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Mystery ICFOnian

Solution Ed #55

Umut Karadeniz
Project Engineer, KTT

Science Quiz

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1:C **2**:D **3**:B **4**:A & C

ON THE COVER

High Profile

On Thursday, March 14th, Donna Strickland, professor in the Department of Physics and Astronomy at the University of Waterloo, leader of the Ultrafast Laser Group, recipient of the Nobel Prize in Physics 2018 and member of ICFO's Scientific Advisory Board (SAB), visited ICFO. As a trailblazer in a field that many ICFOnians have worked in, benefited from, or followed closely, Prof. Strickland's scientific insights and anecdotes generated a great deal of interest in our community.
Read more on pg. 12.

EDITOR'S CORNER

Forward-Thinking

Brook Hardwick
Contributing Editor

It's not just about looking forward, it's about visionary thinking and actions

Political polarization, the aftermath of a global pandemic, inflation, draught, geopolitical unrest.... We are not living in easy times. But just as many make New Year's resolutions to start the year off on the right foot, it is just as important to take inventory of the positive activity that is going on around us, helping to put into perspective the many reasons we have to be optimistic about the future as well as helping to focus on our own role in building this brighter tomorrow.

We have gotten off to an extraordinarily busy start this year, and there is no sign of slowing down. ICFOnians have published high impact advances and received prestigious prizes for their work and are not content to rest on these laurels. We are planning ambitious new projects, transferring technology to companies that can turn it into products and processes, investing in the future or our own institute and also actively supporting initiatives that will benefit society in general. Focusing on diverse aspects of our ecosystem and our many forward-thinking colleagues and stakeholders is a great way to look forward.

ICFO has received competitive funding from visionary entities who support great research. Researchers working in ICFO's QTwist program celebrated the receipt of one of only five grants awarded in BBVA's new Fundamentos program which targets exploratory projects addressing fundamental questions. ICFO has also been tremendously successful in both the "la Caixa" Foundation Fellowship programs and Horizon Europe's MSCA funding program, where Doctoral students and Postdoctoral researchers receive financing for frontier research projects as well as training that will allow them to lead the scientific enterprise of the future.

Established training programs at ICFO for university students and young researchers as well as outreach programs are teaching important skills and offering career orientation. This year's Spring Frontier School was on *Open-Source Tools for Quantum Science and Technology*. Co-located with this school and taking place in a hybrid format at La Pedrera, **Quantum Carla** reached it largest audience to date focussing on career opportunities in Quantum, all pointing to a Quantum revolution that is picking up steam!

The Young Photonics Congress, now in its ninth year, never fails to inspire. Just chatting with student participants and their teachers from high schools around Catalonia, I was reminded how great it is to be 17! Some students were more poised and focused than others, but all were unabashedly eager to see what the world has in store and curious to discover where they will make their mark. If you missed the event this year, take a minute to read some of the comments we gathered (pg. 9) and make a note to meet the students n next year. You will be inspired!

We have celebrated another edition of **ICFOnians for Women in Science Month-** in my opinion one of the best editions to date. Far from sugar coating the current reality of women in science, it was productively thought provoking, encouraging the ICFO community to take a moment to be mindful about gender diversity in science, giving visibility to women who are leaders in their fields, and keeping alive the discussion as to where we started, where we are today, and what needs to be done to continue moving forward.

I hope that you will enjoy this edition and that it will help you to get into a positive and productive mindset to take on new challenges and opportunities in the year ahead.

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Happenings

ICFO NEWCOMERS

Welcome to ICFO

Many of us joined ICFO or took a new position at the institute between January and March

Bora Baran
Student

Edward Jiang
Student

Adrián Sánchez
Student

Ariadna Gómez del Pulgar
Student

Eneko Mateos
Student

Evgenia Klironomou
Student

Javier Fernández
Student

Erik Altelarrea
Student

Irena Stolic
Student

Marco L. Dicosta
Student

Martin Kerschbaumer
Student

Nefeli Stamouli
Student

Ana Mª Enriquez
Student

Francesco de Amicis
Student

Diana Dall'Aglio
Student

Lucia Cortes
Student

Nuria Rego
Student

Corentin Guimard
Student

Viktoriia Shiriaeva
PhD Student

Carlos Gas
PhD Student

Martina Smacchia
PhD Student

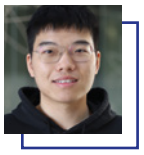
Sanaz Foroughi
PhD Student

Ignacio Pérez
PhD Student

Santiago Tabares
PhD Student

Karuppasamy Soundarapandian
PhD Student

Arturo Cabrera
PhD Student



Ruihao Liu
Visiting PhD Student

Grazia Di Bello
Visiting PhD Student

Alexey Vylegzhanin
Visiting PhD Student

Marc Miranda
Visiting PhD Student

Michal Gwizdala
Postdoctoral Researcher

Jan Lowinski
Postdoctoral Researcher

Antariksha Das
Postdoctoral Researcher

Jennifer Aldama
Postdoctoral Researcher

Julien Legendre
Postdoctoral Researcher

Kaiwen Wang
Postdoctoral Researcher

Sven Bodenstedt
Postdoctoral Researcher

Hadrien Vignaud
Postdoctoral Researcher

Alba Calatayud
Postdoctoral Researcher

Rashmi Runjhun
Postdoctoral Researcher

Amaris Guevara
Postdoctoral Researcher

Gaurav Kumar
Postdoctoral Researcher

Neus Sanfeliu
Postdoctoral Researcher

Sergio-Lucio de Bonis
Staff Researcher

Clara Vilches
Staff Researcher

David Alcaráz
Staff Researcher

Mariona Dalmases
Staff Researcher

Lorenzo Cortese
Staff Researcher

Michael Tayler
Staff Researcher

Lenard Vamos
Research Fellow

Joaquim Torra
Research Fellow

Javier Argüello
Visiting Scientist

Silvania Pereira
Visiting Scientist

Frederic Català
Visiting Scientist

Josep Cabedo
Visiting Scientist

Alex López
Internship student

Isabel Santa María
Internship student

Verónica Padial
Pre-award Project Management

Laia Serradesanferm
Science Writer

Salvador Berlanga
Cibersecurity Manager

Adrián Álvarez
Logistics

Magda Martí
General Services Area Head

Not pictured

Fernando Sánchez (Student), **Matías Viner** (Student), **Giulia Sionis** (Student), **María Isabel González** (Student), **Vladislav Severin** (PhD Student), **Nikhitha Mule** (Visiting PhD Student), **Bastian Bakkensen** (Visiting PhD Student), **Miguel Omar Segovia** (Visiting PhD Student), **Fernando Ardana** (Postdoctoral Researcher), **Grzegorz Rajchel- Mieldzioc** (Visiting Scientist), **Jiaojie Yan** (Visiting Scientist), **Berislav Buca** (Visiting Scientist), **Júlia Cajas** (Internship student)

Happenings

ICFO NEWS

ICFO board of trustees names new director

ICFO's director, Prof. Dr. Lluis Torner, who founded the institute in 2002, informed the board of trustees in 2022 that he would be stepping down from his role, putting in motion the search for a new director.

