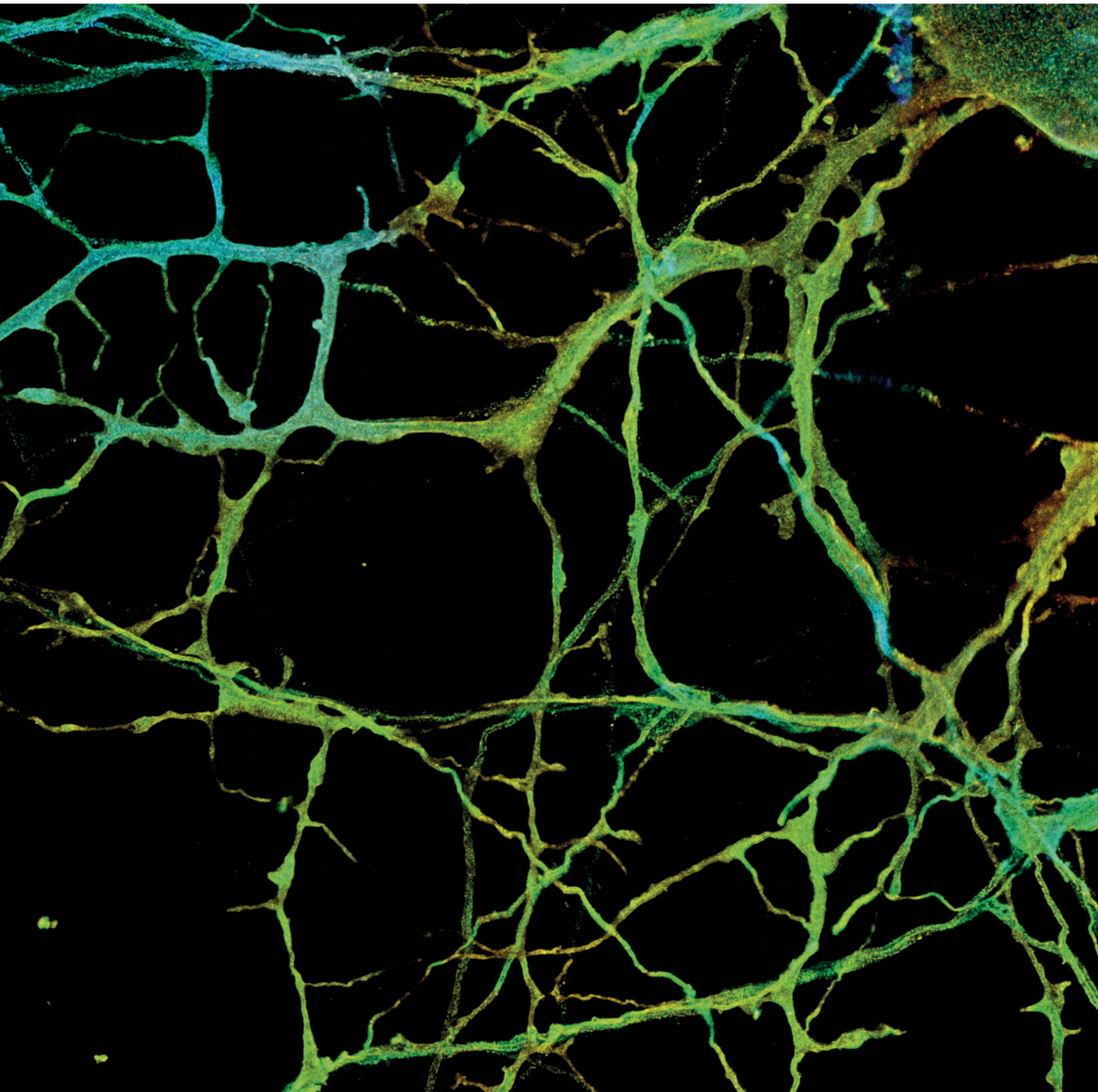


# ICFOnians

Community News from the Institut de Ciències Fotòniques



## EDITOR'S CORNER

### *The Power of Light*

ELISABETH PAIN

*Contributing Editor, ICFOnians*



Light, and the manifestation of its many powers, is all around us. But photonics only emerged as a scientific field with the invention of the laser in the 1960s and the development of optical fibers in the 1970s. Lasers and optical fibers could emit and conduct light in unprecedented ways, opening the door for the generation, transmission, modulation, amplification, and detection of light. Today, at ICFO and in other research centers around the world, photonics examines the creation and manipulation of light to ultimately harness its powers.

Photonics' initial applications were in the area of telecommunications but, nowadays, technical applications include environmental sensors, display technologies, computing, and many other fields. At ICFO, researchers work on all of these fronts. Appearing in this latest issue of *ICFOnians* are Catalan Institute for Research and Advanced Studies (ICREA) Professors Hugues de Riedmatten and Morgan Mitchell, who both won a Starting Grant from the European Research Council recently to push the boundaries of quantum light matter interfaces and of atomic quantum metrology, respectively.

