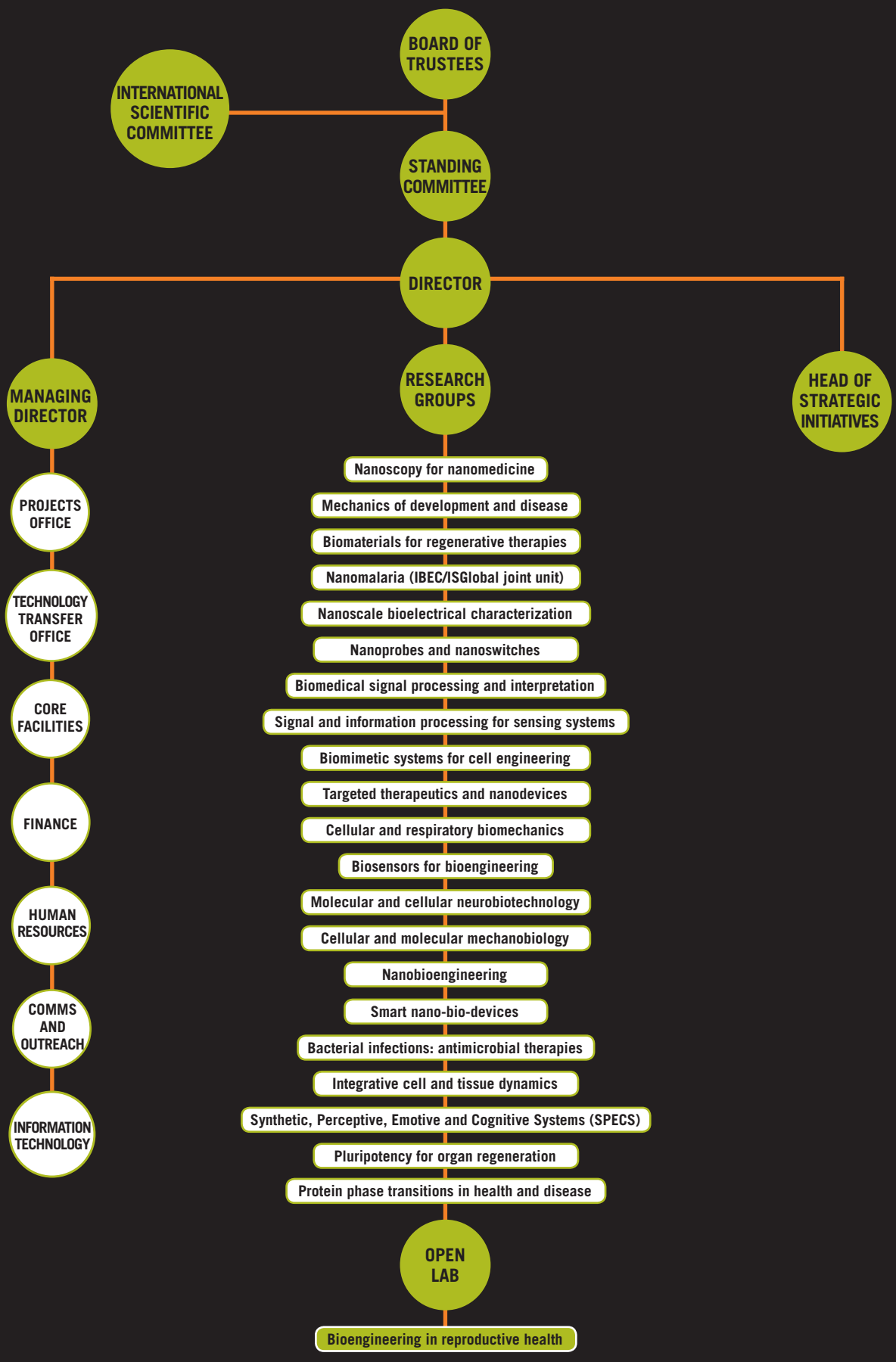
Jocelyne Troccaz, PhD
Director de Recherche, CNRS Equipe Gestes Médico-Chirurgicaux Assistés par Ordinateur (GMCAO), Laboratoire TIMC-IMAG, Université Joseph Fourier-CNRS, France

Prof. **Heiko Zimmermann**
Managing Head Fraunhofer Institute for Biomedical Engineering, Germany

2018 in review: Governance
Organigram



2018 in review: Governance

Strategic Plan 2018-2020

IBEC has managed during its first years of existence to develop its own model for inter-disciplinary research in the field of bioengineering, a model based on the talent of people capable of working at the cutting edge of science to construct or develop models, devices, systems or processes that serve both to understand biomedicine and to develop new methods for diagnosis, prognosis or treatment.

- IBEC's Strategic Plan for the period 2018-2020 does not envisage the Institute standing still. It represents an ambitious new challenge in IBEC's development, and a milestone in its international projection and growth.
- IBEC has its own way of conducting science, and in the coming years its goal is to realise its full potential based on the Catalan ecosystem of science and innovation from which it springs, while seeking a global reach.
- The Strategic Plan 2018-2020 has a clear objective: to help construct the medicine of the 21st century at IBEC, in order to ensure a healthy life for people, to foster universal well-being and achieve better quality of life. IBEC aims to use its scientific and technological abilities to contribute to the development of this 21st-century medicine based on bioengineering capable of designing and analysing biological systems and developing new biomedical technologies.

IBEC'S STRATEGIC PLAN FOR 2018-2020 IS STRUCTURED AROUND FOUR STRATEGIC GOALS:

01. The IBEC WAY. To consolidate the IBEC model for conducting science. A centre where the hybridisation of knowledge and joint work by professionals from a range of disciplines results in excellent science. The vectors supporting the IBEC model are:

- International brand
- Talent as a stand-out factor
- The ability to anticipate the development of scientific research
- Fundraising to maintain IBEC as one of the most important bioengineering centres in the world

02. TRANSLATION. To increase IBEC's ability to enhance the value of scientific results and transfer them to patients and to society in general, through an open innovation model and by setting up an innovation and translation committee to encourage a framework for links with companies in the biotech, medtech and pharmaceutical industries.

03. ECOSYSTEMS. To internationalize IBEC's activities by forging alliances and/or opening sites in the world's highest-performing ecosystems in terms of engineering and biomedicine, to gain direct access to the primary institutional and business decision-makers in the sector.

04. MANAGEMENT MODEL. To implement IBEC's own "researcher-centric" management model which allows researchers to be supported by a range of services to enable them to concentrate on their scientific work, complemented by a commitment to managing agility, thereby boosting IBEC's performance as a whole.

Each of these strategic goals contains different actions to be carried out over the next three years, with the aim of positioning IBEC as one of the world's leading research centres in bioengineering for the improvement of health.

IBEC's Strategic Plan for 2018-2020 was submitted for approval by the IBEC Board of Trustees in June 2018.

HUMAN RESOURCES STRATEGY FOR RESEARCHERS (HRS4R)

In 2018, several actions from the Human Resources Strategy for Researchers (HRS4R) Action Plan were implemented. All these actions are in compliance with the principles established in the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.