On February 14, 2024, the Board approved the appointment of **Prof. Dr. Oriol Romero-Isart** as a **new group leader**, and **director of the institute** for the next 4 years. Romero-Isart, who obtained his PhD at the Universitat Autònoma de Barcelona, has been working abroad during the last 15 years. After a postdoc at the Max-Planck Institute of Quantum Optics in Munich, he moved to Innsbruck to start his own research group in 2013. He is currently Professor at the University of Innsbruck, group leader at the Institute for Quantum Optics and Quantum Information (IQOQI) Innsbruck, and Deputy Managing Director of IQOQI. His research group focuses on topics in the fields of theoretical quantum optics and mesoscopic quantum physics in the context of quantum science and technology.

He will join ICFO in the Spring and will assume responsibilities as the appointed director on September 1st, 2024.

Barcelona's Gold Medal for scientific merit

In a ceremony that took place in the Saló de Cent of the Barcelona City Council, presided over by the mayor of Barcelona, **Jaume Collboni**, the director of ICFO, **Lluís Torner**, together with professor Andreu Mas-Colell and doctor and specialist in neurology, Mercè Boada, all Barcelona figures recognized internationally for their professional excellence, received the gold medal for scientific merit from the Barcelona City Council.

Upon receiving the medal, Torner expressed immense gratitude for the honor it bestowed as well as recognition of the importance of receiving the award from the city of Barcelona, a city that is itself "a symbol of values that we care about deeply: modernity, the aspiration to be a world leading city in innovation, creativity, and quality of life."

New board for ICONS

The **ICFO Organization and Network of Students** (ICONS) has appointed a new board of officers by an open vote. The new leaders are **Rebecca Hoffmann** (President), **Alejandra Padill**a (Vice-President), **Javier Arrés** (Treasurer), **Sidney Palardonio** (Secretary), **Valentina Gacha** (Communications Officer) and **Bianca Turini** (Diversity and Inclusion Officer).

This team takes over from outgoing leaders Cristian Boghiu (President), Javier Arrés (Vice-President), Rebecca Hoffmann (Secretary), Jessica Angulo (Treasurer), Fionnuala Curran (Communications Officer), and Julita Poborska (Diversity and Inclusion Officer) who have invested time and energy in the ICONS organization in order to help fellow ICFOnians get the most out of their time at the institute.

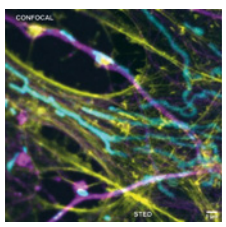
2023 National Research Awards ceremony

The King and Queen of Spain presided over the presentation of the 2023 National Research Awards, the most important recognition in Spain in the field of scientific research, highlighting the talent of the individuals and entities awarded who, through their work, contribute to the advancement and progress of society.

ICFO Prof. F. Pelayo García de Arquer, leader of the CO_2 Mitigation Accelerated by Photons research group, received the 'Felisa Martín Bravo' National Research Prize for Young researchers, in the area of Physics, Materials and Earth Sciences, for his pioneering and interdisciplinary contributions to the fields with relevant applications in the generation of clean energy and the development of optoelectronic elements.

Spain joins Euro-BioImaging as a new member state

Euro-BioImaging (EuBI), *the European landmark research infrastructure for biological and biomedical imaging*, offers its services via **41 internationally renowned specialized imaging** facilities called Nodes, which are located across 19 member countries and the European Molecular Biology Laboratory (EMBL). Spain has officially become one of these member states, boastings 5 Nodes, including the **Super Resolution Node Barcelona**, located both at ICFO and at CRG (coordinated by the head of the SLN team at ICFO, **Dr. Pablo Loza-Alvarez**) and the **Mesoscopic Imaging Node Barcelona**, located at CRG, IRBB and ICFO (coordinated by IRBB).



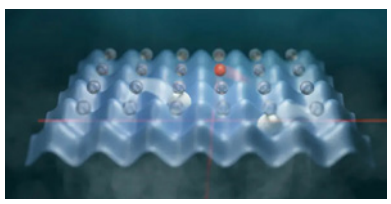
These nodes started as EuBI Candidate Nodes in 2016 during when the EuBI was in an interim phase.

ICFOnians awarded prestigious awards highlighting continued career success

Former ICFO Group Leader, Professor Dr. Dmitri Efetov, now the Chair of Experimental Solid State Physics-Quantum Material at the Ludwig-Maximilians Universität Munich received the **Gottfried Wilhelm Leibniz Prizes 2024**. This prize has been awarded annually to "exceptional scientists and academics for their outstanding achievements in the field of research" by the German Research Foundation since 1986. It is considered the most important research award in Germany.

Professor Giovanni Volpe, a 2008 ICFO PhD graduate supervised by ICREA professor at ICFO Dmitri Petrov, ICFO honorary Alumni representative from 2019-2023 and **full Professor at the Physics Department of the University of Gothenburg**, leading the Soft Matter Lab since 2016, was recently awarded one of Sweden's most prestigious prizes for physics, the **Göran Gustafsson Prize** "for boundary breaking research focusing on microscopic particles with active functions".

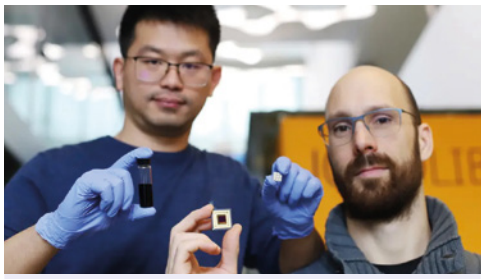
GEFES Award 2023 for best theoretical thesis in Condensed Matter Physics



GEFES, the Condensed Matter Physics Division of the Spanish Royal Physics Society, has awarded **Dr. Javier Argüello Luengo** the prize for the best theoretical doctoral thesis in Condensed Matter Physics out of all theses defended between October 2022 and September 2023. His thesis entitled ***"Synthetic quantum matter using atoms and light"*** was supervised by ICREA Prof. at ICFO Dr. Darrick Chang and Prof. Dr. Alejandro González Tudela, Instituto de Física Fundamental-CSIC, and was defended at ICFO on October 21, 2022.

Happenings

LATEST ADVANCES



Non-toxic quantum dots pave the way towards CMOS shortwave infrared image sensors for consumer electronics

Colloidal quantum dots (CQD) offer a promising technology platform to enable high-volume compatible image sensors in the desirable shortwave infrared (SWIR) regime. CQDs are a solution-processed material platform that can be integrated with complementary metal-oxide-semiconductor (CMOS). However, a fundamental roadblock exists in translating SWIR-sensitive quantum dots into key enabling technology for mass-market applications, as they often contain heavy metals like lead or mercury, materials whose use in commercial consumer electronic applications is legally regulated.