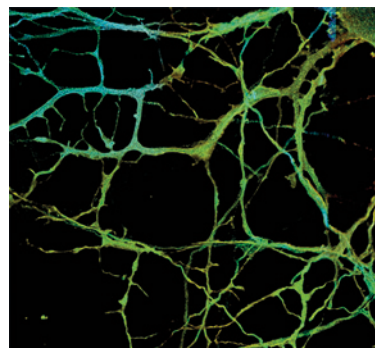
In healthcare, photonics has made possible great advances in non-invasive diagnostics, therapies, and advanced imaging, all of which are being explored at ICFO. An important development highlighted in this Fall issue of the newsletter is the launch of the Nikon Center of Excellence in STORM in Europe. In a special interview with 'ICFOnians', General Manager of Nikon Instruments Europe Peter Drent discusses super-resolution technologies and Nikon's decision to establish the Center of Excellence.

'In the Frame' this issue is ICREA Professor María García-Parajo, who recently joined ICFO to lead the Single Molecule Biophotonics Group with the aim of developing new imaging techniques to study molecules within living cells. But biology is more than another application area for photonics. As César Alonso Ortega, Basic Biology Laboratory Technician at ICFO, explains in *ICFOnians*, biology can also serve as a powerful research tool in photonics.

And, just as the newsletter went to press, ICFO was announced as one of eight Spanish research centers to have been selected by the Spanish Ministry of Science and Innovation for participation in the national Severo Ochoa Centres of Excellence program.

Happy reading!

## COVER



Stochastic Optical Reconstruction Microscopy (STORM) image of the axon and dendrites of a single rat neuron. Color reveals depth so neural connectivity can be traced in three dimensions. The picture spans a region of 40 x 40 x 1 microns with a resolution of 80 nanometers.

## INDEX

### EDITOR'S CORNER

*The Power of Light*

2

### HAPPENINGS

#### ICFO NEWS

*ICFO among the Top*

*SPIE Student Chapter Meeting*

*Nikon Instruments Partners with ICFO*

*ICFO Distinguished Service Appreciation Medal*

*ICFO Ph.D. Graduates*

3

#### ICFO NEWCOMERS

#### RESEARCH HIGHLIGHTS

*Quantum Simulation*

*Optical Oscillators*

*Two ERC Grants for Quantum Research*

#### BUSINESS NEWS

*2011 ICFO-Corporate Liaison Day*

3

4

4

### PEOPLE

#### ICFO-CX 2011 SUMMER FELLOWS

#### IN FOCUS

*César Alonso Ortega*

#### IN THE FRAME

*María García-Parajo*

#### BEYOND ICFO

*Eliot Hijano*

#### CURIOUS FACT

#### COMMUNITY PICTURE

5

6

6

7

7

7

### THE LAST WORD

#### HIGH PROFILE

*Peter Drent*

8

**Coordinating Editor**  
Elisabeth Pain, Freelance

**Editorial Committee**  
Brook Hardwick, Head of Corporate Communication  
Lluís Torner, ICFO Director  
Dolors Mateu, ICFO Manager  
Silvia Carrasco, ICFO Knowledge & Technology Transfer Director  
Laia Miralles i Puig, ICFO Head of Human Resources & Education  
Valerio Pruneri, ICFO Group Leader, Optoelectronics  
Marta García Matos, ICFO Outreach, KTT  
Elisabeth Pain, Coordinating Editor, Freelance

**Reporting & Picture Research**  
Brook Hardwick, Head of Corporate Communication  
Marta García Matos, ICFO Outreach, KTT  
Elisabeth Pain, Coordinating Editor, Freelance  
Sergio Simón, Visual Communication

**Additional Contributors**  
Silvia Carrasco, ICFO KTT Director  
César Alonso Ortega, ICFO Basic Biology Laboratory Technician  
María García-Parajo, ICFO Group leader, Single Molecule Biophotonics  
Eliot Hijano, Masters' student, McGill University in Montreal, Quebec

**Pictures by**  
©ICFO  
Cover: M. Lakadamyali/H. Babcock/M.Bates/X. Zhuang/J. Lichtman  
Source: Spanish Ministry of Science and Innovation  
E. Blanco

**Design & Layout**  
Lluís Campos, Logo designer  
Tòfol Cruz, Design & layout

**ICFO**  
Institut  
de Ciències  
Fotòniques

  
European Regional Development Fund  
European Social Fund

ICFO-The Institute of Photonic Sciences  
Mediterranean Technology Park  
Av. Carl Friedrich Gauss, 3  
08860 Castelldefels | Barcelona | Spain  
Phone: 93 553 4001  
Email: icfonians-newsletter@icfo.es  
Web: www.icfo.es



This newsletter is printed on 100% post-consumer-waste recycled, chlorine-free, and EU eco-labeled paper.



This content is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License. Except pictures that are copyrighted by ICFO.

