ICFO

ICFONIANS 45

Community News Summer 2021

Generating High Impact Science

with diverse perspectives and contributions

EDITOR'S CORNER

Brook Hardwick
Contributing Editor

The Extra Mile

This edition's Editor's Corner is dedicated to all those who exceed expectations

They not only achieve what is required of them or what they are paid to do, dotting the "i's" and crossing the "t's", they offer suggestions for improving on the initial project and diligently invest their time and energy to produce results that are not just good enough, they are superb. They have fresh ideas and the initiative to put them in motion. They present in technicolor detail even when the black and white image would often suffice.

The best part of my job is working with ICFOnians who consistently go the extra mile, contributing to results that we are all proud of and sprinkling a little motivating magic along the way. Their dedication to excellence is contagious.

As you read through this edition of *ICFOnians*, it will be clear to you some of the examples that have inspired this call-out to the ICFO "extra-milers", with two specific community initiatives immediately coming to mind. Knowing that scientific advances are only part of the sharp learning curve that young scientists experience as they launch their careers, PhD student Alvaro Rodriguez proposed a forum to share information on the all elusive publication process. Working with the ICONs leadership team, he brought together assorted members of the ICFO community for a series of talks to offer pointers and insights on the "what, when, where and why" of scientific publishing (pg 9). A second community initiative was the first PRIDE celebration at ICFO.

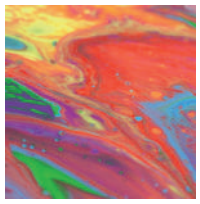
Building on personal convictions and activism, ICFOnians and ICONs leaders Arturo Villegas and Pablo Fernandez organized a month-long agenda, that aimed to bring awareness to the need for support and recognition of the LGTBQI+ community in science (and beyond). The common denominator in these very different initiatives was the personal involvement and commitment of the organizers, going above and beyond what is expected of PhD students, contributing towards the personal and professional growth of the entire ICFO community.

Reaching out to an extended member of our scientific community, we spoke with Prof Rachel Oliver, Professor of Material Science at the University of Cambridge, for our High-Profile interview (pg 12). She is doing fascinating work with nitride semi-conductors, a highly competitive field in which she has also launched a spin-off company, yet she invests countless hours to improve her field and STEM in general through TIGERS in STEMM, a UK based group for equity in research which she helped to found.

This standing ovation for people who go the extra mile would not be complete without a special mention to all of the behind the scenes professionals at ICFO that have gone the extra mile to "make the wheels (of research) go 'round" in spite of COVID complications and limited resources. This is a heart-felt thanks for making us all look good!

Mystery ICFOnian Solution Ed #44: **Merche Rivas Jiménez**. Biology Technician, Biology Lab.

COVER



The painting on the cover of this edition was created in collaboration with artist Reyes Portas using the acrylic paint pouring technique. The blending of different colors in art to create a unique, complex and beautiful final work is a metaphor for the blending of perspectives and contributions at our institute. The diversity of the ICFO community, in all its many forms, fuels our creativity, inspiring us to ask difficult question, develop new knowledge, and propose unique solutions to a wide range of problems faced by society.

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HAPPENINGS

LUXQUANTA BECOMES ICFO'S 10th SPIN-OFF
p. 6

ICFO NEWCOMERS

Welcome to ICFO

Many of us joined ICFO or took a new position at the institute between April and June.

Pol Conesa Vallve
Mgment (Admin)

Giovanna Petrillo
Mgment (Admin)

Andrés Felipe Ordoñez
Postdoctoral Researcher

Antonio Rubio Abadal
Postdoctoral Researcher

Donato Farina
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Research Fellow

Luis Felipe Morales Curiel
PhD Student

Yina Wu
PhD Student

Claudio Iacovelli
Student

Carles Mestre Torrents
Student

Maria Gisbert Alcantud
Student

Xavier Barcons Planas
Student

Paul León Gómez
Student

Antonio Estarellas Perales
Student

Maria Quintana
Student

Yuzhi Wang
Student

Ran Huo
Student

Roger Pons Lanau
Student

Ana María Pérez Barrera
Student

Joshua Thomas Arens
Student

Bennet Windt
Student

Rohan Sharma
Student

Sylvia Lacher
Summer Fellow

Maria Flors Mor Ruiz
Summer Fellow

Paula Cordero Encinar
Summer Fellow

Jaime Echave-Sustaeta
Summer Fellow

Jacopo De Santis
Summer Fellow

Nicholas Cox
Visiting PhD Student

Sara De Vincentiis
Visiting PhD Student

Piotr Grochowski
Visiting PhD Student

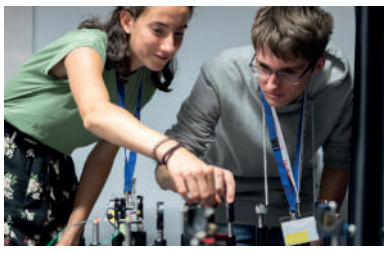
HAPPENINGS

ICFO NEWS

Consellera of Research and Universities

The Hble Gemma Geis, Consellera of Research and Universities of the Government of Catalonia and Chair of the ICFO Board of Trustees, visited ICFO during her first days in office. In initial statements offered to the press, she laid out her strategic vision for the area of research under the new government of Catalonia, underscoring their commitment to support researchers and Catalonia's research system so that Catalonia can position itself beside the other leading countries in Europe in scientific advances. The visit included a tour of the facility, interactions with researchers, members of the KTT team, the CEO of ICFO's spin-off QUSIDE, and members of ICONS. The visit ended with a meeting with ICFO's steering committee.

Future Science Prize for BIYSC participant

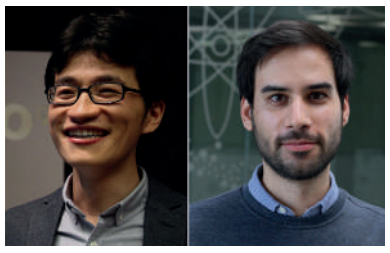


The Barcelona International Youth Science Challenge (BIYSC), a summer science program organized by Fundació Catalunya- La Pedrera in collaboration with international research centers around Catalonia, targets 16-18-year olds, from around the world, aiming to stimulate scientific talent. New Zealander James Zingel participated in the 2019 edition, spending 10 days at ICFO discovering quantum technologies. During the months that followed, he developed a scientific project, supervised by **ICFO postdoctoral researcher Dr Gorka Muñoz,** that involved the comparison of classical and quantum machine learning algorithms, as well as their implementation in current quantum computers. Zingel was awarded the **New Zealand Prime Minister's *Future Science Prize* for the impressive results of this project**.