In a new study published in ***Nature Photonics***, ICFO researchers **Yongjie Wang**, **Lucheng Peng**, and **Aditya Malla** led by **ICREA Prof. at ICFO Gerasimos Konstantatos**, in collaboration with other **researchers from Qurv**, have reported on the development of a new high-performance SWIR image sensor based on non-toxic colloidal quantum dots.

The study describes a new method for synthesizing functional high-quality non-toxic CQDs integrable with CMOS technology, while preserving the advantageous properties of traditional heavy-metal counterparts. Their quantum dots exhibited remarkable performances, with distinct excitonic peaks over 1500 nm—an unprecedented achievement compared to previous techniques. These results further support that this new method can be used for low-cost, high-performance SWIR photodetectors applications.

The researchers teamed up with Qurv, an ICFO spin-off, to construct a SWIR image sensor as a case study, and were able to demonstrate for the first time a proof-of-concept, non-toxic, room temperature-operating SWIR quantum dot-based image sensor. Accessing the SWIR with a low-cost technology for consumer electronics will unleash the potential of this spectral range with a huge range of applications including improved vision systems for the automotive industry, enabling vision and driving under adverse weather conditions.

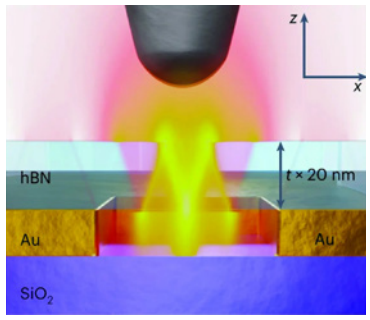
New nanocavities unlock new frontiers in light confinement

The research group of **ICREA Prof. at ICFO Frank Koppens** has published a study in ***Nature Materials*** where they create multimodal-enhanced cavities (MEC) with an unparalleled combination of subwavelength volume and extended lifetime. These nanocavities, measuring less than 100x100nm² in area and only 3nm thin, confine light for significantly longer durations. The key lies in the use of hyperbolic-phonon-polaritons, unique electromagnetic excitations native to 2D materials, as they can be confined to extremely small volumes.

The nanocavities were crafted by drilling nanoscale holes in a gold substrate with the extreme (2-3 nm) precision of an He-focused ion beam microscope. Then, hexagonal boron nitride (hBN), a 2D material that can support the hyperbolic-phonon-polaritons, was transferred on top of it. Light was meant to be confined inside the hBN in the region above the holes.

HBN polaritons are a form of light-wave that, unlike classical particles, can be combined and interfere in complicated ways. Specifically, hBN polaritons can combine into multimodal ray-like excitations.

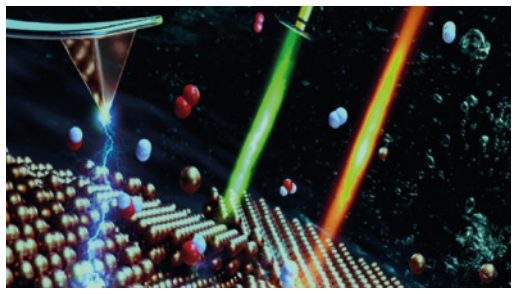
The multimodal excitations that form above the nanoholes in the metal are even more incompatible with the polaritons outside of the hole than they were before, leading to a greater degree of confinement than otherwise possible.



Crucially, this method avoids shaping the hBN directly and preserves its pristine quality, enabling highly-confined and long-lived photons in the cavity simultaneously.

The team intends to use these cavities as a novel platform for quantum light-matter interaction experiments in order to see quantum effects not yet observed, as well as to further study the counterintuitive physics of hyperbolic-phonon-polariton behavior.

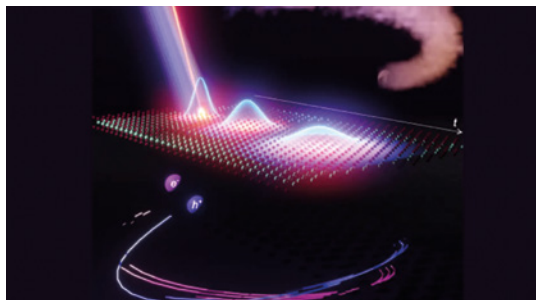
A holistic approach to enhance electro-chemical interface studies



The electrochemical interface (EI) – typically comprising the junction between a polarized surface, a liquid (electrolyte), and dissolved reactants – is at the core of several manufacturing and energy storage technologies. Traditionally, EIs have been studied applying different methods that could probe some specific aspect (e.g., either structure or composition), only providing partial, incomplete insights.

Dr. Lu Xia and ICFO **Prof. Dr. F. Pelayo García**, together with ICFO alumnus **Dr. Ernest Pastor**, lead a multidisciplinary consortium that reviews the prospects of combining different photonic, electronic, chemical, and mechanical probes, to offer a more complete view of EIs. The review, published in ***Nature Reviews Chemistry***, highlights the opportunities of such combinations to overcome traditional spectroscopic limitations and to bridge the existing gap between theoretical modeling, ideal systems, and working interfaces – ultimately enabling the predictive design of EIs and devices with improved performance.

In the near future, their work can be used by other scientists to develop, optimize and guide the design of a wide range of electrochemical technologies, including fuel cells, batteries, electrolysers for hydrogen production and CO_2 electrochemical reduction systems.



Spatiotemporal Microscopy as a powerful tool for studying transport phenomena

Dr. Guillermo Brinatti-Vazquez and **Giulia Lo Gerfo Morganti** from ICFO, in collaboration with researchers from the Catalan Institute of Nanoscience and Nanotechnology and Vrije University of Amsterdam, are the first authors of a review on spatiotemporal microscopy (SPTM) recently published in ***Advanced Electronic Materials***.

The review discusses spatiotemporal microscopy as a promising and versatile technique for observing and controlling transport phenomena. It presents the advantages of this technique, showcasing recent discoveries in particle and heat transport, describes its experimental implementations, and offers insights into potential future applications.

The authors suggest that photocurrent based SPMT will play a crucial role in connecting transport dynamics with device functionality and performance. Broad-band and multidimensional SPTM are also promising, as they would allow the separation of transport contributions of different species.

The review aims to be a reference introduction to spatiotemporal microscopy for transport phenomena and to provide guidelines for scientists interested in including SPTM in their research "toolbox".

