

## HAPPENINGS

New Leica Nanoscopy Imaging Reference Site

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Summer Science at ICFO

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## PEOPLE

New ICFO Group Leader

p.9

## THE LAST WORD

Martin Leahy

p.12

# ICFONIANS 33

Community News Fall 2017

# The new ICFO look

The identity of an institute in constant motion

New applications



ICFO<sup>R</sup>

The same logo you know and love

## EDITOR'S CORNER

**Brook Hardwick**  
Coordinating  
Editor



# Constant Motion

Picking up this edition of ICFOnians, before even reading the first page, you will note that something is afoot.

**ICFOnians is the first place we are rolling out our new look that you will start to notice around the center over the coming months. Those of you who liked our "old" look may wonder why the change? As an institution, we are constantly growing, evolving and looking for ways to improve. We do this because we want to be known around the world for the excellence in our research, the attention to detail in our processes and all institutional endeavors.** From a communication stand-point, we believe that this passion for excellence should be evident as well in the way we present ourselves to the world. The changes we are implementing aim to give ICFO a cleaner, more coherent and recognizable visual identity. Change is good because it demonstrates that we are assessing, growing and taking positive initiatives to improve. We are excited to share the first applications of our new brand with you, and are eager to continue working towards an improved visual identity that will reflect positively on the entire institution.

At ICFO, change is the name of the game. One of the things that makes it so great to work here is that no week, month or year is ever the same. New faces (check out all the newcomers and the launch of a new research group), new aspirations, new achievements, new scientific advances, and new ideas on the horizon. ICFOnians are always in motion, working diligently to stay two steps ahead of the future.

Those who choose to pursue a career in science must possess an openness to change, be it in the form of reinventing the proverbial wheel or implementing paradigm-changing discoveries. Projects open and close; new ideas are debated, tested and implemented or discarded. The career path for scientists, from university student, to doctoral candidate, graduate, postdoc or PI, is a long slow evolution in most cases including not only geographic mobility, but also several focus readjustments. When ICFOnians move on past their allotted time at the institute, change continues to be the norm. As we heard at the recent Career Panels from a number of members of the Alumni Network who have made post-ICFO career changes away from academia and into careers as management consultants, patent engineers, data analysts, entrepreneurs and industrial scientists, embarking on an important career change may require some conceptual adjustments, but scientists are trained to adapt and thrive.

Call it change, evolution, growth or initiatives that help us to position ourselves for opportunities that may not yet be in sight. This issue aims to give a snapshot of an institute that is in constant motion, as exemplified by our new look. We hope you enjoy reading about our most recent projects and achievements.

**Mystery ICFonian**  
Solution Ed #32

**Lisa Kobayashi**  
Former member of the  
Medical Optics group

**Science Quiz**  
Answers from p.12

**1. A , 2. All answers correct, 3. C**

## COVER



While many aspects of ICFO's visual identity are changing, our logo remains the same, as does the dedication to science at the highest international level which defines the way we work at this institute.

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## Layout

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# HAPPENINGS



**BUSINESS NEWS**  
Leica Microsystems and ICFO sign an R&D collaboration agreement.

p.6

## ICFO NEWCOMERS

### Welcome to ICFO

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



**Aamir Mohammed Ali**  
Postdoctoral Researcher



**Ainoa Guinart**  
Student



**Alberto Figueroba**  
Postdoctoral Researcher



**Álvaro Cuevas**  
Visiting PhD Student



**Álvaro Rodríguez**  
PhD Student



**André Guedes**  
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**Avijit Saha**  
Postdoctoral Researcher



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**Cyrine Ernandes**  
Visiting PhD Student



**Daiki Hatanaka**  
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**Daniel Fernández**  
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**Gerard Jiménez**  
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**Giacomo Giacalone**  
Visiting PhD Student



**Gil Triginer**  
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**Giorgio Colangelo**  
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**Javier Alejandro Lopez**  
Student



**Joaquin Alberto Ascencio**  
Student



**Luca Tanzi**  
Visiting Scientist



**Lukas Heller**  
Student



**Marco Wiedemann**  
Research Engineer



**Mehdi Alizadeh**  
Visiting PhD Student



**Mehmet Alican Noyan**  
Research Engineer



**Mohammad Mehboudi**  
Postdoctoral Researcher



**Nathan Day**  
Student



**Nela Durisic**  
Visiting Scientist



**Shanmukh Naidu Majji**  
Student



**Silvana Palacios**  
Postdoctoral Researcher



**Stefano Duranti**  
PhD Student



**Stella Avtzi**  
PhD Student



**Sukeert**  
PhD Student



**Tymoteusz Salamon**  
Student



**Unai Ortiz**  
Research Engineer



**Urs Stauer**  
Visiting Scientist



**Victor Vysloukh**  
Visiting Scientist

## HAPPENINGS

## ICFO NEWS

## Falling Walls Lab Barcelona



Dr. Emre Ozan Polat, a postdoctoral researcher in the Quantum Nano-optoelectronics research group at ICFO, won first place in the **Barcelona Falling Walls** satellite event with his presentation "Breaking the Wall of personal health monitoring. Wearable wellness patches showing health status". As winner of the Falling Walls Lab Competition in Barcelona, Emre will now continue on to the grand finale competition in Berlin (November 8th) where he will present his innovative idea to a jury of scientists and business people in under three minutes, competing with over 100 participants for the final prize.

## Master of Multidisciplinary Research in Experimental Sciences

The Pompeu Fabra University (DCEXS, UPF) and the Barcelona Institute of Science and Technology (BIST), officially launch the **Master of Multidisciplinary Research in Experimental Sciences**. Oriented to equip students with the skills that are needed to start a research career in an increasingly complex and competitive environment, this one year Master is the first of its kind to launch in Spain. It emphasizes the importance of research and its multidisciplinary nature, evidenced by the participation of each student in two research projects in different disciplines, which will be carried out in two different research centers. In addition to the experimental training through these two research projects, students will receive training in cross-curricular subjects such as statistics and imaging sciences, responsible research, and scientific communication. Students will also participate in seminars and workshops in advanced research techniques, taught by top local and international researchers and specialists.