NJP's Best of 2020

The New Journal of Physics (NJP) listed a "publishers pick" of articles comprising some of the most cited and downloaded *NJP* papers from 2020. The paper "Single trajectory characterization via machine learning" published in *NJP* January 2020 by **Gorka Muñoz-Gil**, **Miguel Angel García-March, Carlo Manzo, José D Martín-Guerrero and ICREA Prof at ICFO Maciej Lewenstein**, was included in this list. The paper, which later inspired the ANDI Challenge, proposed a machine learning method based on a random forest architecture, which is able to associate single trajectories to the underlying diffusion mechanism with high accuracy. In addition, the algorithmis able to determine the anomalous exponent with a small error, thus inherently providing a classification of the motion as normal or anomalous (sub- or super-diffusion).

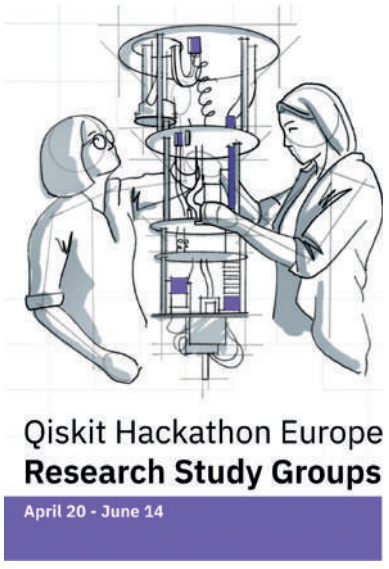
QEOD Thesis Prizes for Fundamental Aspects



Two ICFOnians have been awarded the EPS QEOD Thesis prizes for fundamental aspects. Dr Renwen Yu, currently a postdoctoral associate at Ginzton Laboratory, Stanford University, was awarded the prize for fundamental studies of light-matter interactions in nanosystems based on graphene, along with the exploration of applications in photodetection, light modulation, and optical sensing. His thesis entitled "Toward Next-Generation Nanophotonic Devices", was supervised by the leader of the Nanophotonics Theory group at ICFO, **ICREA Prof Dr Javier García de Abajo. Dr P. André D. Gonçalves**, currently working as a postdoctoral research in the same group, was also awarded the 2021 EPS-QEOD Thesis Prize for fundamental contributions to nanoscale electrodynamics and light–matter interactions with the incorporation of quantum mechanical effects in metal nanostructures and two-dimensional nanophotonics. Gonçalves defended his thesis at Technical University of Denmark in 2019.

Qiskit Hackathon Europe Winners

ICFOnians Korbinian Kottmann, Joana Fraxanet, Niccolò Baldelli plus Friederike Metz from Okinawa Institute of Science and Technology made up one of the three winning teams in the **2021 Qiskit Europe Hackathon**, an event that aimed to promote the use of and contributions to Qiskit, the open-source software package used to simulate and operate quantum computers from IBM. **The ICFO team's project proposed an application of quantum machine learning for quantum data using Variational Quantum Anomaly Detection to map out the phase diagram of a complex quantum many body systems**. They performed the algorithm on a real quantum computer hosted by IBM to demonstrate its applicability. Starting in April 2021, members of the quantum computing community pitched original ideas, formed teams, and turned ideas into viable project proposals based on Qiskit. The top 20 proposals proceeded to Phase 2, in which they had four weeks to implement a Qiskit research project proposal, culminating in the creation of a project report and a video presentation which was evaluated by Hackathon judges.



BIST Ignite Program

The BIST Ignite Program annually funds five projects from within the BIST Community, chosen for their multidisciplinarity and high level of scientific excellence. Each of the five projects receives a grant of €20,000 to carry out the first ten-month phase, after which, depending on the results obtained, a panel of experts will select two of the projects to receive €50,000 additional funding. ICFO will participate in two of the five winning projects:

ASITOC - led by Juan Manuel Fernández-Costa, postdoctoral researcher at IRB and **Michael Tayler**, postdoctoral researcher at ICFO.

TeraFox - led by Ekaterina Khestanova, postdoctoral researcher at ICFO, and **David Pesquera**, postdoctoral researcher at ICN2.

BIST Barcelona Institute of Science and Technology

LATEST ADVANCES

Entangled Quantum Memories for a Quantum Repeater

A study by ICFO scientists Dario Lago, Samuele Grandi, Alessandro Seri and Jelena Rakonjac, led by ICREA Prof at ICFO Hugues de Riedmatten, published in ***Nature*** and appearing on the journal's cover, details the achievement of a scalable, telecom-heralded matter-matter entanglement between two remote, multimode and solid-state quantum memories.

In the experiment, the team used a rare-earth doped crystal as a quantum memory for the basis of their test. They took two sources generating correlated pairs of single photons, in which in each pair, one idler photon was at a 1436nm (telecom wavelength), and the other, signal photon, at a wavelength of 606nm. The single signal photons

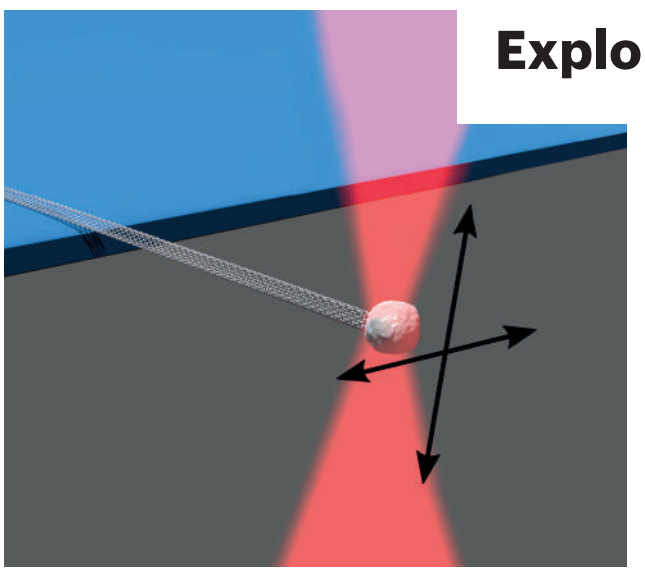
were sent to a quantum memory while the idler photons were sent through a beam-splitter, where the information about their origin and path was completely erased. The idler photon announced its arrival at the detector on the monitor with a click, confirming and verifying entanglement. This entanglement consisted in a signal photon in a superposition state between the two quantum memories, where it was stored as an excitation shared by tens of millions of atoms for up to 25 microseconds.