Happenings

BUSINESS NEWS

European Quantum Zone at Mobile World Congress 2024

ICFO curated the European Quantum Flagship space that showcased the most recent and important advances in quantum technologies for the digital market as well as the immersive and connectivity industry

Since 2016, ICFO has curated European flagship space at **GSMA's Mobile World Congress (MWC)**, an annual occurrence in Barcelona that is the world's largest and most influential event for the mobile technology ecosystem. This year, MWC24 hosted **The European Quantum Zone** that featured some of the latest achievements and advances mainly in the field of **quantum technologies**, and in particular **quantum-encrypted communications**, reflecting interests of the MWC audience in hot topics such as cybersecurity, telecommunications, artificial intelligence, finance, healthcare, reliability and agility in secure communications, data centers and 6G, etc.

Quantum Flagship initiatives, such as the **Quantum Internet Alliance** (QIA) and **Quantum Secure Network Partnership** (QSNP), as well as **EuroQCI-Spain** and Spain's **Plan Complementario de Comunicación Cuántica** were present within the 100m² space.

The European Quantum Zone at MWC 2024

Nine companies involved in Quantum Flagship initiatives, all currently commercializing quantum technologies, were also on hand to showcase their technologies, including two ICFO spin-offs, **Quside** and **LuxQuanta**.

The MWC '24's European Quantum Zone was just a small sample of activities that illustrate how Europe is seeking to drive quantum technologies into the market, industry and ultimately society.

ICFO in top 10 in patent creation

ICFO among universities and research centers cited for their significant contribution to innovation

In early March, the European Patents Organization (EPO) published the 2023 patent index detailing the number of new patents registered in Spain last year. In terms of total number of successful patent applications in 2023, Spain was up by 28% over 2022, with the total number of patent applications from the metropolitan area of Barcelona, where the majority of the top 10 patenting institutions in Spain are located, leading the way.

Among the companies and institutions in the 2023 index's top ten in Spain, the Consejo Superior de Investigaciones Científicas (CSIC) came out in first place with 80 applications across its 120 institutes. ICFO, a significantly smaller institution, ranked tenth along with the Universidad de Valencia, each with 13 patents.

ICFO's Knowledge and Technology Transfer (KTT) team plays a key role in connecting industry with exciting research developments and manages the institute's strong patent portfolio.

We are mindful that we have a responsibility to facilitate the path to market of advances made by ICFOnians, whether that be through our strategic patent portfolio, collaborations with industries to develop new technologies, or the incubation of deep-tech companies like the 11 spin-offs which we have launched to date. Sometimes there is a long road from deep-tech fundamental research to societal impact, but this is an investment that is vital for society and therefore an important priority for ICFO.

Silvia Carrasco
ICFO KTT Director

LuxQuanta secures EIC Accelerator Funding

LuxQuanta, an ICFO's spin-off company and a leading European QKD manufacturer, is one of 42 companies to be selected in the latest call for the European Innovation Council (EIC) Accelerator

LUXQUANTA

The EIC Accelerator, the business acceleration program within the framework of the EU Horizon Europe research and innovation funding program, supports startups and SMEs driving innovative and disruptive products, services, or business models. ICFO spin-off Quside technologies received Accelerator funding in 2023, making LuxQuanta ICFO's second quantum spin-off to be successful in an Accelerator call, a strong acknowledgement of the market potential of the quantum technologies that are emerging from ICFO.

The European Commission's support comes at a crucial time for LuxQuanta as we embark on our second financing round that will enable us to scale operations, penetrate new markets, and attract top talent.

Vanesa Díaz
LuxQuanta's CEO

LuxQuanta spun out of ICFO in 2021 and is a result of the "Quantum Cryptography in Critical Communications" project that ICFO is developing with the support and co-financing of the Generalitat de Catalunya to build a quantum communications ring in the metropolitan area of Barcelona. The project consists of deploying a secure communication network using quantum cryptography, integrated in a seamless way with the current available fiber optic infrastructure around Barcelona, laying the groundwork for the gradual deployment of the pan-European quantum internet, (EuroQCI).

The EIC Accelerator will allow LuxQuanta to receive 2.5 million euros from European grants to boost the commercialization of its quantum key distribution system. The company will also have the opportunity to access venture capital funds of up to 15 million euros. Selection for an Accelerator is a mark of excellence for its recipients. LuxQuanta, with a dedicated team of 25 within just two and a half years of its inception, is on an ambitious trajectory to become the leading European QKD manufacturer.

The award was also great news for **Generalitat de Catalunya** that is invested in positioning Catalonia and its digital and innovation ecosystem on the European and global map of quantum technologies. "*This confirms that Catalonia is ready to take the leap and maximize the pioneering commitment of the Government towards quantum technologies with the new strategy that we are developing in collaboration and partnership with the ecosystem, and with ICFO as a cornerstone.*" declared **Secretary of Digital Policies of the Generalitat de Cataluña, Gina Tost i Faus.**

Collaboration

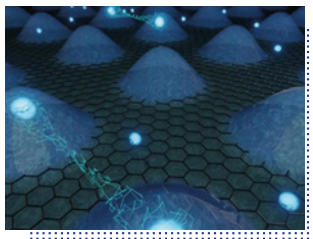
RESEARCH

BBVA Fundamentos Grant

ICFO awarded highly competitive funding for EQS project proposal

Researchers in ICFO's **QTwist research program** receive one of five highly competitive grants awarded by the BBVA Foundation in their new Fundamentos Program. This research program targets exploratory projects that innovatively address the core or fundamental questions of a scientific field or discipline at its current stage of development. Immediate practical applicability is not part of the spirit of this call.

ICFO will carry out the project entitled **"An Electronic Quantum Simulator"** (EQS), led by ICFO professor **Adrian Bachtold** (**coordinator**, Quantum NanoElectronics and NanoMechanics group) with ICREA professor at ICFO Frank Koppens (Quantum Nano-Optoelectronics group) and ICFO professor Carmen Rubio Verdù (STM on 2D Quantum Materials group).



Other researchers participating in the project include ICFO postdoctoral researchers Dr. Ekaterina Khestanova and Dr. Giulia Piccinini, and Distinguished Invited Professor at ICFO, Prof. Pablo Jarillo Herrero (Massachusetts Institute of Technology), as well as Prof. Amir Yacoby (Harvard University).

The QTwist program at ICFO seeks to study the fundamental properties of emerging synthetic quantum materials, including Moiré materials, and their potential future applications in nano-electronics. The EQS project, **the only one to receive funding in the area of Physics and Chemistry in this call, seeks to develop a cutting-edge quantum simulator based on a graphene superlattice.**

The experimental tool will be designed to probe the electronic wave function in two-dimensional systems in a completely novel manner. This may become the groundwork for understanding the rich physics emerging from electron correlations in two-dimensional systems.