D.L.: B-54464-2008

ICFO NEWS



ICFO AMONG THE TOP

ICFO has been selected to belong to the national Severo Ochoa Centres of Excellence program. Launched recently by the Spanish Ministry of Science and Innovation, the program aims to identify the best research institutions in the country and boost their research capacity and visibility through dedicated funding for a period of 4 years. In the first edition of the program, eight institutes in all fields of science including ICFO were selected by an international committee, out of a total of 75 applications. (Pictured above: Spanish Minister of Science and Innovation Cristina Garmendia with the directors of the finalist centers, including ICFO).

SPIE STUDENT CHAPTER MEETING

The ICFO Organization and Network of Students (ICONS), represented by Ph.D. student Yannick de Icaza, took part in the 10th SPIE Student Chapter Leadership Workshop, which gathered 200 optics and photonics students from around the world. The meeting was part of the conference held by SPIE, the international society for optics and photonics last August in San Diego, California. ICONS presented its main activities as a student chapter during a poster session, took part in training courses in team working and management skills, discussed the photonics job market and other topics during round tables, and participated in 'speed networking' sessions. The SPIE conference also featured the Optics Outreach Olympics 2011, in which ICONS presented one of its outreach activities on the role of optical fibers in information and communication.

NIKON INSTRUMENTS PARTNERS WITH ICFO

As part of a new partnership with Nikon Instruments Europe, the Nikon Center of Excellence in STORM in Europe recently opened its doors at ICFO. The agreement was sealed during the Light for Health Event held last spring. The partnership will give scientists at ICFO and external researchers access to groundbreaking Nikon super-resolution microscopy systems. The N-STORM equipment, which relies on stochastic optical reconstruction microscopy (STORM) technology, was developed by Nikon through a licensing agreement with Harvard University in Massachusetts. "The Center of Excellence in STORM," said ICFO Director Lluís Torner, "will make a key contribution to our program [Light for Health], which aims at the development of unique techniques for advanced imaging and probing, early diagnosis, and new therapies in healthcare." General Manager of Nikon Instruments Europe Peter Drent (see Q&A on page 8), added that Nikon's decision to join forces with the Super-resolution Light Microscopy & Nanoscopy (SLN) Facility at ICFO is "a natural progression."

ICFO DISTINGUISHED SERVICE APPRECIATION MEDAL

Professor Marion J. Soileau, currently Vice-President of Research and Commercialization at the University of Central Florida in the United States, has become the first recipient of ICFO's Distinguished Service Appreciation Medal. Professor Soileau has served on ICFO's Scientific Advisory Board since 2000, when he got onboard to help in the planning of the Institute. Professor Soileau has offered his continuous support ever since, with guidance in the areas of institutional organization and technology transfer in particular. The award will be presented during ICFO's 10th anniversary, to be celebrated next spring.

ICFO PH.D. GRADUATES

Sibylle Braungardt graduated on July 12 with a thesis on complex quantum systems co-supervised by former ICFO postdoctoral researcher Mirta Rodríguez Pinilla and Group Leader and Catalan Institute for Research and Advanced Studies (ICREA) Professor at ICFO Maciej Lewenstein. Ana Qubasiak graduated on October 3 with a thesis on ultracold gases in non-Abelian synthetic gauge fields. Her thesis was co-supervised by Maciej Lewenstein, Professor Jakub Zakrzewski of Jagiellonian University in Krakow, Poland, and ICFO postdoctoral researcher Pietro Massignan.