**Barcelona Institute of  
Science and Technology**



**Universitat  
Pompeu Fabra  
Barcelona**

+INFO  
bist.eu/master

## Banc Sabadell Award



ICREA Prof. at ICFO Romain Quidant has received the first **Award for Science and Engineering** given jointly by the Banc Sabadell Foundation and the Barcelona Institute of Science and Technology (BIST), in recognition of his outstanding contributions to the field of nanophotonics, which has shown to have a huge potential for applications in biomedicine.

## Paul Ehrenfest Best Paper Award



Researchers Ariel Bendersky, Gonzalo de la Torre, Gabriel Senno, Santiago Figueira, and ICREA Prof. at ICFO Antonio Acín have received the 2016 **Paul Ehrenfest Award** for their paper titled "Algorithmic Pseudorandomness in Quantum Setups", published in Physical Review Letters. This paper argues that quantum experiments requiring randomness exhibit a different behavior depending on whether we use pseudorandomness produced by Turing machines or true randomness.

## RSEF - FBBVA Medal 2017



ICREA Prof. at ICFO Maciej Lewenstein has been awarded the RSEF (Real Sociedad Española de Física) and the Fundación BBVA's **RSEF - FBBVA Medal 2017** in recognition of his leadership in the field of Theoretical Quantum Optics, Quantum Information and Attosecond Physics and for making seminal contributions and opening new lines of research, potentiating science in Spain and playing an important role in the development of a community in Quantum Technologies.

## ERC Starting Grant



ICFO Prof. Simon Wall, leader of the Ultrafast Dynamics of Quantum Solids research group, was awarded the **European Research Council Starting Grant** to pursue the project "Probing nanoscale and femtosecond fluctuations in high temperature superconductors (SeeSuper)". This project aims to adopt a new approach to study high temperature superconductivity, the spectacular quantum phenomena that enables materials to conduct electricity without resistance. SeeSuper will attempt to understand the origins of high temperature by examining how they vibrate on ultrafast ( $10^{-15}$  s) and nano ( $10^{-9}$  m) time and length scales. Prof. Wall's grant is the tenth Starting Grant to be awarded to an ICFO researcher to date, bringing ICFO's ERC grant total to 26 (10 Starting Grants, 4 Consolidator grants, 5 Advanced Grants and 7 Proof of Concepts Grants).

## New Tenured Faculty



Prof. Darrick Chang, leader of the Theoretical Quantum-Nano Photonics group at ICFO, has been awarded tenure at ICFO by the Board of Trustees of the institute. Darrick arrived at ICFO in 2011 as a CELLEX NEST Fellow. His research group focuses on optical and mechanical control of graphene, development of trapping techniques at the nanoscale, and the study of interactions of atoms coupled to nanophotonic systems. While his work is theoretical, he collaborates with leading experimental groups to bring these ideas to reality. Chang received an ERC Starting Grant in 2014 and has subsequently also coordinated the FP7 European Collaborative Project GRASP (Graphene-Based Single-Photon Nonlinear Optical Devices) and the H2020 Marie Skłodowska-Curie Project LANTERN (Light-Atom Interactions in Nanophotonic Structures).

## Poster Awards



### Rinu Abraham Maniyara and Dr. Dhriti Sundar Ghosh

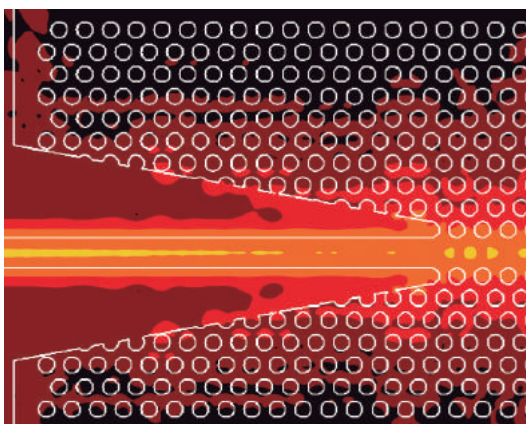
Rinu Abraham Maniyara and ICFO Alumnus Dr. Dhriti Sundar Ghosh led by ICREA Prof. at ICFO Valerio Pruneri were awarded the **ZEISS Award for Talent in the Industry Best Student Poster** at the SPIE Photomask Technology and EUV Lithography Conference and International School on Computational Microscopy for the poster entitled "Transparent and conductive backside coating of EUV lithography masks for ultra short pulse laser correction".



### Roland Terborg, Josselin Pello and Ilaria Mannelli

Roland Terborg, in collaboration with Josselin Pello, Ilaria Mannelli, led by UPC Prof. at ICFO Juan P. Torres and ICREA Prof. Valerio Pruneri was awarded **Best Poster at the International School on Computational Microscopy 2017** in Amalfi Italy, for the poster "Portable lens-free microscopy with sub-nanometric depth sensitivity for thin films and protein detection". The award was sponsored by the Italy Chapter of the IEEE Photonics Society.

## LATEST ADVANCES

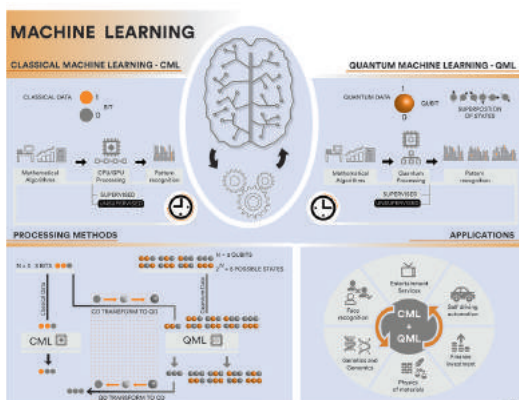


## Graphene Single Photon Detectors

In a recent paper published in *Physical Review Applied*, and highlighted in *APS Physics*, ICFO researcher and Group Leader Prof. Dmitri Efetov, proposes the use of graphene-based Josephson junctions (GJJs) to detect single photons in a wide electromagnetic spectrum, ranging from the visible down to the low end of radio frequencies, in the gigahertz range.