> *We have a dream team of scientists working on some very relevant fundamental questions. The work is high risk in that we aim to do something that has never been done before, but high potential. If we succeed, we will be able to study by experimental means the Hubbard Hamiltonian in the high-Tc superconductivity regime.*
>
> **Prof. Dr. Adrian Bachtold**
> Quantum NanoMechanics research group

> *Over the years, this program will support some of the most innovative fundamental science projects in the country, thus making possible that some of the important global discoveries happen here.*
>
> **Prof. Dr. Lluis Torner**
> ICFO Director

"la Caixa" Foundation Fellowships help to support talented researchers

Five ICFO PhD students receive fellowships in the framework of the doctoral INPhINIT program and three postdoctoral researchers in the Junior Leader Program

The "la Caixa" Foundation fellowships program is the most important of those promoted by private institutions in Spain and Europe, both in terms of the number of fellowships offered and the variety of disciplines covered. Fellowships offer competitive salaries and cross-disciplinary training. In the case of doctoral fellowships, complementary training is provided to strengthen such areas as scientific communication, the researcher's emotional wellbeing, leadership, and opportunities for funding. Postdoctoral fellowships training promotes the independent scientific degree program as an option for a professional future, and fosters innovation and leadership.

The programs have been jointly financed by the European Commission through the Marie Skłodowska-Curie COFUND Action, in the context of the Horizon 2020 Framework Program

ICFO's INPhINIT Doctoral Fellowships

Mirko Fornasier, Medical Optics group led by ICREA professor at ICFO Dr. Turgut Durduran.

Giacomo Franceschetto, Quantum Information Theory group led by ICREA professor at ICFO Dr. Antonio Acín.

Egle Pagliaro, Quantum Information Theory group led by ICREA professor at ICFO Dr. Antonio Acín.

Mónica Torrecilla Vall-Llossera, Medical Optics group led by ICREA professor at ICFO Dr. Turgut Durduran

Bianca Turini, Quantum Nano-Optoelectronics group led by ICREA professor at ICFO Dr. Frank Koppens.

ICFO's Junior Leader Postdoctoral Fellowships

Emanuele Distante, was awarded an INCOMING Junior Leader fellowship to return to the Quantum Photonics with Solids and Atoms group led by ICREA professor at ICFO Dr. Hugues de Riedmatten where he earned his PhD in 2017. He is carrying out the project "*Interacting neutral atoms arrays in optical cavity*".

Samuele Grandi, joined ICFO in 2018 as a postdoctoral research fellow in the Quantum Photonics with Solids and Atoms group led by ICREA professor at ICFO Dr. Hugues de Riedmatten. With his Junior Leader RETAINING fellowship, he is carrying out the project "*Quantum storage of single photons from on-demand source*".

Michela Picardi came to ICFO in March 2022 as a postdoctoral researcher from King's College. She received a Junior Leader INCOMING fellowship to carry out the project titled "*Engineering Near-field Emitters for Radiative HEAt Transfer*" in the Thermal Photonics research group led by ICFO professor Dr. Georgia Papadakis.

Marie Skłodowska-Curie Actions

Eight ICFO Postdoctoral researchers receive MSCA fellowships in most recent call

Part of Horizon Europe, the Marie Skłodowska-Curie Actions (MSCA) are the European Union's flagship funding program for doctoral education and postdoctoral training of researchers. In the most **recent call for postdoctoral fellowships**, 8,039 candidates applied for 1,249 grants. **Eight applicants applying from ICFO received MSCA fellowships**, giving ICFO a **40% success rate** in this call, well above the 15.8% global rate. Two ICFO applicants received scores of 100%.

Meet the fellows

Mir Alimuddin (INCOMING), will join the Quantum Information Theory group

Nicolas Linale, Optoelectronics group

Michal Gwizdala and **Chunyu Li**, Photon Harvesting in Plants and Biomolecules group

Sara Hirthe, Ultracold Quantum Gases group

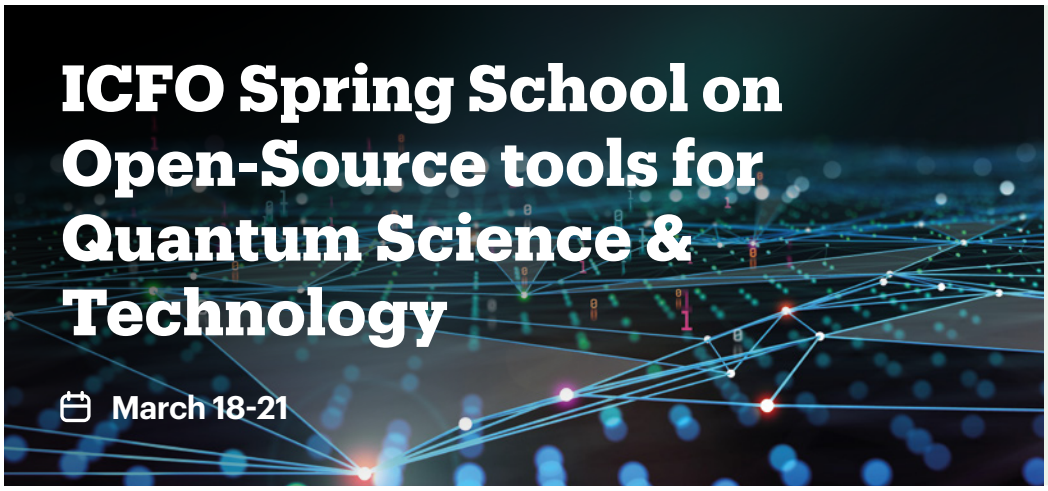
Blazej Jaworowski, Theoretical Quantum-Nano Photonics group

Lu Xia, CO_2 Mitigation Accelerated by Photons group

Federico Centrone, currently in the Quantum Information Theory group, received a Global Fellowship to carry out his research outside the EU or countries associated to Horizon Europe before returning to Europe.

Collaboration

TRAINING



TOPICS INCLUDED IN SCHOOL:

- Quantum Computing with IBM Quantum (IBM Quantum)
- Neutral Atom Quantum Computing (Pasqal)
- Photonic Quantum Computers (Quandela)
- Simulating Quantum Networks (Qutech / TU Delft)
- Quantum Simulation with Neutral Atoms (ICFO)
- Quantum Machine Learning (ICFO)
- (Post) Quantum Cryptography (ICFO)
- Quantum Simulation & Computing with Rydberg Atoms (Strasbourg)
- Quantum programming with PennyLane (Xanadu)

This year's Spring School aimed to provide students with a practical introduction to software and hardware tools for both theory and experiments in quantum sciences and technology, including applications in computation and simulation, communications, and sensing.

The theme of quantum science and technology was chosen in response to growing attention towards quantum computing and simulations and the prioritization of education and training for more students in this field. The theory behind and also the tools needed to solve computational problems Is extremely important for students that want to work in this field.

The program offered a combination of hands-on lectures and tutorials led by researchers from ICFO and academic and industry experts, and covered a range of topics aimed at introducing students and researchers to a variety of open-source tools, as well as their use in cutting-edge research and industry.