A Monitoring Committee that includes eight volunteers from career stages R1 to R4 (predoc to group leader), the Managing Director and two heads of support units have met regularly to plan and revise the implementation of the actions. The HR Unit leads and coordinates the development and implementation of the HRS4R, and the Monitoring Committee acts as a support, advising and monitoring the implementation of the actions.

In March 2018 IBEC received very positive feedback from the European Commission regarding our internal evaluation (self-assessment), and encouraging us to continue working on the actions planned for the following years (2018-2020). During 2018 we focused on the visibility and dissemination of the HRS4R strategy to the IBEC community. To that end, a short video featuring the main actions being implemented was created and disseminated to the whole IBEC community.

IBEC's Action Plan applies to all staff categories and consists of 23 actions with different scopes: from short-term and hands-on actions to institutional long-term ones, all of which are significant for IBEC's progress.

The actions implemented, by category, were:

Selection

- In May 2018, IBEC organized another reSearch4Talent event, an open day designed to attract talent, aimed at undergraduate and Master's students. The one-day encounter represents a chance for students to talk to our researchers and ask questions about day-to-day work in the lab, career paths, work-life balance, mobility, etc, as well as paying a visit to the IBEC labs.

- IBEC has also participated in the following job fairs: "La fira d' empreses" at Universitat de Barcelona, Physics Faculty; Forum empreses at Universitat Politècnica de Catalunya, ETSEIB; and Forum del Talent, at UPC Campus Besòs.

- In December, a New Recruitment and Selection Policy based on Open, Transparent and Merit principles (OTM) was defined and approved by our Board of Trustees. OTM-R is one of the main pillars of the European Charter of Researchers and the Code of Conduct for the Recruitment of Researchers (Charter and Code) and a top priority for the European Research Area.

- A working group (comprising Group Leaders, Senior Researchers, Postdoctoral researchers and Heads of Support Units) met in June, July and September to work on the different aspects of the recruitment and selection process with the aim of improving the transparency, objectivity, quality and attractiveness of our selection processes.

- Its final objective is to ensure that the best candidate for the job is selected, while guaranteeing equal opportunities and access for all. This policy applies to the recruitment and selection of candidates applying for positions at IBEC.

Training

- A yearly Training Catalogue was produced, outlining more than 30 training courses on communication skills, leadership skills, innovation and Tech Transfer, Gender and Diversity, languages and scientific tools and techniques for all IBEC members. The catalogue is available at the beginning of the year with detailed information for each course, so that employees can better plan their training needs and calendar them throughout the year.

- The Mentoring Scheme for postdocs was carried out for the first time. The program has been conceived as a career development tool for postdoctoral researchers.

- Mentors (Group Leaders) support postdoctoral researchers for a year and share their experiences as highly qualified scientists. They offer guidance and knowledge not only about IBEC but also about their particular scientific fields, they give advice to help develop mentees' qualification profiles, help to establish contacts, gain access to the networks of mentors, and give feedback to facilitate self-assessment and to fully develop mentees' careers.

- At the PhD level, we have incorporated a mobility grant into each of the PhD fellowships funded by IBEC. This mobility grant funds up to 9 months of research stays within the duration of the PhD fellowship. To strengthen mobility at IBEC it is a mandatory requirement to obtain the IBEC PhD Certificate of Excellence.

- We have defined the job descriptions for all the technical positions at IBEC.

Working Conditions

Several actions from the second Equal Opportunities and Diversity Management Plan (2017-2019) have been implemented. This plan incorporates the gender and diversity perspective transversally at all levels of the institute. The members of the Gender and Diversity Commission are highly involved and proactive in the implementation of these actions. For instance, they publish regular informative leaflets (distributed in the laboratories) to raise awareness within our community about gender and diversity aspects. Other achievements have included:

- Increasing the number of women Group Leaders and Postdocs: by October 2018 we had already achieved the ratio of 5 women Group Leaders that was planned for 2019.
- Expected outcome for Post doctoral researchers was 45% in 2018: we have exceeded the planned percentage, achieving 49% of women postdocs.
- For Group Leader positions, a quota of 40% of the shortlisted candidates that reach the interview phase belong to the underrepresented sex of the candidates.
- Gender Equity in the selection: it has been fixed a 40% of underrepresented sex in the selection panels.
- Using non-biased language in job adverts through the use of specific gender e-tools.
- Sensibilization Campaign: the SUMA program, a free advisory service by the Eurofirms Foundation for IBEC community members and their first-degree relatives who need information or advice on the disability certificate, as well as support to apply for the certificate.
- A training session on mitigating bias in research was held in March 2018.

The IBEC's Induction Plan has been updated and improved.

New measures have been incorporated into the "IBEC internal procedures guide: measures to promote work-life balance".

A psychosocial risk assessment was undertaken with the aim of determining the perception and opinions of IBEC staff about the different psychosocial risks we are exposed to. The assessment consisted of various meetings with experts from the health and safety experts company ASEM and an IBEC working group made up of members of the Health and Safety committee, the Directorate and the HR Unit. An anonymous questionnaire was answered by 44% of the to community and various focus groups organized with IBEC volunteers to collect qualitative information.

Most of the risk factors showed an adequate assessment with low levels of risk. Nevertheless, there were three areas that needed to be improved: workload; participation/supervision and role definition.

The working group analysed the data collected and the measures requiring implementation to improve our wellbeing and to provide a safe working environment were openly communicated to the IBEC community.

Ethical Issues

The Code of conduct for Research Integrity was published in April 2018. It was developed by a working group that included 6 researchers from R1 to R4, 2 heads of unit and the Managing Director. This code is a framework for good research practice, setting the criteria for proper research behaviour and establishing an environment conducive to high-quality research, thus ensuring that research is conducted according to international ethical standards. This code sets out the ethical standards and standards of research conduct of those engaged in research, and specifies principles, recommendations and commitments.

To reinforce the implementation, a training session for early-stage researchers was held in May 2018.

All these actions demonstrate that the HR Strategy has become a transversal project at the institute and is fully embedded into the IBEC Strategic Plan 2018-2020.

2018 in review: Governance
Transparency

In compliance with Law 19/2014 (Transparency, public access to information and good governance), a section of the IBEC website includes all the information we are obliged to provide in order to adhere to the principles of this law.