ICFO NEWCOMERS



**Ester Tarragó Gracia**  
Event Manager



**Gerard Colomer Vinyals**  
Project Management Support



**Mercedes Rivas Jiménez**  
Laboratory Technician



**María García Parajo**  
Group Leader



**Matthias Baudisch**  
Ph.D. Student



**Juan Andrés Torreño Piña**  
Ph.D. Student



**Thomas van Zanten**  
Ph.D. Student



**Luis José Salazar**  
Ph.D. Student



**Dominik Kufer**  
Ph.D. Student



**Nicolò Accanto**  
Ph.D. Student



**Francesco Pastorelli**  
Ph.D. Student



**Jordi Tura Brugués**  
Ph.D. Student



**Silvana Palacios**  
Ph.D. Student



**Gaëtan Calbris**  
Postdoctoral Researcher



**Myriam Aguirre**  
Research Fellow



**Silke Diedenhofen**  
Postdoctoral Researcher



**Diana Camila Urbaneck**  
Research Fellow



**Graciana Puentes**  
Research Fellow



**Gerward Weppelman**  
Postgraduate Student



**Patrick Ledingham**  
Research Engineer



**Jordi Andilla Salla**  
Research Engineer



**Robert Simpson**  
Research Fellow



**Elif Demiryas**  
Undergraduate Student



**Charles-André Couture**  
Undergraduate Student



**Michal Maik**  
Visiting Scientist

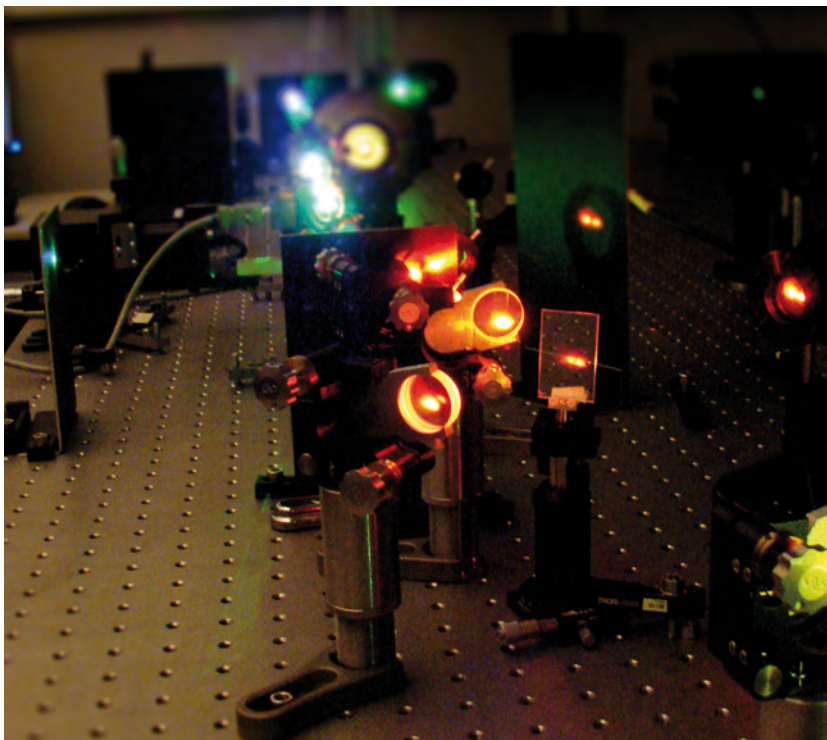


**Anna Oddone**  
Research Fellow

Many of us joined ICFO or took a new position at the Institute between June and September this year.



## LATEST ADVANCES



## QUANTUM SIMULATION

In collaboration with researchers at the Institute of Laser Physics in Hamburg, ICFO Group Leader and ICREA Professor Maciej Lewenstein and former ICFOian André Eckardt proposed a novel quantum simulation approach that would perform as a flexible experimental system for the study of classical magnetism. Classical magnetism has a well-established theoretical foundation, but due to practical difficulties it lacks an adequate experimental system. The researchers successfully harnessed the power of quantum systems to simulate the behavior of matter in a large variety of magnetic phases by using the motional degrees of freedom of atoms trapped in a triangular optical lattice. The finding may help put to rest ongoing debate about still poorly understood magnetic phases like spin-liquids, the authors say. The paper, 'Quantum Simulation of Frustrated Classical Magnetism in Triangular Optical Lattices', appeared in *Science Express* in July.

## OPTICAL OSCILLATORS

Optical oscillators play a vital role in photonics. The June 2011 issue of *Nature Photonics* highlights a new method for in-situ absolute optimization of output power from optical oscillators, which was developed by the group of ICREA Professor Majid Ebrahim-Zadeh at ICFO. The contribution solves a major problem that has been around since the laser invention in 1960. The proposed method works for a wide range of colors and under any operating conditions. It has no detrimental effect on the output characteristics of the oscillator, be it spatial, temporal or spectral. The research paper, which builds upon previous work from Adolfo Esteban-Martin and colleagues, was published in the January 2011 issue of *Optics Letters* by ICFO Ph.D. student Chaitanya Kumar Suddapalli, research fellow Adolfo Esteban-Martin, and ICREA Professor Majid Ebrahim-Zadeh.

## TWO ERC GRANTS FOR QUANTUM RESEARCH

Two Starting Grants from the European Research Council (ERC) were awarded to ICFO this term. ICREA Professor Hugues de Riedmatten, who leads the Quantum Photonics with Solids and Atoms Group, received an ERC Grant to pursue research on ensemble-based advanced quantum light-matter interfaces. The goal of the project is to develop a new generation of photonic quantum memories with enhanced storage properties and embedded quantum processing capabilities. The memories will also serve to explore new routes in the quantum control of matter-matter entanglement. ICREA Professor Morgan Mitchell, who leads the Quantum Information with Cold Atoms and Non-Classical Light Group, was awarded a Grant for a project in atomic quantum metrology. Metrology is a field that deals with the science of measurement. Currently the most sensitive instruments for measuring time, gravity, and magnetic fields are atomic clocks, atomic gravimeters, and atomic magnetometers. One way to further improve the sensitivity of such instruments is to use quantum optical effects for the detection of minute signals otherwise buried in quantum mechanical noise.

## BUSINESS NEWS by Silvia Carrasco

## 2011 ICFO-Corporate Liaison Day

ICFO celebrated its 2011 Corporate Liaison Day on Friday 14 October. The ICFO-Corporate Liaison Day is a one-day program of networking events open to ICFO industrial partners and other collaborators.