By using a heralding photon in the telecom frequency, scientists confirmed that the entanglement produced could be established with a photon that is compatible with existing telecom networks, that entanglement can be created over long distances and that quantum technologies can be integrated into existing classical network infrastructures. Likewise, by using the atomic frequency comb protocol which allows the multiplexing approach, the researchers were able to store the entangled photons at many different times in the quantum memory, without having to wait for a successful heralding event before generating the next entangled pair. This temporal multiplexing is a key feature that represents a major increase in the operational time of the system, leading to an increment in the final entanglement rate.
Next steps will entail bringing the experiment outside of the lab to link different nodes together and distribute entanglement over much larger distances.

Blood Flow Response to Posture Changes in Cerebrovascular Accident Patients

Researchers Clara Gregori, Igor Blanco, Peyman Zirak, Lisa Kobayashi, Stella Avtzi, Federica Maruccia and Giacomo Giacalone, led by ICREA Prof at ICFO Turgut Durduran, collaborated with neurologists at Hospital de Sant Pau and IIB-Sant Pau as well as researchers at the University of Pennsylvania, the Massachusetts General Hospital, the University of Campinas, and the Washington University of St. Louis to publish an analysis in ***BMC Neurology*** that investigates the relationship between changes in blood flow and blood pressure in cerebrovascular disease patients.

Data was gathered from three different studies, carried out between 2005 and 2017 in the United States and Spain, including seventy-two patients with cerebrovascular disease. With this data, collaborators performed a systematic analysis of the cerebral blood flow measurements obtained using diffuse correlation spectroscopy (DCS) techniques. Findings showed that while cerebral blood flow increases in healthy individuals when they pass from a supine position to an elevated posture and then decreases to initial levels when they are lying down again, in ischemic stroke and carotid stenosis patients, this is not the case. During the first 48 hours after the stroke, the cerebral blood flow of these patients is correlated with the mean arterial pressure, only in the injured hemisphere of the brain. These two observations suggest that these posture changes in stroke patients may be used to identify deficits or errors in the brain's autoregulation response.



Exploring the Stiffness of Nano-objects

In a study published in ***Physical Review Letters*** and selected as an **"Editors' suggestion", ICFO researchers Slaven Tepsic, Gernot Gruber and Christoffer B Moller, led by ICFO Prof Adrian Bachtold**, in collaboration with researchers from the Instituto de Nanociencia y Materiales de Aragón (INMA) of the University of Zaragoza, ICMM-CSIC, Polytechnic University of Marche, TUDelft, and University of Nottingham, report on a new approach to measure the small change of the elasticity of a nanotube when changing its temperature. The team built a 1-10 micrometer long carbon nanotube with one end fixed to a silicon chip and the other end free, which sustained a platinum particle. Placing the entire system in a chamber at room temperature where they could lower the temperature slowly to a few degrees Kelvin, they shined the nanotube with a He-Ne laser and observed the system's vibrations. They searched and measured the vibration mode with lowest frequency and observed how the resonance frequency changed to measure the stiffness of the nanotube. The team showed that the thermal reservoir is composed of phonons by a sizeable amount. While lowering the temperature, they saw that the stiffness of the nanotube was dependent on these phonons.

HAPPENINGS

BUSINESS NEWS

LuxQuanta Becomes ICFO's 10th Spin-Off

New spin-off will exploit quantum technologies to provide the highest level of data security

On May 13th, ICFO launched its 10th spin-off company, LuxQuanta. The official signature took place in Barcelona with co-founders of the spin-off company **CTO Sebastian Etcheverry**, Head of the Signal Processing Unit **Saeed Ghasemi,** and ICREA Prof at ICFO **Valerio Pruneri**, as well as ICFO Director **Lluis Torner**, ICREA Executive Director **Emilià Pola**, and ICFO's Knowledge and Technology Transfer Director **Silvia Carrasco**.

The technology and IP developed at ICFO in the Optoelectronics research group led by ICREA Prof Valerio Pruneri, which has now been transferred to LuxQuanta, **exploits the unique properties of quantum physics to provide cryptography solutions to implement an extra layer of security for companies and telecommunication networks. Their main product consists of high-performance quantum key distribution systems to distribute a cryptographic key between users. The company's technology is cost-effective and ready to operate in network environments.**

CTO Sebastian Etcheverry comments, *"The unprecedented computational power of quantum computers presents an enormous risk to some of the cryptographic algorithms we used today. The solution for this world-wide problem could come also from a quantum technology; Quantum key distribution. LuxQuanta's vision is to boost quantum key distribution technology by providing a system with reduced implementation cost and high performance to protect digital data in the near future. Working with ICFO and its KTT team has been an exciting process which has put us in an excellent position to provide safer communication for society."*

Director of ICFO KTT, Silvia Carrasco comments, *"We are extremely excited to see LuxQuanta's launch. After many years of research, development and business efforts, LuxQuanta's exceptional team is prepared to provide quantum solutions to better protect digital data, a growing critical asset for organizations, infrastructures, industries, citizens and our society at large."*

LUXQUANTA

The research that gave rise to LuxQuanta received support from the European Regional Development Funds allocated to the Generalitat de Catalunya for emerging technology clusters devoted to the valorization and transfer of research results (QuantumCAT 001-P-001644, and InnDelta- 001-P-002223), from the Department of Digital Policies and Public Administration of the Generalitat de Catalunya (Criptografia Quàntica en Comunicacions Crítiques), from the Spanish Ministry of Economy, Industry and Competitiveness through the Severo Ochoa Distinction of Excellence, the European Commission through the H2020 FET Flagship on Quantum Technologies (CiViQ - No 820466), the Barcelona and Castelldefels City Councils, and the "la Caixa" Foundation.