This project is in collaboration with researchers from Harvard University, MIT, Raytheon BBN Technologies and Pohang University of Science and Technology.

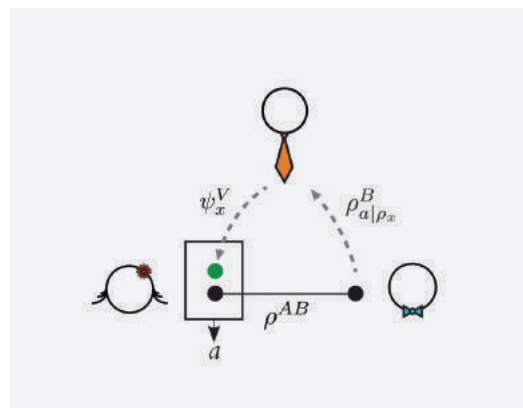
Graphene was placed in between two superconducting layers, where the Josephson junction allows a supercurrent to flow across the graphene when cooled down to 25 mK. Because the graphene heat capacity is so low, when a single photon hit the graphene, it heated the electron bath and produced a detectable voltage spike. This effect occurred almost instantaneously, thus enabling the ultrafast conversion of absorbed light into electrical signals, allowing for a rapid reset and readout.



## Quantum Machine Learning

*Nature* has published a study in which researchers Peter Wittek from ICFO, Jacob Biamonte from Skoltech/IQC, Nicola Pancotti from MPQ, Patrick Rebentrost from MIT, Nathan Wiebe from Microsoft Research, and Seth Lloyd from MIT have reviewed the actual status of classical machine learning and quantum machine learning.

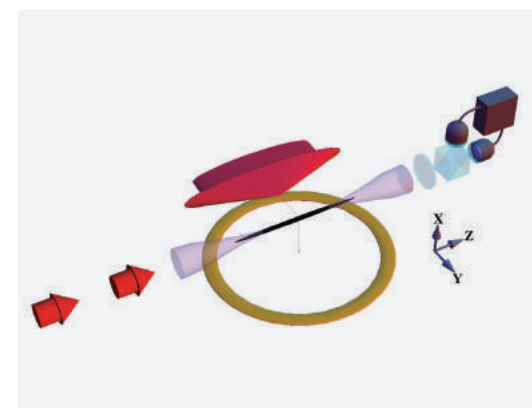
In their review, different possible combinations have been considered: the conventional method of using classical machine learning to analyze classical data, using quantum machine learning to analyze both classical and quantum data, and finally, using classical machine learning to analyze quantum data.



## Quantum Teleportation

In a recent study published in *Physical Review Letters* ICFO researchers Daniel Cavalcanti and Ivan Supic, in collaboration with ICFO Alumnus Paul Skrzypczyk, now at the University of Bristol, have proposed a new benchmark to quantify the performance of teleportation that uses the full information available in a teleportation experiment.

The researchers propose the idea of “non-classical teleportation witness” to certify whether the teleportation experiment is genuinely quantum and show a method to quantify this phenomenon. Using this new quantifying parameter, they prove that all entangled states can implement a quantum channel that cannot be reproduced classically.



## Detecting radio waves with entangled atoms

ICFO researchers Ferran Martin Ciurana, Dr. Giorgio Colangelo, Dr. Rob Sewell, led by ICREA Prof. at ICFO Morgan Mitchell, have reported in a study published in *Physics Review Letters*, and highlighted by *APS Physics*, a new technique for the coherent detection of radio frequency magnetic fields using an atomic magnetometer.

They use highly sensitive, non-destructive measurements to entangle the atoms, while maintaining their collective coherence, and a new technique to allow the coherent build-up of signal from arbitrarily shaped waveforms.

With this technique, they were able to measure the weak radio-frequency magnetic-field signal with a 25% reduction in experimental noise due to the quantum entanglement of the atoms, and a sensitivity comparable to the best radio-frequency magnetometers used to date.

## HAPPENINGS

## BUSINESS NEWS



## ICFO becomes a new Leica Nanoscopy Imaging Reference Site

Leica Microsystems and ICFO sign an R&D collaboration agreement.

**October 6th marked the beginning of a new partnership between ICFO and Leica Microsystems. A new collaboration agreement with this leading microscopy company aims to promote and establish ICFO as a new European Nanoscopy Imaging Reference Site, allowing ICFO's experts in super-resolution to partner with Leica Microsystems to conceptualize and implement technological improvements to the new Leica 3 color, 3D gated STED state-of-the-art system.**

Through this agreement, ICFO and Leica Microsystems formalize an R&D collaboration to foster the exchange of ideas and know-how, the mutual pursuit of new challenges and research lines within the fields of microscopy and nanoscopy as well as the search for novel applications in biomedicine and biophysics.

These high level users come to the SLN facility with very specific requirements that may be impossible to meet with current technologies elsewhere.

Far from offering standard services to researchers, the new Leica system will form part of ICFO's current state-of-the-art Super-resolution Light Microscopy and Nanoscopy (SLN) facility. This facility offers

a large collection of advanced microscopes for the use of advanced researchers from qualifying institution across Europe, including members of the Euro-BiolMaging, Corbel European or LaserLab research infrastructure programs. These high level users come to the SLN facility with very specific requirements that may be impossible to meet with current technologies elsewhere. They are offered the unique opportunity to work together with the SLN researchers and technicians in tailor-made solutions that adapt to their specific needs. Leica Microsystems and ICFO will work together in the forthcoming years to adapt and advance the 3D gated STED system's features and capabilities, incorporating new hardware and software to offer front-end microscopy techniques that are able to operate a step beyond commercial state-of-the-art instruments currently available.