The theme of the 2011 ICFO-Corporate Liaison Day was 'Light for Sensing'. In a morning series of talks, Professor at the University of Nijmegen in The Netherlands Frans J. M. Harren discussed light-based gas sensing in agriculture. ICREA Professor and Group Leader at ICFO Romain Quidant reviewed the field of lab-on-a-chip diagnostics. Alexis Méndez, President of MCH Engineering LLC in Alameda, California then gave an overview of the applications of optical fiber sensors. Finally, Anton Zavriyev, leader of MagiQ's R+D Team in Boston, Massachusetts discussed quantum key distribution technology for seismic sensing.

The program also featured ICFO's Ph.D. Student Thesis Award Ceremony, the Annual Student Poster Session, and a tour of the research labs. Meetings for ongoing collaborative research projects were also held in the afternoon on areas including photonic sensors for the food industry, head up displays technology, advanced imaging, quantum secure communications, and novel sensors.

Now in its third year, the 2011 ICFO-Corporate Liaison Day gathered around 125 people, including industry representatives from more than 20 companies. To date, ICFO has more than 30 members in its CLP Program. The ICFO CLP Program is dedicated to generating shared knowledge, mutual trust, and common benefits with corporations of all kinds.



Top: The 2011 ICFO-CLP Day program gave ICFOians and ICFO industrial partners an overview of where the field of light for sensing is heading.

Bottom: ICFO Ph.D. students and postdocs presented their work in the Annual Student Poster Session. An Award for the Best Poster went to Dhriti Ghosh for his work on 'Avoiding Indium in Optoelectronics'.

**YOUNG TALENT**

# ICFO-CX 2011 Summer Fellows

For the fifth year running, ICFO welcomed undergraduate students in its research labs as part of the ICFO-CX Summer Fellows Program.

Organized by ICFO and sponsored by CatalunyaCaixa Obra Social, the ICFO-CX Summer Fellows Program gives undergraduate students the opportunity to perform photonics research at ICFO over the summer. Summer Fellows are given an individual research project to work on for 12 weeks, under the mentorship of an ICFO researcher.

This year, 14 Summer Fellows came to ICFO from universities in Catalonia, the Community of Madrid, and the Basque Country in Spain as well as Poland and Iceland. Aged between 21 and 27, the Summer Fellows tackled research project in fields as diverse as

nanophotonics, nonlinear optics, quantum optics, and biophotonics.

Alongside their research activities, Fellows were also encouraged to take part in a training program for further professional and personal development. Fellows attended lectures from distinguished guest speakers, group leaders, and postdoctoral researchers to learn more about the science going on in the various research programs at ICFO. Fellows also took part in a range of team building activities aimed at facilitating their integration within the ICFO community and helping them hone their networking skills.



Right, at the top: To celebrate the launch of the fifth edition of the ICFO-CX Summer Fellows Program, CatalunyaCaixa invited all Summer Fellows to one of its 'Nits d'Estiu' summer concerts at Gaudi's La Pedrera building.



Right, at the bottom: Summer Fellows sampled the vast range of ongoing research projects at ICFO during lab tours.

## CX CatalunyaCaixa Obra Social

The ICFO-CX Summer Fellows tell us what made their experience at ICFO unique and valuable:



**Pau Farrera Soler**  
 • Aged 21, from Spain  
 • Physics Student, University of Barcelona  
 • ICFO Group: Optoelectronics

*"I have seen applications of quantum physics that I had no idea existed. It has been a priceless experience."*



**Alexandra Palacio Morales**  
 • Aged 24, from Spain  
 • Physics Student, Autonomous University of Madrid  
 • ICFO Group: Molecular Nanophotonics

*"An area that I am interested in researching further is mixed with optics. ICFO may be a great place for me to return to as a postdoc."*



**Adam Vallés Mari**  
 • Aged 26, from Spain  
 • Telecommunications Engineering Student, Universitat Politècnica de Catalunya, Barcelona Tech. (UPC)  
 • ICFO Group: Quantum Engineering of Light

*"When you come to ICFO you see you are in another galaxy and you think -- WOW -- can I manage all of this?"*



**Maria del Casteller García García**  
 • Aged 23, from Spain  
 • Physics Student, Autonomous University of Madrid  
 • ICFO Group: Optical Tweezers

*"It's very exciting because I am doing things that have never been done before -- that's incredibly motivating."*



**Ane Etxebeste Barrera**  
 • Aged 23, from Spain  
 • Physics Student, University of the Basque Country  
 • ICFO Group: Medical Optics

*"I have learned a lot about what research is about -- it's very different from just studying and passing exams."*



**Núria Codina Castillo**  
 • Aged 23, from Spain  
 • Chemical Engineering Student, University of Barcelona and Technical University of Catalonia  
 • ICFO Group: Ultrafast Imaging and Nonlinear Microscopy

*"In my biochemical engineering Masters, I was introduced to photonics as an important tool -- this program helped me learn a lot more about the research."*



**Bárbara Buades Sabater**  
 • Aged 23, from Spain  
 • Physics Student, University of Barcelona  
 • ICFO Group: Attoscience and Ultrafast Optics