The school included a 1-day **Research Workshop** where the lecturers and invited speakers were able to present their latest results, and a **career development workshop** for Master's students led by the ICFO Knowledge and Technology Transfer team. The **Quantum CARLA Careers Symposium** was scheduled to immediately follow the Spring School and took place at La Pedrera in Barcelona on Friday, March 22nd.

*The school was organized as part of the **Master in Quantum Science and Technology Barcelona** in the scope of the **DigiQ** (Digitally Enhanced Quantum Technology Master) project. It was sponsored by **IBM Quantum**, an industry leader in quantum computing, working everyday towards achieving quantum advantage. This project has received funding from the **European Union's Digital Europe Programme** under grant agreement no. 101084035*

ICFO Digi IBM Quantum

OUTREACH

Quantum CARLA: Empowering Future Careers

March 22 - La Pedrera

Imagine hearing a declaration like "CARLA has changed my life!" straight from an undergraduate participant or a statement like "Amazing talk! This company will get my CV....". These reactions drive the enthusiasm of ICFO's organizing team to keep the momentum going with CARLA events.

CARLA is committed to offering STEM university students and early-stage researchers more than just gatherings; they provide a dynamic space where they can connect, learn, and draw inspiration from experienced professionals across academia, industry, and beyond. Each CARLA event seeks to surpass in impact the previous edition.

In the realm of Deep Tech, including photonics, there is a shortage of skilled professionals across Europe. The CARLA project, born in the framework of the EU program Horizon Europe, took on the challenge by bridging the gap through education and training, showcasing diverse career pathways within photonics.

The recent and third edition of **Quantum CARLA: The Quantum Careers Symposium**, organized by ICFO in collaboration with the **Quantum Flagship, DigiQ,** and **The Master in Quantum Science & Technology Barcelona,** took place at the iconic landmark by Antoni Gaudí in Barcelona of La Pedrera. With over **400 attendees** and speakers from **44 countries** (in person and online), the event sparked insightful conversations and connections.

CARLA events serve as a source of inspiration and networking opportunities, with Quantum CARLA focusing specifically on careers in quantum science and technologies. Building upon the success of past projects, Quantum CARLA aims to sustain and expand upon participants' interest in quantum technologies.

This concept has now been even further expanded with the **360 CARLA, a new EU Horizon project coordinated by ICFO.** 360 CARLA focuses on **creating career development programs in four application verticals:** health, quantum technologies, energy, environment and sustainability, and manufacturing/industry 4.0, reaching an even broader audience of university students and early-stage researchers.

More info
Program and Speakers

Stay tuned for our upcoming activities and events!
www.carlahub.eu

Networking session was awesome. Also, the PhD candidates shared a lot of useful advices for undergraduates and MSc students.

Thank you for giving us the opportunity to expand our knowledge and curiosity while presenting plausible career paths.

Thank you for organizing such a great activity!

I found it quite illustrating!

It was an amazing event that enlarged my view about the current and future opportunities and ongoing works around quantum technologies from a variety of factors.

Being in Peru, this quantum workforce events are a good way to democratize the knowledge.

Carla Camp Participants

Collaboration

OUTREACH

Young Photonics Congress 2024

On March 15th, 128 registered participants from 13 high schools all around Catalonia, took part in the 9th edition of the Young Photonics Congress

Part of the ICFO Outreach team's portfolio of programs specifically aims to engage secondary school students at all levels to transmit the importance of frontier research and photonic-enabled technologies. It helps enormously to have the collaboration of a generous group of educators that make up an **Educators Advisory Team**, advising on activities and materials elaborated for students, secondary school teachers and/or the general public. One powerful suggestion that can be traced back to this Team was the **Young Photonics Congress (YPC)** which this year completed its 9th edition.

On March 15th, **128 registered participants**, from **13 high schools** all around Catalonia, visited ICFO to participate in this annual scientific conference where the **spotlight is on high school students who have developed photonics-related projects.** About half of the participants came to present their project in poster format, most of which will be presented as the "Treball de Recerca" (*Research Work* in English, colloquially known simply as the TdR), an obligatory project for all students working towards a high school/ "Batxillerat" degree in Catalonia. A few of the students had developed their project with some element of support from ICFO Outreach and researchers, thus gaining even greater insights into the research carried out at ICFO and the impact of photonics technologies for research and also in everyday life.

The day started off in the auditorium with an introduction to photonics and ICFO by the Outreach team, followed by flash talks by ICFO researchers who covered a wider range of topics and research areas at the institute.

Carlos Gas Ferrer, PhD student in the Ultracold Quantum Gases group, Dr. Nico Mateos, a project engineer in the SLN Team and Valentina Gacha, a PhD student in the Organic Nanostructured Photovoltaics group.

After the presentations, participants engaged with researchers in a Q&A session, and then the auditorium emptied into the Nest Hall where a lively poster session ensued, attended by member of the ICFO community.

Teachers

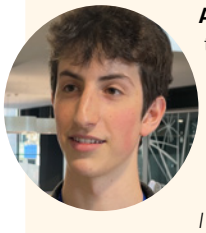
First time participant **Joan Cabrera** who teaches Physics and Chemistry at the **Institut Arnau Cadell** in Sant Cugat del Vallès told us, "I have been blown away by this event. When they sat down in the auditorium, they could tell that this was a serious place, where cool things happen.

The talks from the researchers were great because they showed the kids how far science could take them." Teachers like **Carmen Gámez Tapias** from **Colegio Santo Ángel**, in Gavà, a school that has participated in many editions of the event admits, *"We would bring more students to experience this day if there was more space! We come with students who have demonstrated that they are motivated by physics, math, science, ... and this event is great to help potentiate their curiosity."*

Students

Noelia Vadillo, a student at **Montseny Centre d'Estudis in Barcelona**, came to the YPC all on her own, having discovered the event on the internet. Her poster was titled *"El Glow Up Dels Panells Solars: Construcció D'un Concentrador Solar"* (in English, The Glow Up of Solar Panels: Construction of a Solar Concentrator), and listening to Noelia enthusiastically present her findings, it was clear that 1) she is already passionate about Physics and 2) she is capable of moving mountains! One of her reasons for participating in the YPC was that she hoped it would help her learn of other opportunities where she could interact with ICFO.

A first year Batxillerat student on the science track, **Sondosse El Mouden** attended the congress with about a dozen colleagues from **IES Damià Campeny, Martorell.** She wants to study medicine and confesses that *"Coming to the event today, I thought that this wouldn't have anything to do with what I want to study ... but I discovered, looking at all of the different projects, that it is all related. Without (photonics-based technologies) they would not be able to make as many advances in medicine."*



Alex Blinder, who will finish his high school studies this year at **CIC in Barcelona**, collaborated directly with researchers on his project that's grew from contact with ICFO's Outreach team. *"My project, "Einstein i l'XPS", had an experimental side, which I did with the help of the researchers at the Campus Diagonal UPC Besos, and also a theoretical part that I did with the help of ICFO researchers. I have to say that I really appreciate being able to have the experience with researchers. Also, it's been exciting to work on a project where we still don't know what applications might emerge beyond my study."*

Dr. Lucía Castillo, newly arrived Outreach manager at ICFO who coordinated the YPC for the first time this year, came away as enthusiastic as the participants.