Mobile World Congress 2021

20,000 visitors from 117 countries and 100,000+ online attendees tune in for the latest updates of the mobile ecosystem

From June 28 to July 1st, GSMA, the organizer of the world's largest mobile conference, brought back a special session of the Mobile World Congress (MWC), providing a forum for talks, exhibitions and tech shows spanning many different technological areas of the mobile and telecom industry. Under the same roof, leading companies in the mobile and telecom sectors showcased their newest products and services.

An estimated **20,000 people from 117 countries** attended the event in-person while, in parallel, **about 100,000 connected online** to watch the different sessions and speakers. **ICFO participated** in both the **NexTech** main track session of the event as well as in **4YFN**, the largest start-up event that runs parallel to MWC.

The NexTech keynote talks were hosted and moderated by GSMA CEO John Hoffman, targeting a select public of top investors and industrial representatives. Speakers offered 20-minute presentations on the new innovative and disruptive technologies that stand to change the future of the mobile ecosystem and have a major impact on society.

ICFO participated in a session on European Flagships. ICREA Prof at ICFO Frank Koppens offered a keynote talk focused on graphene and a summary of the achievements of the **European Graphene Flagship**. The presentation highlighted the outcomes and applications that have emerged over the course of the Flagship's existence in various technological areas, demonstrating the impact that graphene and 2D materials have had as well as some of the spin-off and start-up companies that it has occasioned. In the same session, **Tommaso Calarco** offered a keynote on the **Quantum Flagship**, in which ICFO is particularly active. Launched in 2018 with a 1 billion Euros budget, the Quantum Flagship continues to gain momentum in its quest to position the EU as a front-runner in the worldwide race in quantum technologies.

In the **4YFN** agenda, two ICFO spin-offs where given the spotlight in two different events that illustrated what quantum technologies are and what changes they will bring to industry, governmental institutions and society at large in the near, mid and long-term future.

At the Connectivity Summit session, **Sebastián Etcheverry,** CTO of the spin-off **LuxQuanta**, gave an overview on the basics of quantum communication and quantum cryptography, secure communications, and how this will be implemented to deploy the future European infrastructure EuroQCI. He emphasised the QKD systems and the initiatives that are taking place both at the European level, through the projects CiViQ and QRANGE from the Quantum Flagship, and in Barcelona, through programs such as QuantumCAT and SmartCat, where there is an important initiative to deploy Barcelona-Q as a key node of the European Quantum Communication Infrastructure.

In the panel discussion "From Bytes to Qbits: Opportunities of Unprecedented Computing Power", **Carlos Abellán**, founder and CEO of ICFO spin-off **Quside**, joined other spin-off companies Qaptain Quantum, Quilimanjara Quantum tech, and IONQ, for a very broad conversation about new quantum technologies. They covered a wide range of hot topics such as quantum computing (architypes, systems, supremacy, etc), quantum cryptography, quantum random generators as technology providers of ultra-secure quantum communications, and the potential for applications of quantum technologies with new industrial partners and companies, outlining clear and realistic expectations for the future of this field.

RESEARCH

La Marató de TV3

ICFO and Parc Taulí receive funding to use medical photonics to improve COVID 19 patients' journey from intensive care to rehabilitation

In 2020, the Fundació *La Marató* de TV3 focused fundraising efforts on the COVID-19 pandemic to add resources to progress in the research that will improve the quality and life expectancy of the people that it has affected. Researchers from ICFO and Corporació Sanitària Parc Taulí de Sabadell have been awarded a new project through this initiative where medical photonics technologies will be used to improve the understanding of the pathway to personalized ICU management and rehabilitation for COVID-19 patients. This new phase is especially important now that successful vaccination campaigns are allowing a shift in focus to the quality of life of survivors who number in the tens of thousands around the word.

Because of its exceptional versatility, precision, and non-invasive nature, photonics is playing an increasing role in medical techniques and practices, to the extent that today it is considered a key enabling technology in developing healthcare in Europe. **ICFO's Medical Optics group led by ICREA Prof Turgut Durduran** has been developing photonics-based technologies using near-infrared diffuse light for clinical applications with a large network of clinics in the Barcelona area and abroad.

During the COVID-19 pandemic, ICFO and clinicians at the **Hospital Consorci Corporació Sanitrària Parc Pauí de Sabadell, led by Dr Jaume Mesquida**, have been using diffuse optical monitors to evaluate the microvascular health of COVID-19 patients, aiming to improve their care at the intensive units through two ongoing projects. In the first, are the large international clinical trial **HEMOCOVID-19**, and the European Commission funded project **VASCOVID**, which is developing a new device to be introduced to clinical practice.

The ICFO - Parc Taulí project selected for funding from the Fundació *La Marató* de TV3 aims to help clinicians in the management and recovery through rehabilitation of patients who have developed a syndrome called ICU-acquired weakness during prolonged ICU stays. These patients, as a result of aggressive therapies and the severity of the disease itself, develop muscle atrophy that can lead to long-term complications. It has been seen that if standard rehabilitation programs start early, when the patients are still in the critical units, they can reduce the impact of the weakness. However, to discern among patients and correctly establish their needs, it is essential to detect those with higher risk or degree of muscle impairment at early stages.

Starting rehabilitation programs when patients are still in the critical units may reduce the impact of ICU-acquired weakness.

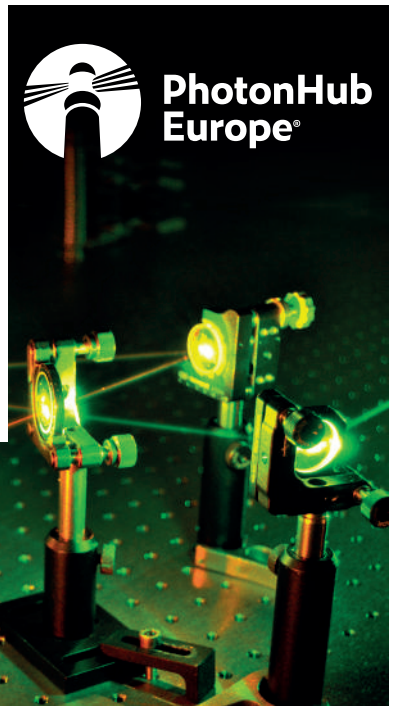
Clinicians are currently using a physical examination to diagnose muscle weakness. Based on their previous experience monitoring long ICU patients with other illnesses, ICFO researchers believe that the abnormal values of the endothelial function might be key in detecting the ICU-acquired weakness. In this project, they will make use of non-invasive near-infrared light to monitor the endothelial function, measuring the patients' blood flow, oxygenation and metabolism at the microvascular level. By using optical technologies such as near-infrared spectroscopy (NIRS) and diffuse correlation spectroscopy (DCS), they aim for early detection of the patients at higher risk of developing muscle weakness and help clinicians to define personalized rehabilitation strategies.