*"I was unsure that I had what it takes to pursue a Ph.D. -- but now I am convinced that I should not be afraid to try."*



**Juan Carlos Ateca Cabarga**  
 • Aged 27, from Spain  
 • Telecommunications Engineering Student, Technical University of Madrid  
 • ICFO Group: Advance Fluorescence Imaging and Biophysics

*"I really wanted to get to know the research field and also to do something useful for my group."*



**Bernat Guillén Pegueroles**  
 • Aged 23, from Spain  
 • Mathematics and Telecommunications Engineering Student, UPC, Barcelona Tech.  
 • ICFO Group: Quantum Information Theory

*"The high point for me was when what I was working on suddenly worked -- even though a few days later I discovered another problem."*



**Pau Gómez Kabelka**  
 • Aged 23, from Spain  
 • Physics Student, Autonomous University of Barcelona  
 • ICFO Group: Quantum Information with Cold Atoms and Non-Classical Light

*"Meeting with [Nobel Prize Winner] Roy Glauber in my first week here was really motivating."*



**Joanna Zielinska**  
 • Aged 21, from Poland  
 • Physics Student, University of Warsaw  
 • ICFO Group: Quantum Information with Cold Atoms and Non-Classical Light

*"Everything is going really well -- except that the theory and the experiment don't agree!"*



**Marcel·li Grimau Puigibert**  
 • Aged 25, from Spain  
 • Physics Student, University of Barcelona  
 • ICFO Group: Quantum Photonics with Solids and Atoms

*"I have learned how to be and how to work in a lab and this has helped me to know that this is my field."*



**Einar Búi Magnússon**  
 • Aged 25, from Iceland  
 • Physics Student, University of Iceland  
 • ICFO Group: Nano-optoelectronics

*"I feel like I am doing experiments that are contributing to the group -- I will definitely continue this work after the SummerFellows program is over."*



**Hernán Pino Quintana**  
 • Aged 23, from Spain  
 • Physics Student, Autonomous University of Barcelona  
 • ICFO Group: Quantum Optics Theory

*"The thing we all have in common is motivation -- you can tell we are all here because we really enjoy research and everyone is giving this their all."*

## IN FOCUS by César Alonso Ortega


**César Alonso Ortega:**  
*“Not only did I find room for a biologist at ICFO, but I was also able to flourish here professionally.”*



I got interested in biology as a kid while discovering nature during our family summer holidays in my dad's village. The magazine *Muy Interesante* and the biology-related books my godfather gave me for my birthdays did the rest. I went on to study biology at the Autonomous University of Barcelona, specializing in microbiology.

After graduating, in 2004, I moved to London, where I combined language studies with waiting and retail jobs for two years. But, at roughly the same time an opportunity for a traineeship in the Microbiology Department of the Royal London Hospital came up, my dad was diagnosed with cancer, so I returned home to be close to my family. Fortunately, my dad recovered, and my experience abroad

gave me sufficient confidence to take on adult life.

Back in Barcelona, I first took a job as a guide in the city zoo. Then I joined Damm, the well-known Spanish brewery, developing yeast strains to improve beer quality and controlling the production process for potential microorganism contamination. I also worked for the city council, developing a computer program for a tree inventory that nowadays helps manage Barcelona's green areas.

In April 2008, I took a part-time position in Pablo Loza-Alvarez's Ultrafast Imaging and Nonlinear Microscopy group. I took over the culture of more than 60 strains of the worm *C. elegans*, for which I developed a database, and

the preparation of samples for the group. The job was challenging, partly because the group had deposited their trust in me, with the quality of their research directly depending on my work.

In 2010, I became a full-time ICFO'ian, adding to my tasks the management of ICFO's Biolab. I am in charge of buying the lab consumables, purchasing and maintaining the equipment, developing the working procedures, making the lab policy and safety procedures known, and training new users. However, one aspect of my job I really enjoy is being involved in cutting-edge research. Last year, I co-authored a paper in Pablo's group studying worm embryogenesis, and this year I participated in preliminary tests for the group to develop a novel worm experimentation technique using laser.

More recently, I also started working with Light for Health Program Manager Susana Santos and the Prevention Department to develop regulations for the use of biological agents. Last July, I received a degree in laboratory animal husbandry to help the institute gear up for animal research.

Admittedly, I had never imagined that a physics research institute could be a place for me. Not only did I find room for a biologist at ICFO, but I was also able to flourish here professionally, in a symbiotic relationship where I am eager to help the field of biology grow always further.


*\*César Alonso Ortega holds the position of Basic Biology Laboratory Technician at ICFO.*

## IN THE FRAME by María García-Parajo

I can trace the origin of my research career back to when I was a child growing up in Venezuela. On the way to Caracas, I used to spot a little road going up the mountains to the Venezuelan Centre for Fundamental Research. Intrigued, I got my Dad to take me to the Centre, and I found it so fascinating that I decided this would be the place I would work as a grownup! I joined the Centre as a research engineer right after finishing my undergraduate studies at the University Simón Bolívar in Caracas. But I quickly realized that I needed to learn some more physics.