Future applications include neurodegenerative diseases, retinal genetic disorders or bacterial virulence, amongst others. Collaborations with Bellvitge Hospital and the University of Barcelona for the study of retinal degeneration, with Sant Pau Hospital in Barcelona to study beta-amyloid plaques and their effects on Alzheimer's disease, and with the Josep Carreras Foundation for research to better understand and eventually treat leukemia, are already starting to benefit from the unique services of this facility.

The three-year R&D collaboration expects to bring fruitful results within the European biomedical research community. Dr Pablo Loza, leader of the SLN facility at ICFO comments, "We are thrilled with the addition of this new Leica state-of-the-art microscope and the new collaboration agreement set forward with Leica Microsystems' R&D team. We are sure that

## PHOTO

Leica Microsystems representatives together with ICFO's director, members of the SLN Facility, and the Knowledge and Technology Transfer team celebrate the new collaboration agreement.

The Nanoscopy Imaging Center will allow advancement in the study of diseases such as leukemia, Alzheimer's and retinal degeneration, among others.

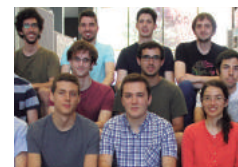


this instrument, combined with all other instruments within our SLN facility, will produce a qualitative jump for today's research and applications and will enable us to delve into a new realm of novel biomedical applications that we are yet to fathom".

Christoph Thumser, Sales Director for Life Science Research EMEA stated "Leica Microsystems are delighted to embark on this collaboration with ICFO. We are confident that the combination of ICFO's expertise in photonics and optical technology and Leica Microsystems strengths in advanced imaging solutions will lead to great developments in microscopy. ICFO's strong links to the imaging community through its association with CORBEL and EuroBiolMaging will also benefit Leica Microsystems. Due to the SLN's plan to offer open access to the Leica TCS SP8 STED 3X system, we will learn a great deal about how nanoscopy is used today and how it should develop into the future."



# COLLABORATION



**YOUNG TALENT**  
Summer Fellows  
2017  
p. 8

## YOUNG TALENT



## Summer Science at ICFO

### Nurturing Scientific vocations.

**One of ICFO's core missions is to have a formative influence on the next generation of scientists.**

Throughout the year, academic programs as well as outreach events attract a steady stream of high school and undergraduate students to ICFO, offering a wide range of introductory activities as well as active internships that challenge young minds to better understand the work carried out at the center.

During the summer months, these important visitors have a noticeable presence in our corridors and labs. ICFO offers a full series of Summer Lectures, designed to introduce newcomers to the many different lines of research at the center. A series of lab tours as well as projects conducted within ICFO's research groups provide the framework for these young scientists (and scientists-to be) to experience ICFO as a researcher, not just a visitor.

From June through September, we welcomed students in high schools, universities and graduate programs, sharing the excitement of the ICFO research experience.

## High School programs

**ICFO collaborates with youth science programs designed to give outstanding students a summer full of science. Young minds come to the institute to spend a couple of weeks and work within a frontier research group.**

Fundació  
Catalunya  
La Pedrera

PROGRAMA  
JOVES I CIÈNCIA

ICFO hosted three high school students for a one to two week stay within the Joves i Ciència program, supported by Fundació Catalunya-La Pedrera. Students worked on projects within the Theoretical Quantum-Nano Photonics group, the Quantum Optics Theory group and the Quantum Information Theory group.

[jovesiencia.cat](http://jovesiencia.cat)



As part of the CiMs+CELLEX program, this year ICFO welcomed two CiMs+Cellex students who worked on projects within the Quantum Information Theory group and the Theoretical Quantum-Nano Photonics group.

[www.cims-cellex.cat](http://www.cims-cellex.cat)



During ten days, ICFO welcomed ten students from around the world from BIYSC (Barcelona International Youth Science Challenge), a program organized by the Fundació Catalunya - La Pedrera. Students discovered how light and matter interact at the nanoscale, guided by the researchers of the Plasmon Nano-Optics group.

[www.biyisc.org](http://www.biyisc.org)

ACER<sup>R</sup>

This year, through the 3rd Edition of the Extraordinary High School Prizes, the Catalan Association of Research Centers (Associació Catalana d'Entitats de Recerca - ACER) awarded 2 scholarships. The students worked on the project "Image Compression Algorithms" within the Theoretical Quantum-Nano Photonics group and within the Quantum Information Theory group.

[www.acer-catalunya.org](http://www.acer-catalunya.org)

Richi Childhood  
Cancer Foundation

ICFO teamed up with the Richi Foundation as part of the Richi Talent program, welcoming three talented high school students who worked with the Outreach team and Prof. Antonio Acín during three weeks on the project "Find the quantum rules of quantum technologies".

[www.richifoundation.org](http://www.richifoundation.org)

Generalitat  
de Catalunya

The Generalitat's Education Department, through the Science, Technology and Mathematics (CTM) program, puts in contact motivated teachers and their talented students with various Catalan research centers. This year, through this program, ICFO helped Paula Sierra Varela from the INS F.X. Lluch i Rafecas of Vilanova i la Geltrú, to complete her high school research project in collaboration with the Medical Optics group.

[www.web.gencat.cat](http://www.web.gencat.cat)

## COLLABORATION

## YOUNG TALENT

## ICFO School on the Frontiers of Light

July 3-6

ICFO's Academic Programs Office led by ICREA Prof. at ICFO Niek van Hulst and Dr. Rob Sewell has operated for the second consecutive year a high level Summer School program for graduate students.

Nearly 40 years after the seminal work by Arthur Ashkin that resulted in the invention of Optical Tweezers, 31 Masters and starting PhD students recruited from some of the best research centers in the world participated in a program that introduced the physics of optical forces and the principal current trends in the field. The carefully chosen list of topics included in this school dedicated to Optical Trapping and Optical Manipulation included statistical physics, optomechanics, biophysics and soft matter.