Endothelial and microvascular health is critical for the well-being of the patients, and these new emerging technologies will be relevant for saving lives, reducing mortality and improving the survivors' quality of life.

COLLABORATION

TRAINING FOR INNOVATION

PhotonHub Europe



A pan-European photonics digital innovation hub to boost SME growth and ensure Europe's global competitiveness

ICFO is an enthusiastic participant in the new H2020 funded program PhotonHub, the Europe-wide photonics digital innovation hub which has been granted €19 million from the EU in order to support and accelerate the uptake of photonics technologies by European industry. Currently impacting directly or indirectly 10% of the European economy, photonics, an enabling technology, stands to facilitate the growth of companies, create new jobs, and promote competitivity of the industrial base of Europe.

PhotonHub is establishing a single photonics innovation hub which integrates all of the best-in-class photonics technologies, facilities, expertise and experience of 53 top competence centres across Europe under one roof as a one-stop-shop solution with open access for any company anywhere in Europe that wants to innovate with photonics. As a result, PhotonHub will provide European companies, in particular "non-photonics" SMEs and mid-caps that are first users and early adopters of photonics, with open access and guided orienteering through the PhotonHub front office in Brussels, across a broad range of services and capabilities offering innovation, training, and business/ investment support:

TRAINING AND UPSKILLING SUPPORTS

Training and upskilling support to companies will cover both technology- and application-specific learning in photonics using lecture-based tutorials, hands-on lab-based training and "Train-the-Trainer" programmes within the hub's 40 Demo Centres and 10 Experience Centres throughout Europe, all coordinated for consistent standards of excellence under the umbrella of the ***European Photonics Innovation Academy of PhotonHub***. ICFO will be giving the second training session within the Academy on the 11th of August, entitled "Photonics with applications in health, energy and communications".

"TEST BEFORE INVEST" INNOVATION SUPPORT

"Test before invest" innovation support to companies will offer expertise and equipment for design, prototyping, experimentation, engineering and pilot production, with further guidance and seamless links to the industrial supply chain of manufacturing in Europe, all provided by Europe's top research and innovation facilities offering the broadest possible range of photonics technologies covering the full value chain from early stage product concept to pre-market launch.

SUPPORTS TO FIND INVESTMENT

PhotonHub will help companies innovating with photonics to find investment from suitable sources of venture capital or other private/public sources of growth capital to further boost their capabilities in bringing new photonics and "photonics-enabled" products faster to market.

PhotonHub's digital community-building platform will ensure fast user-friendly access for European SMEs to the broadest possible range of advanced photonics expertise and technologies on the European scale, covering the entire value chain from TRL3-8.

A REGIONAL, NATIONAL AND PAN-EUROPEAN INNOVATION NETWORK

In order to accelerate the uptake and deployment of photonics technologies by European industry at all levels, support actions need to reach companies in every corner of every region of Europe. **PhotonHub** will work closely with regional photonics innovation hubs all over the continent, such as PhotonCAT led by ICFO in Catalonia, to provide additional support to boost photonics innovation among SMEs at the local level. PhotonCAT will also be the photonics node of the Catalan European Digital Innovation Hub (EDIH) candidate, DIH4CAT, which will support the uptake of digital innovation in general in the Catalan ecosystem.

"The strategic alignment of research centers and innovation labs with SMEs, connecting locally, nationally and across Europe with the goal of facilitating the implementation of new photonic technologies is directly aligned with ICFO's mission to have a positive impact on society", underscores **Sergi Ferrando**, Business Developer in ICFO's Knowledge and Technology Transfer team. *"ICFO has a strong history of connecting with industry through programs such as our Launchpad for new technology spin-offs, the Client Liaison Program (CLP) and also myriad industrial partnerships. Application domains are varied, including agrofood, sustainable environment and energy, digital infrastructure, health, and smart cities, to name a few, but the potential for applications in new industrial areas is endless."*

PhotonHub EU began operations in 2021 and will be operating a continuous open call for companies to apply for its support services. Applications for support will be facilitated online through the PhotonHub website, **www.photonhub.eu**

PhotonHub has received funding from the European Union's Horizon 2020 research and innovation program under the Grant Agreement n°101016665, in Public Private Partnership with Photonics21.

TRAINING- SAVE THE DATE

ICFO

Schools on the Frontiers of Light

**Schools to be held this year in hybrid and/or online format

www.frontier.icfo.eu

July 5 – 8, 2021
ICFO Weizmann International School on the Frontiers of Light:
New Approaches to Atom-Light Interactions

October 25 – 28, 2021
ICFO - UT - PTL International School on the Frontiers of Light:
Photons for Green Energy

November 8 – 11, 2021
ICFO- UNAM International School on the Frontiers of Light:
Quantum Challenges

Through the SPIE@ICFO Chair for Diversity in the Photonic Sciences, ICFO offers Travel Fellowships for international masters and undergraduate students to participate in ICFO Schools, with preference given to students from developing countries.

COMMUNITY

PRIDE at ICFO

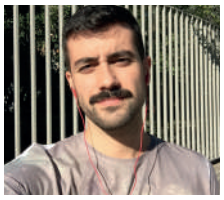
A month of activities dedicated to LGBTQIA+ and diversity in STEM

In June 2020, ICONS, the Student chapter at ICFO, took the first step towards opening a conversation about LGBTQIA+ representation in science in general and at ICFO in particular by organizing an online forum to discuss the importance of openness and visibility for this community. A year on, ICONS supported by the Diversity and Equity Committee, championed the first ever PRIDE Month at our institute, organizing a series of activities to discuss and learn more about the situation for LGBTQIA+ people in STEM.