ORGANIZATION

ORGANIZATIONAL AND OPERATIONAL STRUCTURE
- Government organs
- Organization charts
- Agreements for the creation and operation of public sector entities
- Lists and catalogues of services
- Catalogue of procedures

SENIOR POSITIONS AND MANAGERS
- List of senior positions and managers
- Incompatibilities
- Activities, goods and interests
- Remuneration, compensation and subsistence allowance
- Code of good practices for posts of the Generalitat of Catalonia

PUBLIC EMPLOYEES
- List of jobs in the public sector
- Staff assigned by contract bidding agreed with the Administration
- Remuneration, compensation and subsistence allowances

CALLS: ACCESS AND RESOLUTION
- Calls for work staff, specific groups and promotion training

UNION REPRESENTATION
- Number and cost of full-time union representatives

PROCEDURES AND LEGAL ACTIONS

REGULATIONS
- Sectoral regulations
- Directives, instructions and memos
- Regulations in process

ADMINISTRATIVE INTERVENTION RULES

REVIEW OF ADMINISTRATIVE ACTS

ADMINISTRATIVE AND JUDICIAL RESOLUTIONS WITH PUBLIC RELEVANCE

OPINIONS

LINES OF ACTION

GENERAL AND SECTORAL PLANS AND PROGRAMS, AUDITS, AND STATISTICAL INFORMATION
- IBEC Annual Report (years 2007 to 2018)
- IBEC Strategic Plan 2014-2017
- Human resources strategy for researchers

ECONOMICS AND FINANCES

BUDGETS
- Approved budgets; executed; liquidated
- Annual accounts

AUDITING AND AUDITING REPORTS
- Auditing and auditing reports (years 2014-2017)

PATRIMONY OF THE GENERALITAT OF CATALONIA
- Inventory of real estate
- Movable assets of special value
- Assets management
- Patrimonial management and contracting

SUBSIDIES AND GRANTS
- Subsidies and public aid (planned and awarded)
- Financial monitoring of subsidies and aid

CONTRACTING

CONTRACTS
- Bidding and related procedures

AGREEMENTS
- Registration of collaboration agreements
- Other agreements

TERRITORY

SECTORAL TERRITORIAL PLANS

CARTOGRAPHIC INFORMATION

HEALTH AND SAFETY AT WORK

RISK PREVENTION AND SAFETY AND HEALTH OF EMPLOYEES AT WORK
- Report of the Prevention Service 2017
- Occupational risks prevention audit certificate
- Rights and responsibilities of personnel

2018 in review: Statistics

IBEC in figures, 2018

In 2018, the total number of IBEC's staff (including administration personnel as well as researchers, students and technicians) was 341, representing an increase of 56 people since 2017. Of this total, 250 were hired by IBEC, while the rest are seconded, affiliated, externals, visitors or other status.

The following statistics reflect the situation on 31st December 2018.

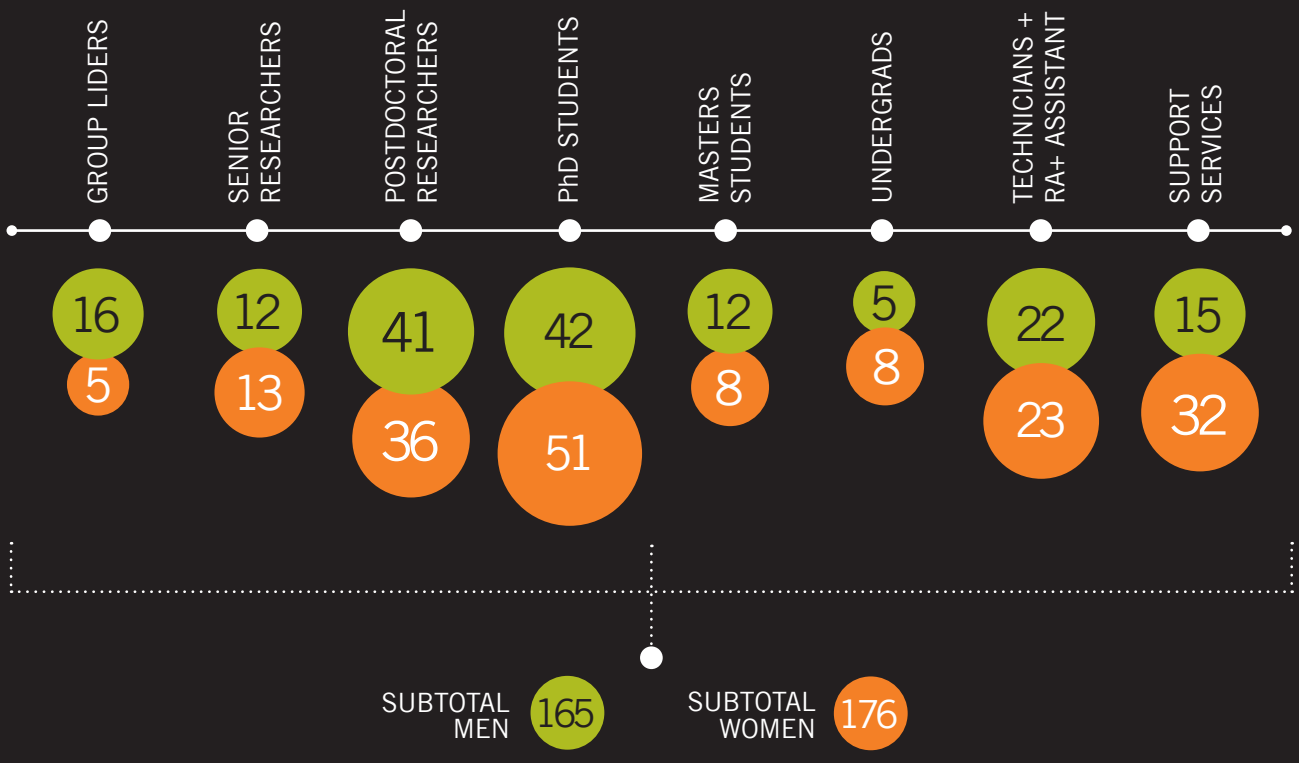
01 AGE OF ALL IBEC SCIENTIFIC STAFF

65% OF SCIENTIFIC STAFF IN 2018 WERE UNDER 35

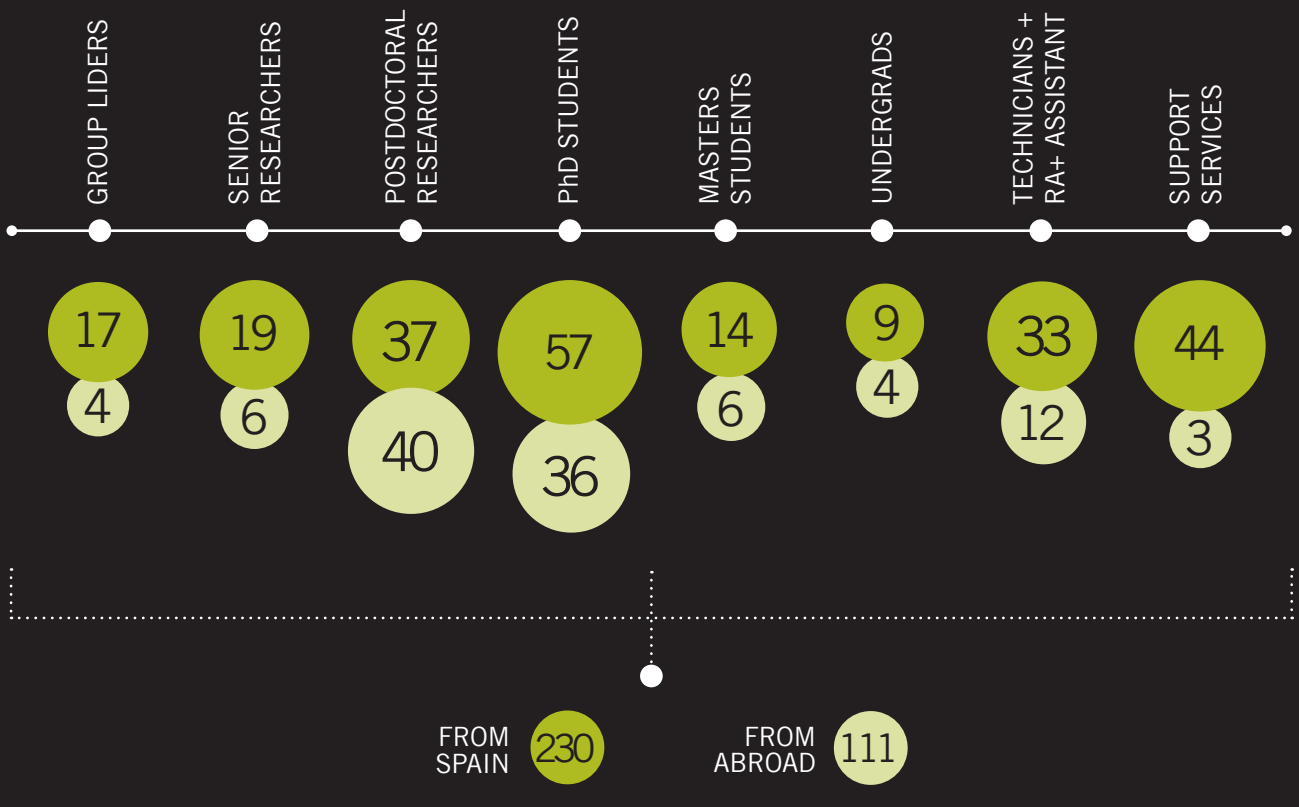
02 GENDER OF ALL IBEC STAFF (RESEARCHERS, TECHNICIANS AND ADMINISTRATION)