This was the second School on the Frontiers of Light to be organized by ICFO, the first of which ran in July 2016 and focused on Quantum Nano-and Opto-mechanics. The goal of these Schools is to enhance ICFO's role in training highly talented students worldwide.

The school agenda included pedagogical lectures on selected topics, research seminars, group discussion sessions, and lab tours and was specially designed to cater to the Master-level students and beginners in the field. The academic program culminated in a special Symposium in which worldwide experts from different communities presented some of the main emerging trends.



The 2018 Frontiers of Light Summer School will focus on optoelectronics and photovoltaics and will take place from July 2-6, 2018.

#### Invited Lecturers:

Prof. Lukas Novotny (ETH Zürich); Prof. Erwin J.G. Peterman (VU University Amsterdam); Prof. Juan M.R. Parrondo (Complutense University of Madrid); Prof. Giovanni Volpe (University of Gothenburg); Dr. Raúl A. Rica (University of Granada).

#### Local Organising Committee:

Prof. Romain Quidant (ICFO), Dr. Raúl Rica (University of Granada) and Dr. Robert Sewell (ICFO).



#### PHOTO

(Left to Right) Top row: Sergi Masot Lloma, Oriol Rubies Bigordà, Ruben Arjona, Asier Alvarez Rueda, Javier Prada Rodrigo. Middle: Adrian Jesús Suñer Rubio, Anicet Tibau Vidal, Conrad Corbella Bagot, Lluç Sendra Molins, Arnau Bertran Inglada, Alberto Muñoz de las Heras, Laia Domingo Colomer. Bottom: Martí Martínez de Morentin Cardoner, Joan Bernabeu Gómez, Álvaro Ortega González, Alba Romero Rodríguez, María Delgado Ortet, Manuel Fernández Merino

## Summer Fellows 2017

Each summer, eligible students who are within the last two years of their Master-equivalent or Engineering degree studies, are hosted and coached by the different ICFO research groups.

Now in its 11th edition, the Summer Fellows program welcomed 18 undergraduate and Master's students to ICFO to carry out challenging research projects under the supervision of a Group Leader and with the assistance of Postdocs or PhD students.

This program is part of ICFO's efforts to attract young top talent at an early academic career stage. It represents a unique opportunity for the fellows to collaborate in frontier research projects, to learn how these projects are conducted and to gain research experience.

## SPECIAL SYMPOSIUM

## New Frontiers in Optical Trapping and Optical Manipulation

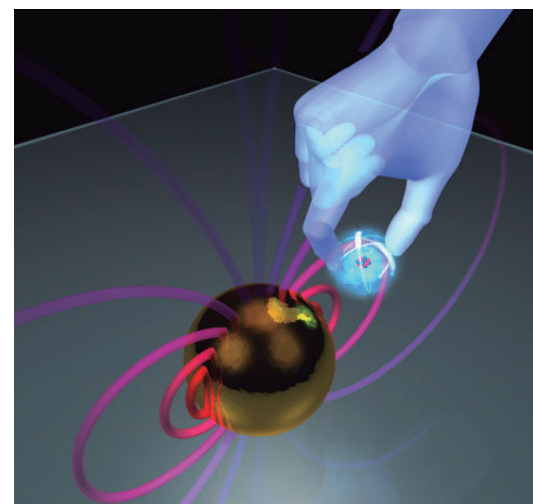
July 7



In honor of ICFO Prof. Dmitri Petrov.

Optical trapping has become a transversal enabling tool involved in a wide range of experiments from fundamental Physics to Biology. This event brought together experts from different communities with the goal of exploring emerging trends.

The symposium complemented this year's ICFO School on the Frontiers of Light, and was held in honor of our late colleague Prof. Dmitri Petrov, leader of the Optical Tweezers Research group at ICFO from 2002-2014.



#### Invited Speakers:

Prof. Kishan Dholakia  
University of St Andrews

Prof. Lukas Novotny  
ETH Zürich

Prof. Arno Rauschenbeutel  
VCQ, Austria

Prof. Reuven Gordon  
University of Victoria

Prof. Monika Ritsch-Marte  
Medical University of Innsbruck

Prof. Giovanni Volpe  
University of Gothenburg

Prof. Erwin J.G. Peterman  
VU Amsterdam

Prof. Juan M.R. Parrondo  
Complutense University of Madrid

#### Local Organizing Committee:

Prof. Lluís Torner  
ICFO

Prof. Romain Quidant  
ICFO

Dr. Raúl Rica  
University of Granada

Dr. Robert Sewell  
ICFO



# PEOPLE

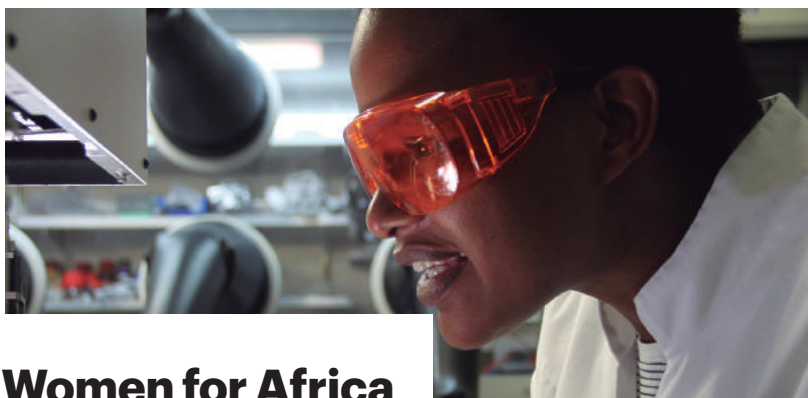


## BEYOND ICFO

Carreers Outside Academia: ICFO's Alumni Network strengthens the ICFO community.

p. 10

## IN FOCUS



## Women for Africa Foundation

**Contributing to sustainable development in Africa through the drive of female scientists like Prof. Nobanathi Wendy Maxakato.**

Thanks to the foundation's fellowship program, ICFO has had the privilege of welcoming this South African scientist to our institute for a six-month sabbatical. While ICFO will enjoy the benefits of her expertise, the foundation also hopes to make her achievements in the international scientific community more visible, and thus, promote African women's access to research activities.