In 1988, I left Venezuela to do a Master's degree in semiconductor science and technology at Imperial College London in the United Kingdom. I stayed on for a Ph.D., developing a natural lithography technique for the fabrication of semiconductor quantum structures and measuring quantum confinement effects using photoluminescence spectroscopy. In 1993, I moved to France for a two-year postdoc at the former CNRS Laboratory of Microstructures and Microelectronics in Bagneux, where I developed a technique called near-field optical microscopy (NSOM) to study individual quantum structures. Interested in developing applications, I joined Niek van Hulst's former group in Twente, in The Netherlands (where Niek was based before he joined ICFO), working there for nearly 10 years.

Through a beautiful collaboration with an immunologist in Nijmegen, I became increasingly fascinated by the complexity of living systems. So I took a group leader position at the Institute for Bioengineering of Catalonia in Barcelona (IBEC) to focus on the development of single molecule imaging techniques, including NSOM, for investigating biological processes. How individual


**María García-Parajo:**  
*“I would like to also contribute to securing ICFO's leadership in the field while training a new generation of researchers.”*



molecules organize and 'talk to each other' through time and space is important in both health and disease, and we have been developing optical techniques to study these spatiotemporal landscapes within living cells.

At ICFO, which I joined last July, my group's research will exploit nanophotonic concepts for the study of individual molecules within living cells. We will for example use photonic antennas to increase the current spatial and temporal resolution of NSOM. We also aim to bring biophysical insight into fundamental biological questions with health implications, by developing tools to exert mechanical forces on cells and emulate physiological shear-stress and by using single molecule fluorescence techniques to track the resulting re-modeling of the cell membrane.

It is all extremely exciting but also challenging, and currently we are looking for Ph.D. students and postdoc researchers to join our group, preferably biophysicists and/or experimental physicists with an optics background and a clear affinity for biology.

I see ICFO as an excellent environment for us to continue developing cutting-edge photonic techniques and demonstrating their unique advantages in biological fields. Together with the other recently-established biophotonics groups, I would like to contribute to securing ICFO's leadership in the field while also training a new generation of researchers able and excited to work at the interface of physics and biology.

*\*María García-Parajo is ICREA Professor and leader of the Single Molecule Biophotonics Group at ICFO.*

## BEYOND ICFO By Eliot Hijano

I have liked physics since high school so I enrolled in a physics degree at university. During my second year I decided to look for a place to start learning something about research. At that time, I was mainly studying quantum mechanics and atomic physics, so I looked for projects related to these subjects.

I found ICFO on the Internet and noticed that there were some summer fellowships available, so I applied. It is very difficult to get a fellowship to do research when you are an undergraduate, so as soon as ICFO gave me the opportunity to come, I said yes!

My research at ICFO consisted in using a 2D simulation of a hydrogen molecule to see if the geometry of the molecule was somehow related to the polarization spectrum of the X-ray it emits in the process of high harmonic generation. I worked under the supervision of both Dr Carles Serrat and ICREA Professor Jens Biegert.

I very much enjoyed my fellowship at ICFO, not only because of the research but also because of the many people I met, the various labs I visited, and all the talks I attended. I also had the chance to learn a lot about programming in Matlab and Fortran, which proved really useful in later projects.

The most rewarding moment for me was when I found out that my results at ICFO were going to be published in an international, peer-reviewed journal. There is nothing better than feeling useful, and it is always nice when things work out.

ICFO was the place where I learned what research was all about. To be honest, I was not sure if I wanted to work on a Ph.D. before going to ICFO. But I liked it so much that I finally decided to pursue a career in research.

*\*Eliot Hijano is a Masters' student at McGill University in Montreal, Québec.*



### ELIOT HIJANO'S CV

- Born in August 1989
- 2007: High school diploma
- Summer 2009: Summer Fellowship at ICFO
- Winter 2009: Internship at the Software Engineering Department of UNED
- 2010: Physics degree from UNED (with an 'End of Degree' award)
- Summer 2010: Summer Fellowship at the Canarian Institute of Astrophysics
- Winter 2010: Internship at ICFO
- Present: Masters' degree in theoretical physics (quantum gravity) at McGill University in Montreal, Québec
- After 2012: Graduate studies, possibly using his 'La Caixa' scholarship to study in the United States

## CURIOUS FACT

### *The Legend of Archimedes' 'Heat Ray'*

One of the greatest mathematicians, physicists, and inventors of all times, Archimedes is believed to have designed all kinds of machines in order to defend his home town of Syracuse against the Roman siege, back in circa 214-212 BC. Legend has it that one of the devices Archimedes designed to repel the enemy was a set of mirrors disposed in such a way that they functioned as a parabolic reflector of sunlight, burning Roman ships as they approached the city. The credibility of Archimedes' 'heat ray' has been subject of scientific debate for centuries, with tests of Archimedes' idea demonstrating partly, but not fully, its feasibility. While the focused light may not have been sufficiently strong to set the ships on fire, many believed it could nonetheless have worked as a weapon, blinding or scaring away the ship crews. The Romans eventually won the battle, and Archimedes got killed while the city was being taken over.