52% OF ALL STAFF IN 2018 WERE FEMALE

03 ALL STAFF BY GENDER AND JOB CATEGORY



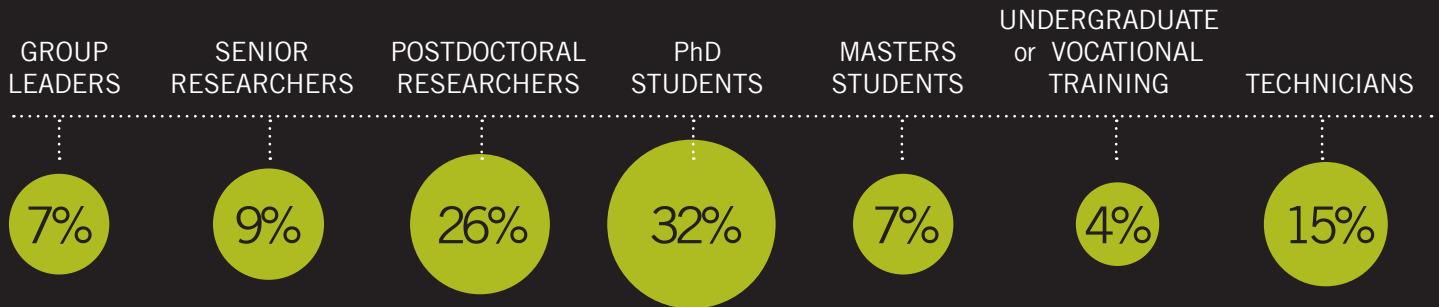
04 ALL STAFF BY NATIONALITY (SPAIN/OTHER AND JOB CATEGORY)



05 ALL IBEC BY NATIONALITY (MAP)

ALL 294
OF SCIENTIFIC PERSONNEL AT IBEC IN 2018 ARE REPRESENTED
(NOT INCLUDING ADMINISTRATION STAFF)

06 IBEC RESEARCHERS AND TECHNICIANS BY JOB CATEGORY

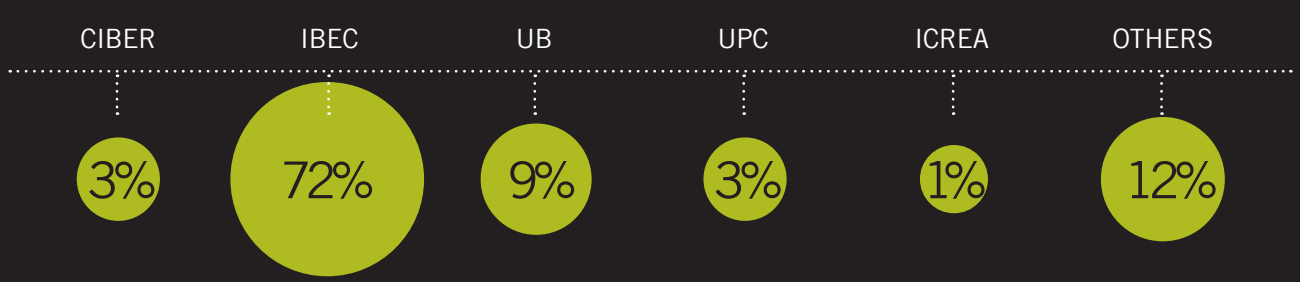


AUSTRIA 2
BOSNIA AND HERZEGOVINA 1
BULGARIA 1
CZECH REPUBLIC 1
FRANCE 6
GERMANY 5
GREECE 3
IRELAND 1
ITALY 27
POLAND 3
PORTUGAL 3
ROMANIA 2
SERBIA 1
SWEDEN 2
THE NETHERLANDS 5
TURKEY 1
UNITED KINGDOM 1
SPAIN 186