PRIDE activities continued the conversation opened in the 2020 debate, and expanded the scope to examine more topics regarding gender diversity, individual and institutional tools to ensure an inclusive workspace and how science can help us tackle hate speech rhetoric.

ICONS

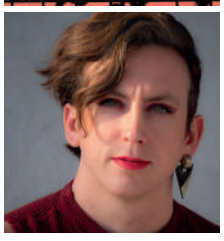
2021 AGENDA



June 3
AITOR VILLAFRANCA VELASCO
LGBTQIA+ Diversity in STEM
Researchers at Institute of Optics, CSIC, Madrid and founding member of PRISMA

June 11
Coming Out - a documentary by Denis Parrot
Documentary Screening and discussion.
*If you missed it, you can find the documentary at www.filmin.es/pelicula/out

June 17
EMILIO LÓPEZ, EMIRAU
LGBTQIA+: From Definitions to Intersectionality
ARTivist and co-creator of EmiRau Instagram platform for LGBTQIA+ visibility and rights



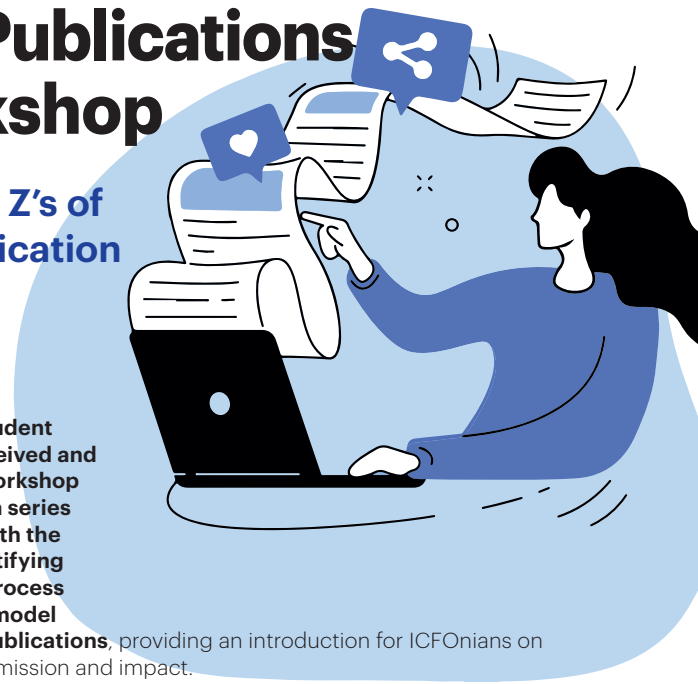
June 29
JARA JUANA BERMEJO-VEGA
Fighting anti-LGTBIQ rhetoric from the sciences
Marie Curie Athenea3i fellow at Universidad de Granada and co-founder of the Q-Turn: changing paradigms in quantum science workshop

DIVERSITY AT ICFO

The Diversity and Equity Committee at ICFO promotes a wide range of initiatives related to diversity in a broad sense to underscore the institute's commitment to being a diverse, inclusive and welcoming environment in which all members of the community can engage in a creative, open and authentic way. It organizes the annual ICFOnians for Women in Science Month that aims to address gender diversity in STEM, and will incorporate the successful PRIDE month activities, conceived and organized this year by ICONS, into its annual agenda to promote awareness and inclusion of the LGBTQIA+ community. Future activities are planned for the Fall in order promote awareness of mental health and inclusion of people with disabilities.

The Publications Workshop

The A to Z's of the publication process



ICONS

The ICONS Student Network conceived and organized a workshop composed of a series of seminars with the goal of demystifying the editorial process and business model of scientific publications, providing an introduction for ICFOnians on successful submission and impact.

The talks drew on available resources as well as the previous experience of a wide range of members of the ICFO community. Over the course of four hybrid sessions, the workshop dealt with the **"What, Why, Where and When" of publishing**, insights for successful publishing, and what to do with your findings after they have been published.

Session 1

WHAT, WHY, WHERE AND WHEN DO WE PUBLISH?

Lluis Torner · ICFO Director
Ferran Camps · ICFO Documentation
From a broad institutional perspective of the different aspects of publications and the publication process that have a significant impact on a scientific career, to the very specific details of the scientific publishing industry, open access, trends, and metrics, this first session introduced fundamentals, some of which were covered in more detail in later sessions.

Session 2.1

HOW TO SUCCEED: WHAT TO CONSIDER FOR A SUCCESSFUL SUBMISSION

Arturo Villegas · PhD Student
Rob Sewell · Head of Academic Affairs
Klara Theophilo · Postdoctoral Researcher
Javier Argüello · PhD Student
Arturo and Rob offered pointers on subjects ranging from the practical: manuscript preparation and choosing a journal, meeting journal requirements, ... to more formal: authorship acknowledgement, communication with internal and external collaborators, and research integrity. Klara and Javier rounded out the presentations by offering related personal insights from the PhD and Postdoc perspectives.

Session 2.2

HOW TO SUCCEED: HOW IS SUBMITTED PAPER EVALUATED?

Javier García de Abajo · ICREA Profesor at ICFO
Georgia Papdakis · ICFO Professor
Alexandre Dauphin · Research Fellow
The speakers in this session covered the author, referee, and editor's points of view, addressing topics such as how much to engage while evaluating, resources provided by the editorial and how to write the report to the editor. As often a paper may not be accepted on first submission, the resubmission process was also discussed from the three points of view mentioned.

Session 3

WHAT ELSE?

Federica Beduini · Outreach
Silvia Carrasco · Director KTT
Brook Hardwick · Head of Corporate Communication
María García Parajo · ICREA Profesor at ICFO
After results have been published in a scientific journal, there are many other activities and mechanisms that can enhance their impact and help to reach different audiences, all of which benefit the researcher's career. Activities discussed in this final session ranged from Outreach activities, IP management and industrial collaboration, publishing in mainstream and digital media and the importance of conferences and scientific gatherings.

A special thanks to Alvaro Rodriquez for the idea to put this initiative in motion, to ICONS president Arturo Villegas, who joined forces adding his ideas and energy to the organization, and to all of the ICFOnians who contributed their expertise to this program.