## COMMUNITY PICTURE



In early October, ICFOnians headed to L'Estartit in Girona-Costa Brava for a weekend excursion packed with outdoors activities, including a bicycle tour, kayaking, snorkeling at the natural marine reserve Medes Islands, and a paint fight!

## HIGH PROFILE



**Peter Drent:**

*“If you go from academia to a commercial company, it’s like closing a door, but this is a glass door.”*



Peter Drent is General Manager of Nikon Instruments Europe in Amstelveen in The Netherlands. Nikon, which recently started commercializing super-resolution microscopes based on the STORM technology, last May opened the Nikon Center of Excellence in STORM in Europe at ICFO.

**What is special about the STORM technology?**

In top research, our customers always want to push the limits of science. There is a group of people that want to understand smaller details better. STORM has the disadvantage of not being fast but the advantage of having much more resolution. With STORM we can go a factor 10 higher in resolution than standard microscopy, so from 200 nanometers to 20 nanometers.

**What prompted Nikon Instruments Europe to partner with ICFO?**

Our working relationship with ICFO started about two years ago in multi-photon microscopy. Melike Lakadamyali worked at the birthplace of the STORM technology in Harvard and so she was one of the first persons using this technology. She came to ICFO at the same time that we were really introducing the STORM technology in Europe and we needed a partner to develop the understanding of the technology. Now with the Nikon Center of Excellence in STORM in Europe [located at ICFO], all people who have questions can go to that one place. We organize demonstrations, workshops, and training sessions there.

**What do you see as the most exciting applications of the STORM technology?**

Melike has shown that if you look at the network of axon connections with a confocal microscope, you see a certain connection pattern. But if you look at the same connection pattern with the STORM microscope, you see a lot more detail appearing, so it opens up new information. But the STORM technology also has its limitations as it cannot see deeper in the tissue, so now we are working with Melike on the combination of confocal imaging and STORM imaging. Another challenge is to bring the STORM resolution to the living cell, and this is also work being done by Melike and other collaborators at ICFO.

**Could you tell us about your background and career progression at Nikon?**

I studied biology at the University of Utrecht in the Netherlands, and after that I did some scientific jobs as a researcher at the University of Antwerp in Belgium and at a Dutch agricultural research institute in Wageningen. My work was related to cell-cell communication and I was using microscopy a lot. My Nikon salesperson one day told me, ‘Peter, Nikon has a job opening and I think this job is

really for you.’ I actually refused the opportunity. About half a year later, she came back to me, and that time, I took on the challenge because meanwhile the idea had been rolling around in my head. I joined Nikon as a product specialist. In 1993 we introduced our first confocal microscope and I was involved in the sales and marketing. Then I entered the world of product managers, and after that I became general manager, thus leading the sales and marketing and product support team.

**What advice would you give to young scientists interested in business management?**

Keeping your passion is very important, because in industry, just like in academia, we need young people with special ideas for change. To be successful in a company you also need to evolve with your products. And then, in a commercial role, your activities are measured per month, per quarter, and per year, because you are part of the performance of the total company. For some people this is frightening, for others it’s an exciting challenge! Also never forget that, if you go from academia to a commercial company, it is like closing a door, but this is a glass door. You always can look back.

## SUDOKU by [www.sudoku-puzzles.com](http://www.sudoku-puzzles.com)

EASY

3	6			4			9
			7	5		8	
1	8	5	9			4	
		2		1	7		6
6			7		3		5
4		3		6		9	
	5			7	3	9	2
	2		3	5			
9			8			7	4

MEDIUM

	5			6		4	
				1		7	8
				7	2	3	5
1	7			5		4	
				3			
	8		4			5	7
2		7	6	4			
3	6			9			
		9		5		1	

DIFFICULT

1	9					5	3
	6			7		8	
		8	4		3	7	
			3	1			
4							8
			2	4			
		3	6		5	1	
	2			4		3	
9	4					2	6

VERY DIFFICULT

			8	6	4		
5			9		2		1
		7				6	
6		9			1		5
	7						6
4		5			8		3
		2			5		
9			2		3		4
			5	9	1		

*Want to subscribe?  
Have you got news to share?*

Whether you’d like to subscribe to **ICFOnians**, change your email address, or have some comments and ideas for future content. We’d love to hear from you!

To register for subscription and read back issues of **ICFOnians**, please visit the ICFO Website [www.icfo.es](http://www.icfo.es).

To get in touch, please send us an email to: [icfonians-newsletter@icfo.es](mailto:icfonians-newsletter@icfo.es) indicating your name, email address, and institution.

Follow us on:



[www.twitter.com/ICFOnians](http://www.twitter.com/ICFOnians)  
[www.facebook.com/ICFOnians](http://www.facebook.com/ICFOnians)