EUROPE: 251

ASIA&OCEANIA: 17

07 IBEC RESEARCHERS AND TECHNICIANS BY ASSOCIATED OR CONTRACTING INSTITUTION



08 MOBILITY IN 2018

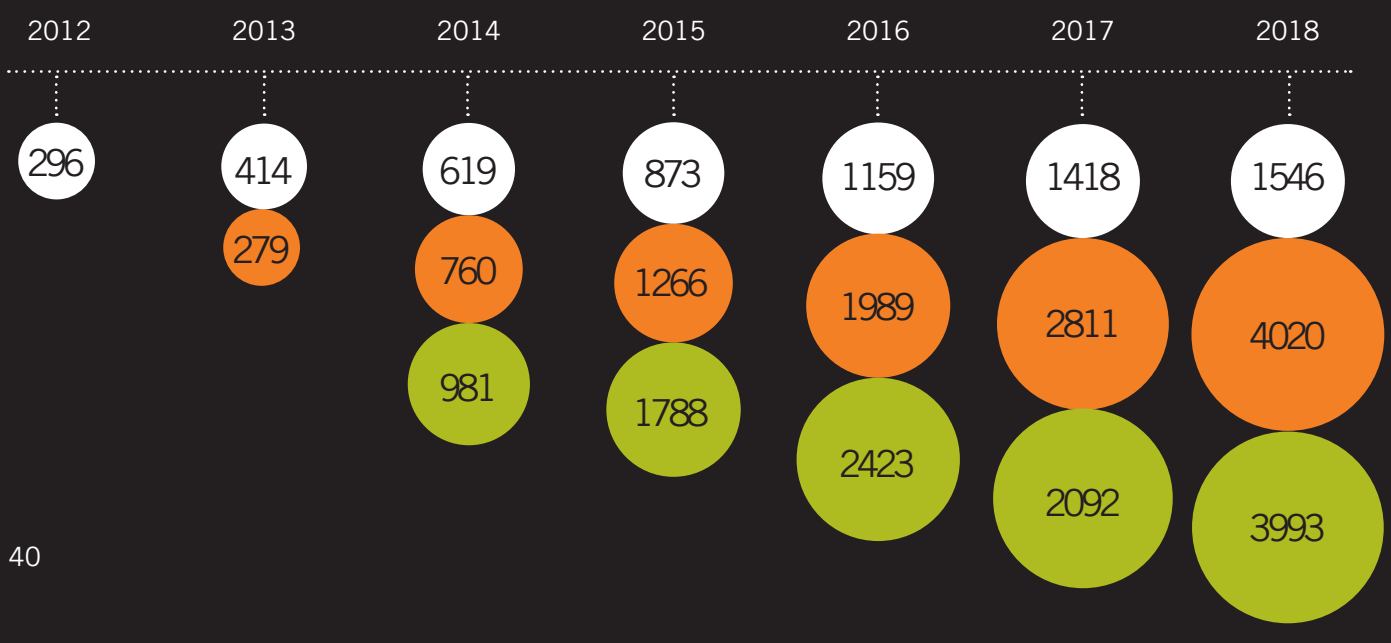
MOVED TO THE REST OF THE WORLD **4**

MOVED TO OTHER LABS IN EUROPE **18**

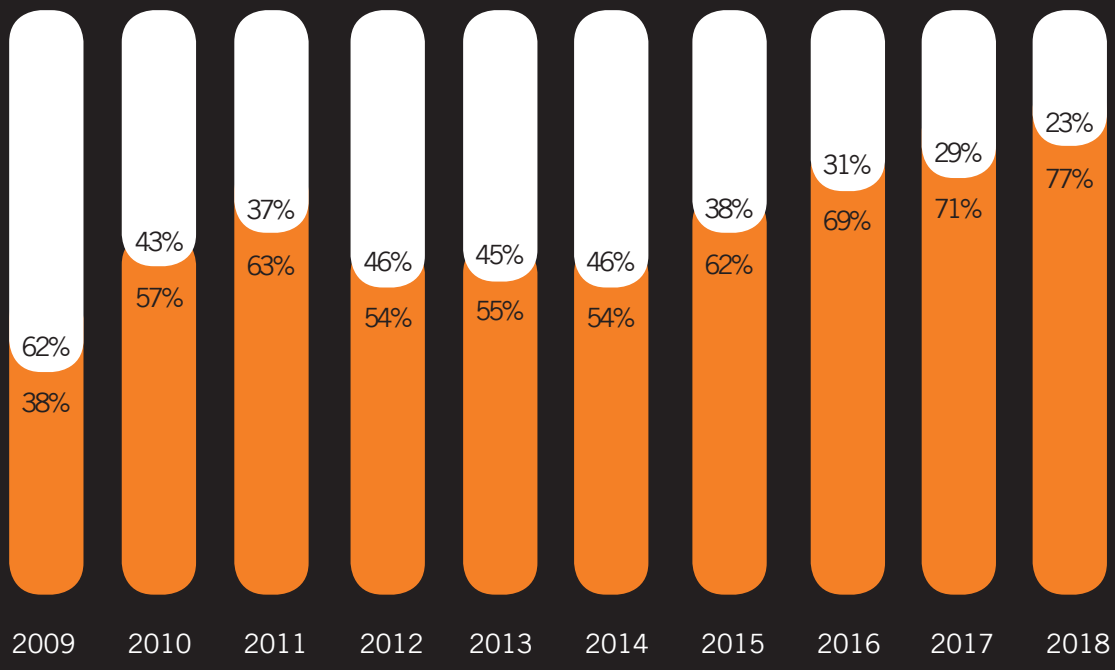
MOVED TO OTHER LABS IN SPAIN **3**

NUMBER OF RESEARCHERS WHO SPENT TIME ELSEWHERE IN 2018: **25**

09 NUMBER OF FOLLOWERS ON SOCIAL MEDIA 2012-2018



10 FUNDING SOURCES IN 2018

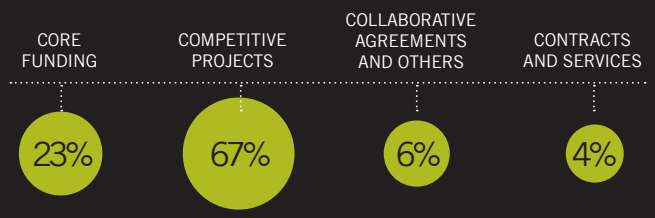


Percentage of funding from core vs. competitive sources. Core funding is funding from trustees. Soft funding includes competitive projects (funded by sources such as the EU's H2020 program, the Spanish Ministry of Science and the Catalan Ministry of Research), industry contracts, funding from private institutions.

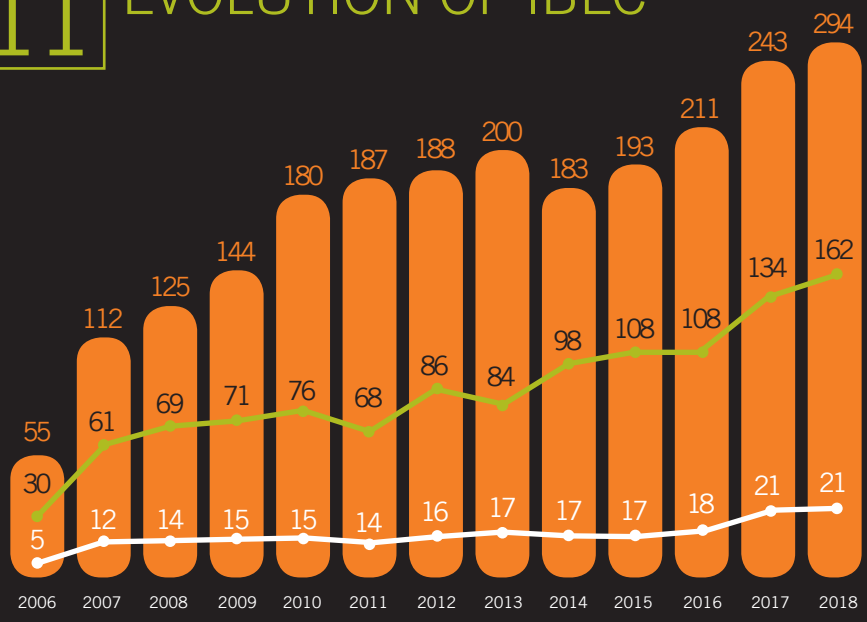
CORE FUNDING

SOFT FUNDING

DIFFERENT SOURCES OF FUNDING IN 2018, BROKEN DOWN INTO TYPES.



11 EVOLUTION OF IBEC



RESEARCHERS

PUBLICATIONS

Indexed journal articles only, not including conference proceedings, etc.

76% OF IBEC 'S INDEXED JOURNAL PAPERS IN 2018 WERE IN THE FIRST QUARTILE

NUMBER OF GROUPS

2018 in review: Visibility

Top 10 Media mentions

BY READERSHIP

01

08

10

03

06

05

02


pronto
La revista más vendida de España
Prueban prótesis para huesos impresos en 3D capaces de regenerarse
La incorporación de nanopartículas favorece su integración en el organismo
Probado con éxito en ratones
Las impresoras 3D reproducen a la perfección diferentes formas.