**Nobanathi Wendy Maxakato**  
Senior Lecturer in the Department of Applied Chemistry at the University of Johannesburg (South Africa).

### Research Interests

The synthesis, functionalization and fabrication /modification of selected electrode materials with nanomaterials and transition metal nanocatalysts for direct alcohol fuel cell applications. Aims at finding new catalysts that are capable of solving the problem of surface poisoning at low potentials in Fuel Cells Electrochemistry with a special focus on Fuel Cells.

### Work at ICFO

Prof. Maxakato spent the summer at ICFO working in the Organic Nanostructured Photovoltaics group led by Prof. Jordi Martorell.

### What inspired you to pursue a career in science?

**Prof. Nobanathi Wendy Maxakato:** My science teacher had so much passion for teaching and that made me choose Chemistry as my major subject. He used to give us a general equation:  $A + B \rightarrow C$ ; I was curious to know how A and B react to produce C. I was interested in discovering new things.

### What obstacles did you have to overcome to launch your career?

**NWM:** My primary and high school institutions had no laboratories or computers. The first time I had a chance to use proper educational materials and resources, such as labs or even a computer, was when I entered the University. My first year of university was a continuous struggle to learn how to use all these tools that were completely new to me. Because I loved Chemistry and had a clear drive towards success, I never gave up but instead worked even harder to achieve my goal.

### What issues remain for South Africa to increase the impact of its scientists and how can programs like the Women for Africa Foundation help?

**NWM:** The lack of well-equipped research facilities is still a challenge. The government is currently supporting research institutions and centers but I believe it can do even better. Through my stay at ICFO, I intend to establish international collaborations and encourage all researchers to do the same since joint projects allow the possibility

of applying for bilateral funding. International collaborations will set South Africa at an internationally recognized level and obtaining bilateral funding will allow the acquisition of proper research facilities.

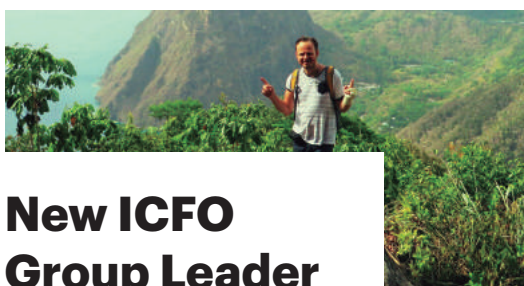
### What impact do you hope to have with your work on fuel cells?

**NWM:** Fuel cell research is a promising potential replacement for batteries in low power electronic applications such as laptop computers and cell phones. The use of fuel cells is a promising clean technology with low energy consumption and therefore this work is of best interest to South Africa, a country that is experiencing rapid industrial growth.

### What has been the most positive take away of your stay (to date)?

**NWM:** My visit at ICFO has given me the chance to explore different research projects as well as new ideas for my current research projects at home. I've also been able to begin new collaborations with an energy research group at the Centro Nacional del Hidrogeno (CNH2), also based in Barcelona and a group at IREC (Catalonia Institute of Research in Energy) where I was exposed to the state of the art instruments related to my field. I will share the skills and the knowledge I have acquired with my research group in South Africa and the University at large.

## IN THE FRAME



## New ICFO Group Leader

**Prof. Dmitri K. Efetov**

### Outside ICFO

**Dmitri enjoys outdoor activities mainly road biking, running, skiing, mountaineering or lazy sunbathing at the beach with his wife.**

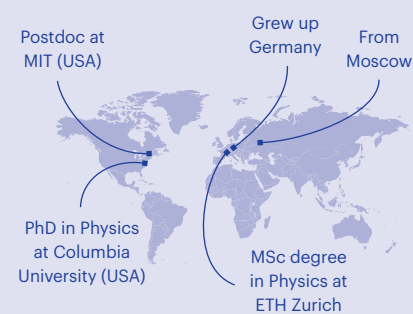
He equally likes playing and watching basketball and soccer, and has hopes to become a strong supporter of FC Barcelona. Dmitri describes himself as a city explorer at heart who is not fussed about sightseeing itinerary but always on the hunt for delicious local cuisine paired with wine.

### Inside ICFO

**His group at ICFO will work on the investigation of novel two-dimensional materials at the intersection of condensed matter physics, optics and quantum science.**

He is interested in using innovative nano-fabrication techniques to create novel designer materials made from vertical stacks of two-dimensional materials such as graphene, hBN, MoS2, NbSe2 and many more, together covering almost every phenomena in solid state physics. The sheer infinite number of combinations of these compounds allows the combination of systems with competing electronic orders. The dramatically restricted phase space and strong electronic interactions enable enhanced quantum effects. The group aims to study these complex electronic states with a combination of electrical, optical and thermal measurements, and to provide new types of quantum systems with which to encode, sense and control quantum information.

**Originally from Moscow, Russia, Dmitri grew up in Germany.** He received a MSc degree in Physics from ETH Zurich (Switzerland), and a PhD in Physics in the group of Prof. Philip Kim at Columbia University (USA) where his research focused on quantum transport phenomena in graphene hetero-structures. During his postdoctoral work at MIT (USA) he explored the fundamental properties of the same class of materials towards their application for quantum information.



## PEOPLE

## BEYOND ICFO

# Careers Outside Academia

ICFO's Alumni Network was launched in order to maintain and strengthen the ICFO community.

This community, including all those who have at one point in their careers called ICFO home, now numbers over 1000, including current ICFOnians and Alumni.