> *I loved it! It is really inspiring to interact with these students, so young but so prepared and motivated, and also to meet the teachers who are on the front line, doing a great job helping the students to discover just how interesting STEM can be. I am already looking forward to next year's 10th edition!*

THANK YOU ICFO OUTREACH VOLUNTEERS

The following ICFOnians participated in outreach activities (January - March 2024) sharing their enthusiasm for science with new audiences:

Dr. Adam Vallés Marí, Dr. Alastair Cunningham, Alejandra Padilla, Dr. André Gonçalves, Antonio Sampaoli, Dr. Ariadna Martínez Marrades, Dr. Bárbara Burlini Polesso, Beatriz Polo Rodríguez, Carlos Gas Ferrer, Dr. Carmelita Rodà, Dr. Carmen Rubio Verdú, Dr. Christoffer Moller, Dr. Clara Vilches Caubet, Diana Méndez, Dibya Jyoti Sarangi, Diksha Mittal, Enric Pérez Parets, Dr. Georgia Papadakis, Georgina Tresanchez, Joana Ibáñez Solé, Jordi Piñol, Júlia Barberà Rodríguez, Dr. Katerina Nikolaidou, Dr. Kostas Mouloudakis, Laura Zarraoa, Lukas Lau, Marina Cunquero, Dr. Mariona Dalmases, Dr. Markus Teller, Dr. Marta Zanoletti, Mirko Fornasier, Dr. Miguel Ángel Moreno Villaécija, Miguel Dosil, Dr. Nicolás Mateos Estevez, Dr. Nicoletta Liguori, Rajashree Haldankar, Roman Veyron, Dr. Sergi Ferrando, Dr. Stefan Forstner, Tomáš Lamich, Valentina Gacha, Dr. Viktoriia Golovanova, Dr. Zoi Melissari.

BECOME AN OUTREACH VOLUNTEER

outreach@icfo.eu

Collaboration

OUTREACH

#100tífiques

Inspiring girls and boys and breaking gender stereotypes in science and research

Back in 2019, to commemorate the **International Day of Women and Girls in Science**, 101 women scientists from BIST centers headed out to 103 educational centers around Catalonia to share their passion for science with 11-13-year-old kids. The event was called "100tífiques" in honor of the 100+ researchers and schools. Since then, this amazing initiative has grown into an annual event, **this year mobilizing around five hundred women scientists in BIST centers as well as other public and private organizations**. On February 7th the women scientists visited schools in person and virtually, ensuring that all interested schools were able to celebrate this International Day which aims to get girls and boys excited about STEM, and also to help break gender stereotypes related to science and research.

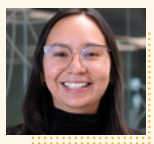
100tífiques is organized by the **Barcelona Institute of Science and Technology** (BIST), along with the **Fundació Catalana per a la Recerca i la Innovació** (FCRI) and in collaboration with the **Generalitat's Departments of Education, Research and Universities.** Recent improvements to the program include workshops with communication professionals for participating researchers, helping to prepare talks, as well as access for teachers to specific training to make the most of the scientist's visit to the school or institute.

Thank you to ICFO's 2024 Volunteers, some of whom were part of the original 100 back in 2019.

Clara Vilches

Lucía Castillo

Joana Ibañez



Valentina Gacha

Marina Cunquero

COMMUNITY

Diversity Focus: ICFOnians for Women in Science

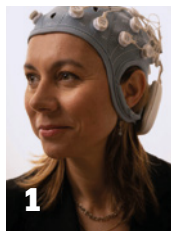
Keeping alive the discussion around gender diversity in science

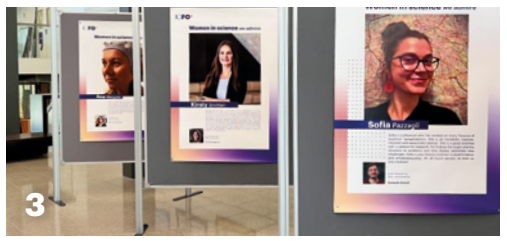
Now in its 7th edition, ICFO's institution-wide tradition of celebrating the **International Day of Women and Girls in Science** began in 2016, the same year that the UN declared the International Day. In 2018, we extended the celebration all the way to March 8th, **International Women's Day**, in order to dedicate an entire month to related discussions and activities.

Thanks to the involvement of people from all over the institute, researchers, members of the management team, the 2024 program was one of the most complete and productive to date. The program broadened its focus this year to celebrate a wide range of voices and perspectives, recognizing that women's roles in science are of course in the research arena, but also in industry and positions focused on enabling scientific production and impact from all angles and at all levels.

In addition to activities organized for the immediate ICFO community, there was a surge of Outreach activities aimed at reaching young people and providing students with scientific woman role-models, influencing perceptions on who is doing science and who can succeed as a leader in science.

More info
2024 Program





1. "Leading a Successful Deep-tech Start-up", inaugural keynote talk by Ana Maiques, CEO at Neuroelectrics.
2. **Conversation with Industry Leaders: Vanesa Díaz,** CEO of ICFO spin-off LuxQuanta, and Ilaria Ambrogio, Research Fellow - Senior director at Proctor & Gamble, two successful women working in the photonics industry, share professional perspectives.
3. Women in Science We Admire Campaign 2024 on exhibit in the Nest Hall

2024 BIST Forum

The meeting of the BIST scientific community highlighted the social and economic impact generated by frontier research

Panels made up of centers from the BIST community illustrated BIST's impact on the research landscape as well as the economy, both in Catalonia and on the European level

The BIST scientific community, made up of seven major Catalan research centers – **CRG, IBEC, ICFO, ICIQ, ICN2, IFAE,** and **IRB Barcelona**– held the BIST Forum in the auditorium of La Pedrera. This year's annual meeting dealt with the three main areas to which frontier research in Catalonia contributes: the expansion of knowledge, the change in the productive model and the development of society.

The president of the Generalitat, Pere Aragonès, inaugurated the Forum, which brought together two hundred people from the scientific, political, economic and lay communities. Among them, the chancellors of UB, UAB, UPC and UPF universities, and heads of the Barcelona Chamber of Commerce, the Cercle d'Economia, Foment del Treball and Barcelona Global. President Aragonès pointed out that ***"we have one of the most powerful research ecosystems, with the greatest potential in southern Europe" and the BIST community "is one of the clearest examples".***

People

GO & FLY

Congratulations to 6 New ICFO PhD Graduates

312 ICFOnians have successfully defended their theses at ICFO

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.