04


LA VANGUARDIA
El Institut de Bioingeniería de Catalunya y una empresa de prótesis ensayan piezas en 3D con nanopartículas bioactivas que las integran
Huesos de impresora que regeneran el propio
Los investigadores aseguran que "en unos años no sabrás que llevabas una pieza extraña"

09


LA RAZÓN
CATALUÑA
Una fórmula física para frenar la metástasis
Un equipo de investigadores catalanes desarrollan un nuevo marco para contribuir en la cura del cáncer de mama
Competición entre fuerzas


Retina
05. SMART NANO-BIO-DEVICES
Tira de imaginación y piensa en unos mini batiscafos que entran en el cuerpo y destruyen bacterias, tumores o colesterol. No es ficción, es real.
«Los batiscafos nos dan una mayor probabilidad de atravesar las membranas celulares y llegar donde están los tumores».
Samuel Sánchez
NANOROBOTS

07


elPeriódico
Últimas noticias de Frankenstein
Cinco científicos hacen balance sobre las promesas de regenerar o crear vida
Bioingeniería, xenotrasplantes, robótica y simulación, técnicas prometedoras
Josep Samitier
«Crear un ser vivo juntando órganos no se ha hecho realidad, pero sí los trasplantes»
Marc Güell
«Antes de cinco años podremos poner un riñón de cerdo en un ser humano»
Núria Montserrat
«Podemos coger un corazón, quitarle sus células y repoblarlo con otras»
Patricia García-Cañadillo
«La frontera es generar modelos virtuales personalizados de órganos»
Paul Verschure
«Es factible que la inteligencia artificial alcance capacidades humanas»
Órganos mecánicos
Ciberingeniería
Simulación virtual

2018 in review: Visibility

Top 10 Events in 2018

FEBRUARY

Sangeet Sabha – An **Indian classical music evening** at the PCB organised by PCB, organized IRB and IBEC.

5th **Nano World Cancer Day,** organised by Nanomedspain.

MARCH

Just like every year, NanomedSpain participates in the **Annual Conference of Biomedical Research Technology Platforms**, held this year in Barcelona.

Nanomed Spain has a stand at the **ImagineNANO** fair in Bilbao.

APRIL

Stand at the **Fira de Recerca en Directe** 2018.

Reprogramming, **Differentiation and Molecular Genetics** course.

MAY

The 4th **Research4Talent** event, an open day for Degree and Master's students.

IBEC presents an exclusive **European première** of the movie *I'll Push You* in collaboration with Cinesa Diagonal, as part of the activities of the IBEC's fundraising program Faster Future.

Pint of Science 2018.

Seminar on Nanotoxicity co-organized by **NanomedSpain**, CIBER-BBN and MATERPLAT.

JUNE

Stand at the 12th **Festival de la Ciència.**

Celebration of the Forum of Applications of **Nanomedicine in Drug Delivery** and Targeting organized by NanomedSpain and CIBER-BBN.

3D Bioprinting Workshop OVOMAX Project, co-organized by NanomedSpain.

JULY

- Living Machines 2018 – 7th International Conference on Biomimetic and Biohybrid Systems.

SEPTEMBER

- Barcelona Cognition, Brain and Technology Summer School (BCBT2018).
- Stand at La nit de la Recerca.

OCTOBER

- IBEC's 11th Symposium on Bioengineering for Regenerative Therapies.
- International Scientific Committee Meeting.

DECEMBER

- Scanning Tiny Biology workshop.
- IBEC Christmas Celebration.

NOVEMBER

- Second International Symposium on Photopharmacology (ISPP2018).
- nanoBio&Med2018.

2018 in review: Visibility

Top 10 Outreach activities

JANUARY

BOJOS I BOGES PER LA BIOENGINYERIA

IBEC organizes for the first time 'Bojos i boges per la Bioenginyeria' within the framework of the program 'Bojos per la ciència' of the Fundació Catalunya La Pedrera.

FEBRUARY

YOMO 2018

Stand at the YOMO Barcelona festival, at the Science and Technology Youth Festival.

MARCH

SALÓ DE L'ENSENYAMENT

Stand in the science space at Saló de l'Ensenyament 2018.

APRIL

FIRA RECERCA EN DIRECTE

Stand at the Fira Recerca en Directe organized by Parc Científic of Barcelona.

JUNE

MAKER FAIRE

Speakers Corner: (BIO) -PRINTING: dream or reality? Supervisor: Núria Montserrat.

SEPTEMBER

NIT JOVE DE LA RECERCA

Interactive workshop for the 'Nit de la recerca' at Cosmocaixa.

2018 in review: People

Administration

Director
Josep Samitier

Managing Director
David Badia

Assistant to the Director
Ester Sánchez

Administrative Assitant
Sonia Lertxundi

IMS Developer
Carles Ortega

Junior Developer
Marc Purgimon

Project Manager
Sergio González

Head of Strategic Initiatives
Teresa Sanchis

DIRECTORATE | STRATEGIC INITIATIVES

Head of Finance
Ana María González

Accounting Technician
Victòria López

Accounting Assistant
Jessica Díaz

Purchasing Technician
Mayte Muñoz

Accounting Manager
José Antonio Martín

Accounting Assistant
Berta Pla

FINANCE

IT Manager
Julio Bafaluy

IT Technician
Francisco Contreras

IT Technician
Alejandro Silverio

Head of Communications and Outreach
Vienna Leigh

High School/Voc. Training
Oriana Ortiz

Communications Assistant
Pilar Rodríguez

INFORMATION TECHNOLOGY | COMMUNICATIONS AND OUTREACH

Assistant to the Projects Office
Judith Forné

Project Manager

Project Manager
Rosa Miralles

Project Manager
Guillermo Talavera

Head of Projects Office
Javier Adrián

Funding Manager
Esther Gallardo

Project Manager
Sara Vicente

Project Manager
Daniel Caudepón

PROJECTS OFFICE

Head of Human Resources
Carolina Marí

Human Resources Technician
Neus Vilalta

Human Resources Technician
Ciara Boter

Health and Safety Technician
Raquel Guillén

Human Resources Technician
Núria Jané

Biosafety Officer
Marta Llorens

HUMAN RESOURCES

Events Coordinator
Pilar Jiménez

Media Relations and Branding Coordinator
Àngels López

Head of Technology Transfer Office
Xavier Rúbies

Project Manager
Xavier Puñet

Project Manager
Diana Mª González

TECHNOLOGY TRANSFER

For the Core Facilities staff list, see the Research and Services section, page 93

2018 in review: People

PhD theses in 2018

The data show the date of the thesis defence, the name of the student, his/her group at IBEC, the title of the PhD thesis and the awarding body.