Benefits of the Alumni Network:

#1

Helps all ICFOnians to remain connected personally and professionally

#2

Links Alumni with professional resources (scientific contributions, industrial collaborations, and mentors)

#3

Acts as an avenue for Alumni to continue to contribute to the institute

The "Beyond ICFO- Careers Outside Academia" event was an opportunity for Alumni who have successfully transitioned from their careers in academia to a wide variety of industries and sectors, to give back, offering their perspectives, advice and insights to ICFOnians contemplating career options. The event was organized in coordination with ICFO's Academic Programs office and KTT unit and aimed to provide insights into industry. The Alumni Network invited a diverse group of ICFO Alumni panelists to discuss their career paths with an audience made up of current ICFOnians as well as Alumni. Through two focused panels, they explained how they got from ICFO to their current roles, and then fielded questions from the audience:

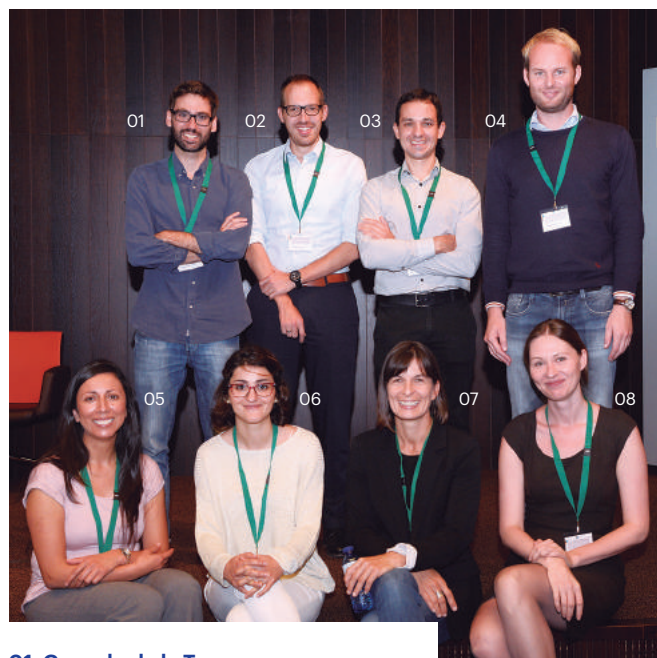
- Panel dedicated to industries in the technology sector
- Panel covering careers in consulting, data analysis and patent management

In addition to the personal perspectives offered by ICFO Alumni, in order to paint as detailed a picture as possible of the realities of life outside academia, Dr. Aleksandra Boskovic, Research Director of the Optics, Surfaces and Integration Technologies division in CORNING Inc. was invited to offer a keynote address for this occasion. In her presentation, she touched on the wide range of industrial research taking place at CORNING, and gave insights into possible career trajectories at CORNING for professionals with competencies like those possessed by researchers at our institute.

The event was successful thanks to the generous contributions of the Alumni panelists and our industrial allies at CORNING. The real-world experience they shared will benefit all members of the ICFO community who will at some point in their career need to be familiar with all of the relevant options that exists for developing careers beyond ICFO.

**monocrom** 

Monocrom sponsored an extended coffee break giving ICFOnians the opportunity to network with panelists.



## 01. Gonzalo de la Torre

Arcvi Business Consultant and Data Scientist

Once he got a glimpse of what the world outside academia looked like, he decided to focus on Data Science. He is now a Business Consultant and Data Scientist at the start-up Arcvi.

## 02. Martin Kuttge

Carl Zeiss Microscopy Product Manager

When he finished his postdoc time at ICFO, he moved back to Germany to work in consulting in the automotive industry. After that, he started working in Carl Zeiss Microscopy, where he is now Product Manager.

## 03. Marc Amendros

Business Manager

Founder of the ICFO spin-off Signadyne, he became the Signadyne Business Manager at Keysight Technologies when this technology giant acquired Signadyne in August 2016.

## 04. Stephan Teichmann

McKinsey & Company Associate

He left the world of academia behind and started working in a completely different area. He found what he was looking for in the consulting firm McKinsey & Company, working as an Associate.

## 05. Natali Martinez

Goodman Senior Test Engineer

After ICFO, she relocated to the US and worked in the oil company Halliburton as Principal Scientist. She has recently moved to Goodman/Daikin where she works as a Senior Test Engineer.

## 06. Naeimeh Behbood

Monocrom Lead Researcher

She is working in Monocrom as the Lead Researcher in the new products from the high power diode laser division.

## 07. Stephanie Cheylan

Grünecker Patent Engineer

She changed her career in applied physics research for the patent law world, and is now working for Grünecker as a Patent Engineer. Her job involves writing and prosecuting patent applications, to protect scientific advancements.

## 08. Anna Kubasiak

Deloitte Manager and Technical Lead

After defending her thesis on quantum physics, she made the transition to data science. Now she is working in Deloitte as Manager and Technical Lead in the Advanced Analytics department.



Dr. Aleksandra Boskovic, Research Director of the Optics, Surfaces and Integration Technologies division in CORNING Inc. was invited to offer a keynote address for this occasion.

GO & FLY

# 140 Women and Men

have successfully defended their theses at ICFO since its founding in 2002.