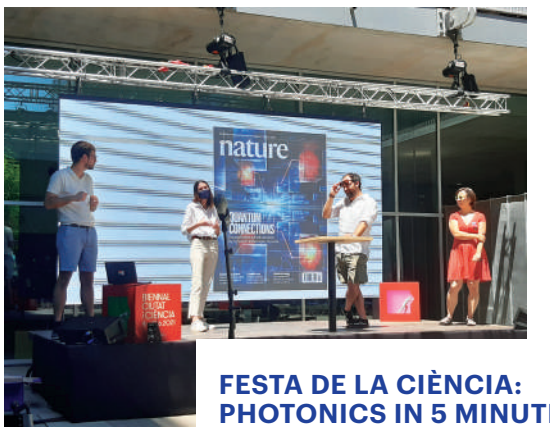
COLLABORATION

OUTREACH

Barcelona City & Science Biennial 2021

ICFO participates in the city-wide celebration of the culture of science

Barcelona celebrated its second edition of the City and Science Biennial (Biennal Ciutat i Ciència) from June 8th through 13th, a movement promoted by Barcelona City Council through the Department of Culture, Science, Education and Community, and the Barcelona Institute of Culture. This city-wide event sought to put science at the center of a public debate on how to deal with questions and uncertainties of the 21st century. It presented a wide range of offerings that **encouraged citizens to think about knowledge, its potential and limits, from various point of view**: the advances that mark the future, their ethical implications, the close link between science and art, sociology and politics, gender equality, rights and opportunities, and the sustainability of the planet. This edition also included the Science Festival (*Festa de la Ciència*) which offered opportunities to experience, observe, and investigate science in the first person, together with the scientists that generate new knowledge.



ICFO participated in and supported this event through presentations and also through the Barcelona Art, Science and Technology Hub (Hac Te), launched in December 2020, in which ICFO is one of the founding partners.

CIUTAT I CIÈNCIA: WHERE ART & SCIENCE COME TOGETHER

On June 11th, ICFOnians took to the stage in a session targeting a non-specialized adult audience which took place on the square of El Born Cultural and Memory Center. The busy pedestrian area was set with a large outdoor stage for presenters and seating for those who had registered for the event. Curious onlookers were able to stand along the perimeter area to enjoy the talks as well. Six artists of different disciplines and six scientists from different BIST centers talked about their scientific and artistic research in 6-minutes, Pecha Kucha-type presentations supported by images and music. ICFO had a prominent role offering two separate presentations.

ICREA Prof Maciej Lewenstein, leader of the ***Quantum Optics Theory*** group and postdoc **Dr Reiko Yamada** presented their research about quantum randomness and its expression through sound events based on the true randomness extracted from quantum physical systems at ICFO.

Dr Antoine Reserbat-Plantey, postdoctoral researcher in the ***Quantum Nano-Optoelectronics*** group led by ICREA Prof Frank Koppens, accompanied the public on a journey into matter, bringing them as close as ever to the nano-world by allowing them to see one-dimensional objects.

FESTA DE LA CIÈNCIA: PHOTONICS IN 5 MINUTES

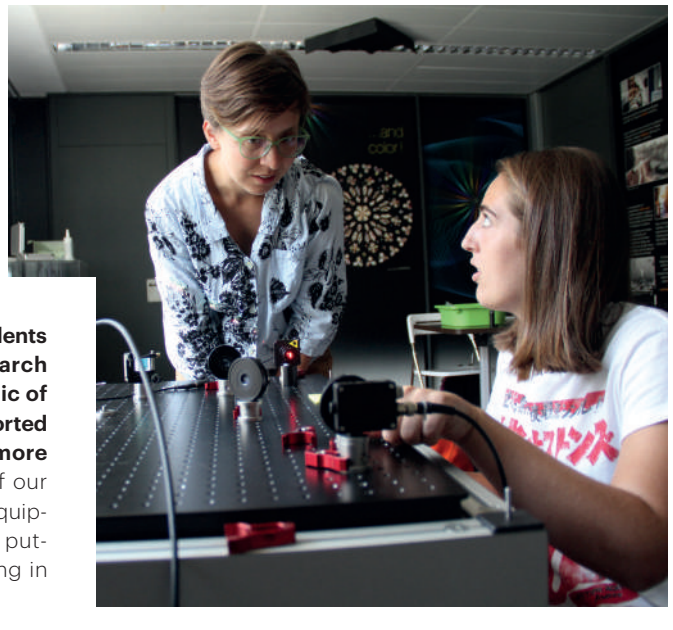
On Sunday June 13th ICFO took its popular ***Photonics in 5 Minutes*** to the stage, for the first time as an in-person event. The event targeted the general public and was held in the sunny inner square of the Barcelona Biomedical Research Park, just a few steps away from the seaside.

As hands-on activities with the public are made difficult by the current health situation, ICFO opted for a series of four engaging 5-minutes flash talks kicked off by Dr Federica Beduini with her smooth presentation on the research we do at our institute and how photonics is important for society. She was followed by Dr Lorenzo Cortese, who spoke about the biomedical applications of photonics and the close collaborations occurring between ICFO and clinicians through the Barcelona Medical Photonics Network.

PhD student Constanza Sansierra switched to green energy, presenting her work on artificial photosynthesis and renewable fuels production, while Darío Lago Rivera, also pursuing his PhD at ICFO closed the session with a talk on entanglement between quantum memories, complementing his presentation with a practical demonstration. The Q&A session gathered questions for all the speakers and one-to-one conversations with the engaged public went on well after the official end of the event.

OUTREACH

Hands-on Activities for Students



During the last two years of high school, students in Catalonia must complete a short research project (*Treball de Recerca*- TDR) on a topic of their choice. For many years, ICFO has supported interested students determined to know more about photonics by opening the doors of our institute to give them access to special lab equipment, proposing exciting experiments and putting them in contact with ICFOnians working in the field of their interest.

These collaborations did not stop even during the lockdown as the outreach team worked closely with ICFOnians to adapt current activities or to design new ones that could be performed with household materials, offering guidance via teleconference to the students. Some of the new activities, like the one created by Álvaro Rodríguez Echarri about diffraction, were so successful that they have become part of the portfolio of ICFO activities for high school research.