FEBRUARY

ROGER ORIA FERNÁNDEZ

Cellular and Molecular Mechanobiology
'Cell sensing of the extracellular environment: Roles of matrix rigidity, ligand density and ligand distribution'
(UB)

MARCH

Sergi Oller

Signal and information processing for sensing systems
'Data processing for Life Sciences measurements with gas chromatography – Ion mobility spectrometry'
(UB)

Laura Urrea Zazurca

Molecular and Cellular Neurobiotechnology
'Funciones de la proteína priónica celular, α-sinucleína y Reelina en enfermedades neurodegenerativas'
(UB)

APRIL

Berta Gumí Audenis

Nanoprobes and Nanoswitches
'Structural organization of model membranes: a complementary approach combining atomic force microscopy and x-ray techniques'
(UB)

MAY

Giovanni Maffei

Synthetic, Perceptive, Emotive and Cognitive Systems (SPECS)
'Automatic and deliberate control of action: an embodied perspective of artificial and biological brains'
(UPF)

JULY

Marina Uroz Marimón

Integrative Cell and Tissue Dynamics
'Regulation of cell division and cell cycle progression by cell-cell and cell-matrix forces'
(UB)

Diogo Pata Santos

Synthetic, Perceptive, Emotive and Cognitive Systems (SPECS)
'The dynamics of hippocampal encoding: beyond the spatial metaphor'
(UPF)

SEPTEMBER

Jaideep Katuri

Smart Nano-Bio-Devices
'Guiding active particles through surface interactions'
(UB)

OCTOBER

Jemish Parmar

Smart Nano-Bio-Devices
'Micromotors for environmental applications'
(UB)

NOVEMBER

Joan Martí Moñoz

Biomaterials for Regenerative Therapies
'Chemical design and validation of Ca2+-releasing platforms to promote vascularization in tissue regeneration'
(UPC)

DECEMBER

Gizem Altay

Biomimetic Systems for Cell Engineering
'Towards the development of biomimetic in vitro models of intestinal epithelium derived from intestinal organoids'
(UB)

2018 in review: People

IBEC Seminars in 2018

Throughout the year, international experts, scientists working with our research teams on specific projects and some of the IBEC group leaders are invited to give lectures as part of the IBEC Seminars program. The aim of these events is to provide an overview of the state-of-the-art research in various fields and to give the audience the opportunity to discuss recent developments with the guest speakers.

In addition, the PhD Discussions Sessions are devised so as to encourage the participation of PhD students, providing a forum where they can present the results of their research and discuss it with fellow students and researchers. Throughout 2018, 6 PhD students presented their work in these sessions.

JANUARY 12 ■ **Dong-Pyo Kim**, POSTECH (Pohang University of Science & Technology), South Korea | 'Advances in microfluidic technology driven by materials'.

JANUARY 18 ■ **Gopi Shah**, CRUK Cambridge Institute, University of Cambridge | 'Prospects of light sheet microscopy in developmental biology and cancer research'.

JANUARY 31 ■ **Gregory M. Lanza**, MD PhD, Division of Cardiology; Washington University Medical School, St. Louis, MO | 'Molecular imaging and drug delivery: The CTRAIN experience'.

FEBRUARY 23 ■ **PHD DISCUSSION**
Aida Baelo, Bacterial infections: antimicrobial therapies | 'From the understanding to the treatment of biofilm wound infections'.
Arnau Biosca, Nanomalaria | 'New antimalarial strategies and drug delivery systems based on nanotechnology'

FEBRUARY 28 ■ **Johanna Ivaska**, Turku Centre for Biotechnology, University of Turku, Finland | 'Mechanosensitive regulation of cancer and pluripotency'

MARCH 20 ■ **Carlo A. Bortolotti**, Dipartimento di Scienze della Vita, Universita di Modena ed Regio Emilia, Italy | 'Monitoring biorecognition with organic bioelectronic transistors'

MARCH 23 ■ **PHD DISCUSSION**
Andreu Matamoros, Molecular and cellular neurobiotechnology | 'Role of the Cellular Prion Protein in hippocampal neurotransmission, learning and memory'
Maider Badiola, Nanobioengineering | 'Paving the way towards an in-vitro 3D mechanosensory-motor circuit on a chip'

MARCH 28 ■ **Aurélien Bancaud**, LAAS-CNRS, Toulouse, France | 'µLAS technology for DNA processing: setting up elementary functions (concentration, separation, purification, identification) and application in oncology and targeted sequencing'

APRIL 4 ■ **Fernando López-Gallego**, Heterogeneous Biocatalysis Laboratory. University of Zaragoza | (iQSCH-CSIC), ARAID, Science Foundation of Aragón 'Immobilization of multi-enzyme systems; an avenue to fabricate self-sufficient heterogeneous biocatalysts'

APRIL 13 ■ **Joan Seoane**, Group Leader and Director of the Translational Research program at the Vall d'Hebron Institute of Oncology (VHIO) | 'Intratumor heterogeneity in brain cancer'

APRIL 20 ■ **David Dagan Feng**, PhD, FACS, FATSE, FHKIE, FIEEE, & FIET | 'Biomedical engineering and technology research at USYD and beyond'

MAY 2 ■ **Francesco Ricci**, Chemistry Department, University of Rome, Tor Vergata, Rome, Italy 'DNA-based nanodevices for diagnostic and drug-delivery applications'

JUNE 1 ■ **PHD DISCUSSION**
Jesús Ordoño, Biomaterials for regenerative therapies | 'Lactate-based strategy for cardiac tissue engineering'
Ernest Latorre, Integrative cell and tissue dynamics | 'Active superelasticity revealed by three-dimensional epithelial sheets of controlled size and shape'

JUNE 8 ■ **Mar Álvarez**, Ramón y Cajal researcher, Biomedical Applications Group, IMB-CNM 'Organ-on-chip monitoring'

JUNE 15 ■ **Vivek Shenoy**, University of Pennsylvania | 'Cell-matrix interactions in fibrosis and cancer: multiscale mechano-chemical models'

JUNE 29 ■ **PHD DISCUSSION**
Helena Lozano, Nanoscale bioelectrical characterization | 'Electrical and morphological characterization of bacterial polar flagella'
Martina Maier, Synthetic, Perceptive, Emotive and Cognitive Systems (SPECS) | 'Rehabilitation of cognitive deficits and depression after stroke'

JULY 6 ■ **Cristina Canal**, Ramón y Cajal Fellow; Biomaterials, Biomechanics and Tissue Engineering (BBT), UPC | 'Cold atmospheric plasma: a novel potential therapy for cancer treatment'

JULY 16 ■ **Ina Meiser**, Group manager Cryobiotechnology, Fraunhofer Institute for Biomedical Engineering (IBMT) | 'Application-oriented cryopreservation and banking of stem cells and stem cell derivates'

JULY 20 ■ **Hiroshi Ishida**, Graduate School of Bio-Applications and Systems Engineering, Tokyo University of Agriculture and Technology | 'Active flow generation for mobile robot olfaction and olfactory assisting devices'

JULY 23 ■ **Kevin Chalut**, Cambridge Stem Cell Institute | 'Mechanical signalling and cell fate'

SEPTEMBER 21 ■ **Yunuen Avalo**, BEST COFUND postdoc, Nanomalaria group, IBEC | 'GUVs as biomimetic systems to study pathogenic-related mechanisms of human Parasites'

OCTOBER 8 ■ **Rui L. Reis**, Prof. Rui L. Reis, University of Minho | 'New Approaches, combining natural materials and stem cells, for the engineering of different types of tissues'