Together they have helped us measure what we have learned, how far we have come, and how much we have yet to learn. The following ICFO'ians have recently succeeded in defending their PhD theses. Honoring ICFO's tradition, ICFO'ians gather to celebrate your accomplishments 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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July 31, 2017

**Silvana Palacios**  
*Single Domain Spinor Bose-Einstein Condensate.*

**TD: Prof. Dr. Morgan Mitchell**



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September 5, 2017

**Mathieu Massicotte**  
*Ultrafast optoelectronics in 2D materials and their heterostructures.*

**TD: Prof. Dr. Frank Koppens**

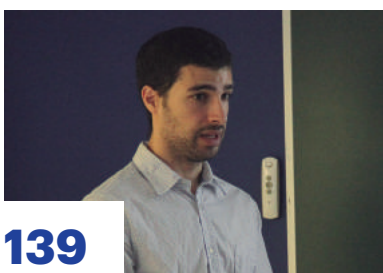


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July 12, 2017

**Matthias Baudisch**  
*High Power, High Intensity Few-Cycle Pulses in the Mid-IR for Strong-Field Experiments.*

**TD: Prof. Dr. Jens Biegert**



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September 7, 2017

**Pau Mestres**  
*Cavity optomechanics with optically trapped particles.*

**TD: Prof. Dr. Romain Quidant**



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July 17, 2017

**Esteban Bermúdez**  
*Hybrid Photonic-Plasmonic Devices with Single Nanoscale Light Sources.*

**TD: Prof. Dr. Romain Quidant**



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September 7, 2017

**Vahagn Mkhitarian**  
*Nanophotonics of Ultrathin Films and 2D Periodic Structures: A Combined Experimental and Theoretical Study.*

**TD: Prof. Dr. Valerio Pruneri and Prof. Dr. Javier García de Abajo**

COMMUNITY PICTURES



## Mystery ICFO'ian

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

ICFO'ians 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 ICFO'ian is! Look for the answer in the next edition of ICFO'ians.

1. He changes his appearance frequently.
2. He actively participates in ICFO outreach activities.
3. He could be a one-man-orchestra given the number of instruments he plays.
4. He successfully merged his love of music with physics.
5. He has thoroughly analyzed the issues faced when building a lightsaber.

# THE LAST WORD

## HIGH PROFILE

## Martin Leahy

**Prof. Martin Leahy holds the Chair of Applied Physics at National University of Ireland Galway, is the Director of the Tissue Optics and Microcirculation Imaging (TOMI) Laboratory, and the Scientific Director of the National Platform for Biophotonics and Imaging (Ireland).**

- Serial entrepreneur, having been technical and/or managerial lead of spin-out companies in biophotonics and energy.
- Distinguished Invited Professor at ICFO (January – August 2017) collaborating with the Medical Optics research group
- **Current research interests:** Tissue optics and microcirculation imaging, biophotonics, photonics, photoacoustics, optical coherence tomography (OCT), blood perfusion, skin, brain, microvascular and vascular imaging, biomedical imaging relating to cancer, diabetes and the eye.
- **Spin-outs:** Oxford Optronix Ltd.; Limerick West Windfarms Ltd.; Millstream Energy; Biomass Heating Solutions Ltd.; Wheelsbridge AB; Compact Imaging Ireland Ltd.

### Can you tell us about your first Tech Transfer experience?

We spun-out Oxford Optronix Ltd. even before defending my PhD. The whole thing was a huge learning experience but to summarize some of my biggest lessons: I learned that one should plan to



*“All ICFOnians are bright and well trained; what will make them successful is being passionate, reliable and getting the job done.”*

get to the next stage with the resources available and make it work. It is much easier to ask for more if you deliver on your previous promise. I learned the hard way that while you need to plan for success, sometimes challenges arise which require an unreasonable will to succeed.

### What keeps you in academia?

I really value the freedom of enquiry in academia, as well as the very bright colleagues, students, and labs equipped to go where no scientist has gone before. I also enjoy the opportunity to communicate my work in talks and conferences and the liberty of giving my discoveries and insights back to society immediately and freely where appropriate. Typically, we suggest something no-one has done before, compete with the best people in the world for the funds, discover something no-one has seen before and publish it before anyone else. Could it be tougher or more fun?

### Who funds applied physics research (and how hard is it to get)?

Since the economic crisis of 2008, in the EU and especially in Ireland, there has been a refocussing of research funding toward areas with potential for economic or clinical impact within five years. I participated in two FP7 projects, one H2020 project and lead one H2020 project with ICFO as leader/partner. Getting the money is hard with only one in twenty succeeding in many of these programmes. Adhering closely to the specification in the call documents is as important as the science.

### Straddling the line between industry and research as you do, what advice do you have for ICFOnians plotting the course of their careers?

I would advise ICFOnians to remain passionate and focus on progressing the things in your responsibility and control. Ignore negativity, conspiracy theories and politics. Do the right thing, even if it seems there is no immediate gain. All ICFOnians are bright and well trained; what will make them successful is being passionate, reliable and getting the job done.

### Any advice for PI colleagues?

I would advise employers (PIs) to value industrial experience, especially that of entrepreneurs. Entrepreneurs are a lot like us, they must find money to develop a product that does not exist, make it work with a tight budget and few resources, they must ensure someone does EVERY part of the project and do themselves what others are unable or unwilling to do. They are judged more harshly than us at the end of the project if it is not a total success, i.e. with product sold or licensed or company acquired. PIs can always publish and document reasons why the science did not work, and of course work within a learning environment that values the training aspect of projects for PhDs and postdocs. On the road to commercial success, a good idea counts for a few percentage points, a working prototype maybe 10%, a fit for purpose product 20% and more than half of the success comes down to marketing, supply chains and sales. The real world is tough.

## Science Quiz

**1. The Nobel Prize for 2017 was awarded “for decisive contributions to the LIGO detector and the observation of gravitational waves.” One laureate, Kip Thorne, advised Christopher Nolan on the movie Interstellar (2014). Which famous director did Thorne work with in 1991?**

- A)** Errol Morris **B)** Luc Besson  
**C)** Kathryn Bigelow

**2. Einstein’s first article on gravitational waves was sent to Physical Review but never published. Why?**

- A)** Einstein realized it was wrong.  
**B)** The referee criticized it.  
**C)** Einstein was offended that PR refereed his article.

**3. How much optical power was circulating in LIGO’s 4-km arms when the first GW observation was made?**

- A)** 1 kW  
**B)** 10 kW  
**C)** 100 kW

\* Find answers on pg. 2

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