We still believe that the experience of coming to ICFO and tinkering with lab equipment under the direct guidance of scientists has a very large impact on the experience of these young students. For this reason, since September 2020, the Outreach team has been working closely with the Safety unit to safely bring students back to ICFO, helping more than 50 students with their research projects with in-person activities.

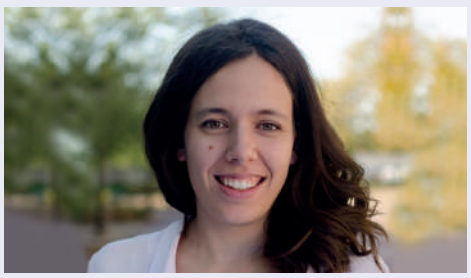
BEYOND ICFO

What Comes Next?

Career perspectives from the Alumni Network

The Alumni Network invites ICFOnians from around the world to share their personal and professional experiences with our community. These Alumni Seminars offer not only career inspiration but tips that can be universally applied to careers in academia, industry or beyond.

Advice to ICFOnians



ANA ASENJO-GARCÍA

Assistant Professor at **Columbia University**

"When you want to apply for a tenure track, people will give you tons of advice because they want you to do well. But keep in mind that they usually tell you what has worked for them, and often this advice is contradictory. I would recommend you to listen to everyone, but then do whatever is best for you and fits with your personality and way of working."

JON DONNER

CEO at **Nanofabrica**

"If you want to make money, opening a start-up is not the best idea, in terms of risk-reward; you should probably become a banker. Launch a start-up for other reasons: because you think it's interesting, you're attracted to it, you want to sell a product or you want to change the world. All these are good reasons."

JAN HUWER

Cambridge Research Laboratory of **Toshiba Europe Ltd**

"The best training to learn how to present your research are conference presentations, especially when you present to people who are not experts in the fields. You don't get special training on this; you grow into it and learn from the senior people's experience. The most important is to focus and ask yourself: 'What is the essence of what I'm doing?"

GO & FLY

Congratulations to 3 New ICFO PhD Graduates

231 ICFOnians have successfully defended their theses

Continuing to adapt to the need for social distancing, ICFO's newest PhD graduates defended their theses in a hybrid format, with the thesis committees, colleagues, friends and family supporting them in this important moment from the auditorium and online.

Each of these ICFOnians has played an important role in ICFO's success and reputation as a leading international research institute. Honoring ICFO's tradition, ICFOnians celebrate this important personal, professional and institutional milestone and encourage you to Go & Fly! Remember that wherever you go, you will always be a part of the ICFO community.

229 April 8, 2021

MARIA AUXILIADORA PADRÓN BRITO

"Quantum Nonlinear Optics at the Single-Photon Level with Cold Rydberg Atoms"

TD: ICREA Prof Dr Hugues de Riedmatten

230 April 15, 2021

LISA SAEMISCH

"Large-Scale Imaging of Optical Antennas and Single Molecules"

TD: ICREA Prof Dr Niek van Hulst

231 June 22, 2021

DARIO DE SANTIS

"Witnessing Non-Markovian Evolutions"

TD: ICREA Prof Dr Antonio Acín

Mystery ICFOnian

How much do you know about the people you work with?

ICFOnians are a fascinating group, with hobbies, interests and talents that may surprise you. Have a look around and see if you can guess who this edition's Mystery ICFOnian is!
Look for the answer in the next edition of ICFOnians.

1. Since he moved to Spain, he has always lived in Castelldefels.

2. His career has been connected to ICFO for the past 14 years.

3. He has worked for an ICFO Spin-Off and he stills collaborates there as a consultant.

4. He has been involved in Outreach projects such as 'Go Photon' and the Schlieren camera.

THE LAST WORD

HIGH PROFILE

Rachel Oliver

Professor of Material Science, University of Cambridge and founding member of TIGERSTEMM, a UK based inclusion group for equity in research in STEMM. www.tigerinstemm.org

1. How has your research focus grown from your time at Oxford through your current position at Cambridge?

I did my PhD at Oxford on nanostructures in nitride materials, focusing on how to grow quantum dots in those materials. That remains one of my major interest, but now I focus more broadly on nitride semi-conductors and am interested in anything where we can link the nanoscale structure to their properties and understand how we can engineer nano-scale structures to give us new or better functionality in devices. Most recently I have been working on developing porous gallium nitride and using that to enable new light emitting devices. We are particularly interested in micro-LEDs for displays for augmented reality and virtual reality.

2. How has TIGERS impacted your work as a scientist?

I came into this work focused on questions of gender equality, but working with TIGERS and meeting a very diverse group of people with passions of their own for equity has opened my eyes to the challenges facing people of color, disabled and LGBTQ scientists. One of the cross- overs into my scientific work is in always trying to ensure that a real range of voices is heard and therefore we get as many innovative ideas into the science that we are doing as possible.

3. From your experience as a founder of a deep tech spinout company developing novel porous nitride materials, would you say that industry or academia is doing a better job with diversity and equity?

My experience of getting a spin-off company off the ground made me aware of the challenges that women still fact in these sorts of spaces. For example, there was often a lack of consideration for people's child-care arrangements, whereas awareness of this is part of our "normal" these days in academia. It made me see that there are aspects of the spin-off environment where the structures still favor a certain type of person with little concern for equity in that context. There is a reasonable amount of evidence that there are a lot less women founders than you would expect given the number of innovative women out there, and this has a lot to do with the genuine structural barriers that are quite difficult to address.

4. Are we doing the right things to make research careers in STEMM more equitable and inclusive?

A lot of the time we see actions being taken by individuals like me, or we see funders or institutions putting pressure on individuals to take actions and to worry about their own groups. This is good, but in fact we need to see the bigger picture. The remit of the question should not be "What is Rachel doing with her 15 people?", but rather "What is Cambridge doing with their tens of thousands of people and how are they supporting Rachel?"

5. What advice would you give ICFOnians about how they can make science more equitable and diverse?

We all have a little bit of power because people are asking things of us all the time. We can use that power to ask diversity related questions before saying yes. For example, if I am asked to review proposals, I will ask "what are you doing to monitor the diversity of your applicants and awardees. What will you do about it if you see that there are real inequities there?". It is difficult for 1 person to make change, but if voices are continually asking questions, everyone gets used to having to think about the issues. So, when something is asked of you, ask for something in return to make sure that equity has been considered.

Sudokus

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