OCTOBER 19 ■ **Álvaro Aytés**, Idibell | 'Cross-species analysis of gene regulatory networks during prostate cancer progression'

OCTOBER 26 ■ **PHD DISCUSSION**
Anna Vila, Biomimetic Systems for Cell Engineering | 'Engineering of 3D Small Intestinal Mucosa Models'
Alexandre Gomila, Nanoprobes and Nanoswitches | 'In vivo photomodulation of GABA and Glycine repector channels'

OCTOBER 30 ■ **Guillaume Salbreux**, The Francis Crick Institute | 'Physics of epithelial flows and folds'

NOVEMBER 16 ■ **Benedetta Bolognesi**, IBEC 'The mutational landscape of a prion-like domain'

NOVEMBER 23 ■ **Rubén Moreno-Bote**, Serra Hunter Associate Professor, UPF | 'Aligned neuronal encoding of sensory information, biases and choices in perceptual decision making'

NOVEMBER 30 ■ **PHD DISCUSSION**
Martí Checa, Nanoscale bioelectrical characterization | 'Nanoscale dielectric imaging by 3D-Electrostatic Force Microscopy'
Javier Rodríguez, Biomedical signal processing and interpretation | 'Sudden cardiac death risk stratification of idiopathic cardiomyopathy patients by the application of cardiovascular coupling analysis'

2018 in review: People

Training in 2018

These pages list the specific training courses that took place at IBEC during 2018.
IBEC's mission is achieved by carrying out different objectives, one of which is to train the next generation of experts in healthcare technologies. IBEC aims to prepare researchers to deliver brilliant research while giving them the opportunity to take the next steps forward in their professional careers.
The annual Training Catalogue provides a number of courses on transversal skills, scientific tools and techniques, health and safety and languages offered to the IBEC community.
Furthermore, Welcome and Induction training is offered to all newcomers to ensure that their incorporation into IBEC is as fast and smooth as possible.

JANUARY 16 AND 17, 18 AND 19

From Science to Business
(Leadership & management skills)
Course provider: organized by BIST, Jen Allanson and Geraint Wyn Story | For 1st year PhD Students

FEBRUARY - APRIL | OCTOBER - DECEMBER

Spanish classes for beginners (Languages)
Course provider: Oxford House | For all IBEC members

MARCH 6

Security Laser Training (Health & Safety)
Course provider: ProcarelightCare | For researchers at all career stages

MARCH 7

Mitigating Bias: promoting diversity and sustainable excellence in research
(Gender & Diversity)
Course provider: Claartje Vinkenburg | For all IRB & IBEC members

MARCH 20

Ergonomía cómo prevenir o mejorar lesiones músculo-esqueléticas (Health & Safety)
Course provider: ASEM | For all IBEC members

APRIL 11 AND 12

Time management and personal effectiveness
(Leadership & management skills)
Course provider: Tom Jacobs | For all IBEC members

APRIL 11 TO 13

Leadership in Action
(Leadership & management skills)
Course provider: organized by BIST, VITAE | For early postdocs. 1st and 2nd year Postdoctoral researchers |

MAY 3 AND 17

Mindfulness for improved self-mastery and resiliency (Leadership & management skills)
Course provider: Andrés Martin Asuero | For all IBEC members

MAY 9

Introduction to Research Integrity
(Leadership & management skills)
Course provider: Maruxa Martínez | For PhD Students |

MAY 21 AND 22, 23 AND 24

Taller competencial de Conversaciones Críticas
(Leadership & management skills)
Course provider: Elena Palma | For Administration staff

MAY 23 AND 24

How to survive a PhD
Course provider: organized by BIST | For PhDs

JUNE 12 TO 14

From Science to Business (Leadership & management skills)
Course provider: organized by BIST | For postdoctoral and senior researchers

JUNE 13

New Spin-off Creation: best practices and lessons learned (Innovation skills)
Course provider: Josep Lluís Falcó | For all IBEC members

JUNE 21

Buenas prácticas en Protección de la Información Confidencial en proyectos de investigación (Communication)
Course provider: onBranding | For all IBEC community

JUNE 26

Image J and Video Processing
(Scientific tools & techniques)
Course provider: Pere Roca-Cusachs | For PhD students, Master students and post-docs

JUNE 27 AND 29

Grad School (Leadership & management skills)
Course provider: organized by BIST, VITAE | For 2nd and 3rd year of PhD

JUNE 27 AND 28 AND JULY 2

Say it so it stays: Oral presentation skills training for scientists (Communication)
Course provider: Elinor Thompson | For PhD students and post-docs

JULY 11 AND 12

Career development for Scientists
(Leadership & management skills)
Course provider: organized by BIST, Tobias Maier | For PhDs and Postdoctoral researchers

OCTOBER - DECEMBER | JANUARY - MARCH | APRIL - JUNE

English (intermediate & advanced) (Languages)
Course provider: Oxford House | For all IBEC members with an IBEC-labour contract + all PhD students and Postdocs regardless of their contracting institution

OCTOBER 3 TO 5

Professional Development for Senior Postdoctoral Researchers
(Leadership & management skills)
Course provider: organized by BIST | For postdoctoral and senior researchers

OCTOBER 8 TO 10

Leadership and Management skills for Senior Group Leaders (Leadership & management skills)
Course provider: HfP | For Senior Group Leaders

OCTOBER 10

Data Visualization (Scientific tools & techniques)
Course provider: organized by BIST, Jernej Zupanc | For PhD students and post-docs

OCTOBER 18

Good practices workshop "How to design experiments?" (Scientific tools & techniques)
Course provider: Riccardo Leardi | For PhDs and Master's students

OCTOBER 25

Becoming a Scientific Writer, putting 'why' before 'how' (Communication)
Course provider: Gavin Lucas | For PhD students and post-docs

NOVEMBER 15

Learning to write clearly, the 'how' of good scientific writing (Communication)
Course provider: Susan Frekko | For PhD students and post-docs

NOVEMBER 29

Product development in the industry: How they think, how they work (Innovation skills)
Course provider: Isabel Amat | For all IBEC members

DECEMBER 18

Good practices in a multidisciplinary lab
(Leadership & management skills)
Course provider: HfP | For Master students and 1st year PhDs

THROUGHOUT THE YEAR

Effective Teamwork begins and ends with Communication (Leadership & management skills)
Course provider: Yolanda Atienza | For all IBEC members from the same research group

ALONG THE YEAR

Training for Research Groups: Communication and collaboration (Leadership & management skills)
Course provider: D'Alma business partners | For all members of the same research group

ALONG THE YEAR

Coaching sessions for Group Leaders
(Leadership & management skills)
Course provider: Elena Palma | For group Leaders

JANUARY 2019

Introduction to Matlab
(Scientific tools & techniques)
Course provider: Javier Burgués | For PhD students

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info@ibecbarcelona.eu

www.ibecbarcelona.eu

A centre of: BIST Barcelona Institute of Science and Technology

A member of: Institució CERCA Centres de Recerca de Catalunya

Universitat de Barcelona
Universitat Politècnica de Catalunya BarcelonaTech
Generalitat de Catalunya
Unió Europea
Fons europeu de desenvolupament regional
Gobierno de España Ministerio de Economía y Competitividad