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Tymoteusz Salamon
Theoretical models for quantum simulators of novel materials and devices

January 15, 2024
ICREA Prof. Dr. Maciej Lewenstein and Dr. Debraj Rakshit

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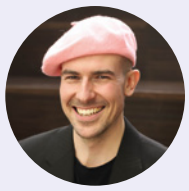

Jan Lowinski
Nonlinear optics with a Rydberg ensemble for quantum information processing purposes

January 19, 2024
ICREA Prof. Dr. Hugues de Riedmatten

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Christina Graham
Transparent surfaces based on ultrathin materials with tailored optical and biological functionalities

February 23, 2024
ICREA Prof. Dr. Valerio Pruneri

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Sven Bodenstedt
Optically Detected Nuclear Magnetic Resonance Above and Far Below Earth's Magnetic Field

February 15, 2024
ICREA Prof. Dr. Morgan Mitchell and Dr. Michael Tayler

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Gaurav Kuma
Colloidal Quantum Dots Based Bolometer

March 11, 2024
ICREA Prof. Dr. Gerasimos Konstantatos

312

Neus Sanfeliu Cerdán
A liquid-to-solid transition governs neuronal mechanotransduction during touch in Caenorhabditis elegans

March 12, 2024
Prof. Dr. Michael Krieg

COMMUNITY

1 to 5. ICFO Calçotada

6 to 8. Excursionistas hike to La Garriga

Mystery ICFOnian

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

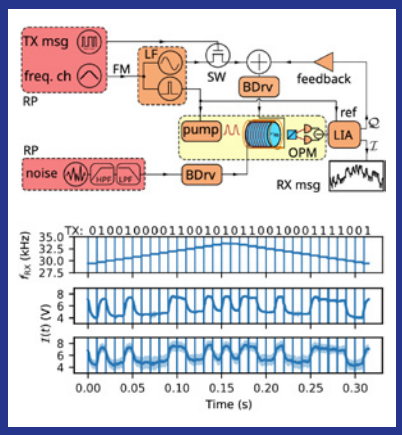
ICFOnians are a fascinating group, with hobbies, interests and talents that may surprise you. Have a look around and see if you can guess who this edition's Mystery ICFOnian is!

Look for the answer in the next edition of *ICFOnians*.

1. She is always trying to convince people on the merits of being vegan.
2. You may not imagine her this way now, but a few years ago, her hair was pink.
3. She truly believes in inclusivity in the workplace and is active in her efforts to make sure this is a reality at ICFO.
4. She would desperately like to connect with serious book lovers to start a serious book club at ICFO.
5. Since moving to Barcelona, she has discovered rock climbing.

The Last Word

SCIENCE QUIZ



ICFOnians Aleksandra Sierant and Charikeleia Troullinou, together with Michal Lipka of the University of Warsaw published **"Multiparameter quantum sensing and magnetic communication with a hybrid dc and rf optically pumped magnetometer".** This work demonstrates spread-spectrum radio reception in the LF and VLF bands using rubidium atoms as a radio receiver.

1. How large is a traditional resonant antenna for 30 kHz VLF waves ?

A) 5 millimeters

B) 5 meters

C) 5 kilometers

2. VLF is used for communication

A) to Antarctica

B) through water

C) through rock

D) all of the above

3. Who patented the spread-spectrum method ?

A) Ingrid Bergmann

B) Hedi Lamarr

C) Josephine Baker

4. Rubidium, named for the deep red color it produces in a flame, was discovered by (pick two)

A) Gustav Kirchhoff

B) Augustin Fresnel

C) Robert Bunsen

D) Gustav Klimt

Answers on pg. 2

HIGH PROFILE

Donna Strickland

Professor, Department of Physics and Astronomy, University of Waterloo. Leader of the Ultrafast Laser Group. Recipient of the Nobel Prize in Physics 2018.

Donna Strickland is the 3rd woman in history to have been awarded the Nobel Prize in Physics, together with Gérard Mourou, for inventing chirped pulse amplification (CPA) - a method of making pulses of laser light of high power and short duration.

Can you tell us about the Eureka moment that led to your invention of chirped pulse amplification (CPA)?

Gerard had the idea of a CPA in 1983 but it was when we went to a conference in 1984 and everybody was doing pulse compression in fibers that we realized this is how we would do it. They were already stretching the pulse in the fiber, making extra colors in the fiber so that they could make shorter pulses. They weren't trying to amplify them, simply trying to make them short. Gerard already knew that we needed to make short pulses long so we could amplify them, so we realized that all we had to do was put the amplifier after the fiber before the compressor, and this would all work. That was the eureka moment, and it took a year after that for us to show that it did work.

The importance of the discovery isn't always clear immediately, or maybe it was in your case?

Not even close! We knew that it was the way to make a Petawatt laser, but we thought it would be in the big laser labs for the great big energy lasers- so there would have been very few lasers that could do it. We thought it would have an impact in the field, but not that it would be the huge thing that CPA turned out to be.

While we were doing our work, Peter Moulton at Lincoln Labs at MIT was doing work on a new laser material, and that allowed much shorter pulses than what we could have in a big storage energy medium. This combination allowed us to have even shorter pulses so we could get the same peak power with less energy. All academic labs could afford these lasers and that's when it became huge.

The application that CPA is known for is eye surgery, and that came later from an accident with a student in Gerard's group. The Ti:sapphire laser reached to where your eye could just see and people were tempted to take their goggles off, easily forgetting that it was so powerful because it looked like a weak beam. Eye damage became a real problem.

> *I am surprised at how many young people ask me how they can do Nobel Prize winning graduate work. You don't want to even aim for that.*

They took Gerard's injured student to an ophthalmologist on campus. Typical laser damage would still be thermal and cause a tear, but this was a perfect round hole and that got them thinking. It was this same ophthalmologist working with Gerard who figured out how to use CPA for ophthalmology.

Can you tell us about something that you find exciting in your field today?

If I ever get my laser to work, I'm supposed to be doing low energy laser acceleration with the inventor of laser acceleration, Toshiki Tajima, a theorist. The idea is that you would go to a tumor that is one that you could get to surgically. One of the problems in removing tumors is always that you can't really tell if you've got it all, so you have to choose to leave some or cut too deep. Either way it's a problem. And so Toshi has started to think, let's let them leave the last little bit. If we could just get the laser accelerator at the end of a fiber tip, maybe then we could just radiate the last micron and the doctor can leave some but know that the radiation will then take the rest. If I ever get my laser to work, that's what we're going to work on.

What advice would you give ICFOnians who are looking to establish a successful career in science?

I am surprised at how many young people ask me how they can do Nobel Prize winning graduate work. You don't want to even aim for that! If you think physics is fun, then you should do physics, and you should find the part of physics that you find most fun to do so that you actually want to do it every day. And if you want to do it every day, then you will do a really good job because you're enjoying doing it.

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Please send questions, comments and suggestions to communications@icfo.eu