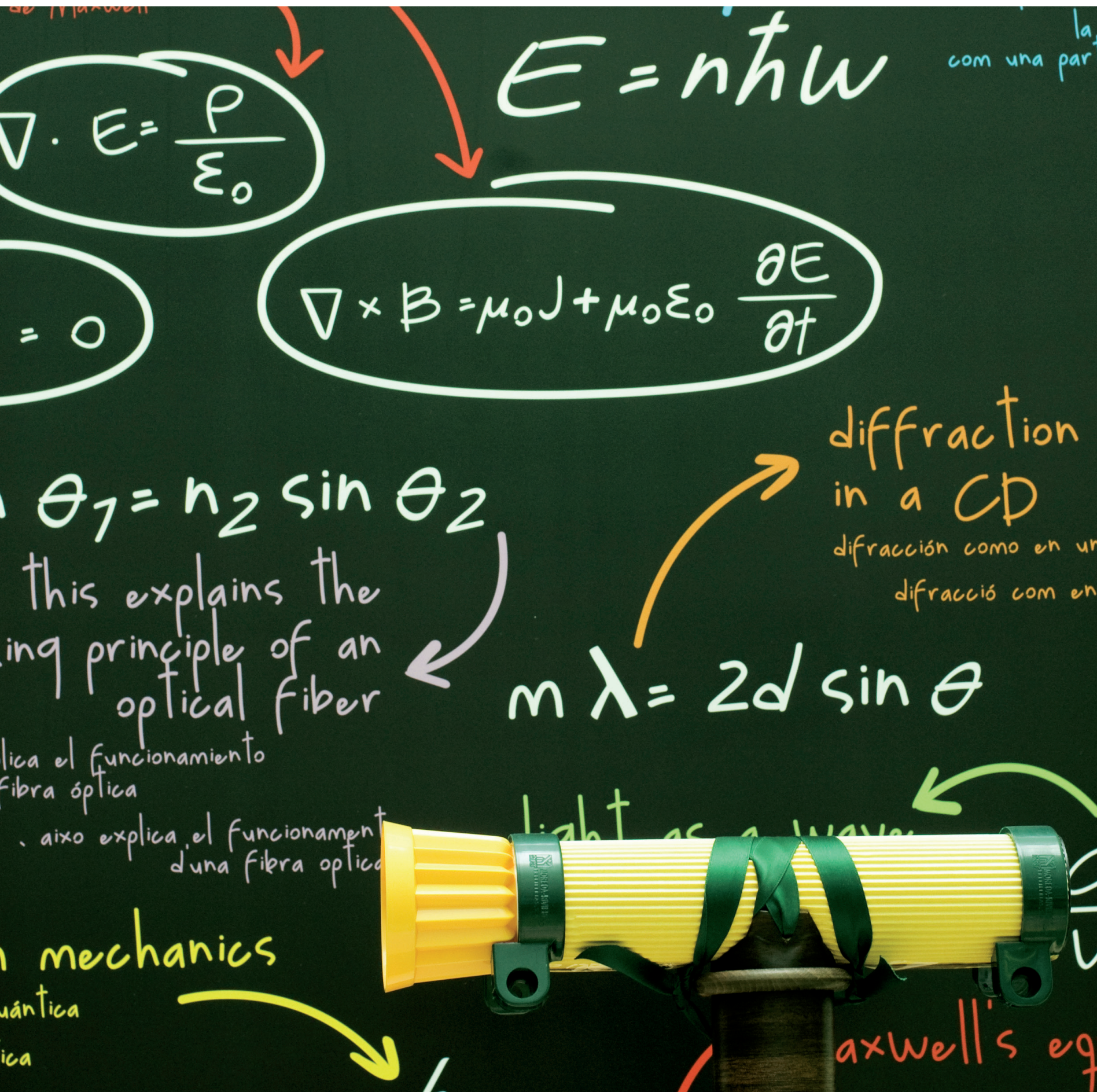


ICFOnians

Community News from the Institut de Ciències Fotòniques



EDITOR'S CORNER

Welcome to 2012 - ICFO's 10th Anniversary



BROOK HARDWICK
Coordinating Editor



Looking back to the very beginning in 2002, ICFO was “A Big Plan”, as Montse Vinyes remembers in her interview “In Focus”. There were high expectations as to the potential of photonics and the capacity for this team of scientists and managers, soon to be known as ICFOonians, to make a mark in the world of frontier research. Fast forward to 2012, we have published more than 1000 papers in leading topical journals. We will soon have access to a new state-of-the-art building giving us a total of 14,000 square meters in a purpose built facility, supporting a team of more than 200 researchers plus Administration and Support professionals. We are all working together towards the goal of advancing the frontiers of the science of light and exceeding the expectations of many of our enthusiastic supporters.

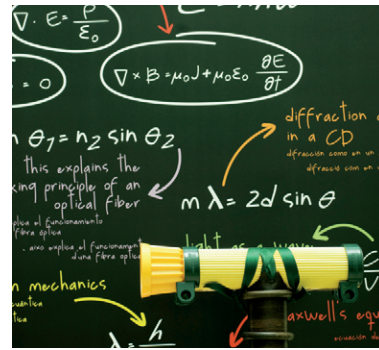
With more hard work and relentless enthusiasm, the future promises more dividends in terms of collaborations, innovations, discoveries, knowledge transfers and other achievements. In this issue of ICFOonians, we follow recent happenings in all of these areas. Four PhD students have successfully defended theses on advances in Nonlinear Optics, Optical Antennas, Near-Field Nanoscopy, and Optical Parametric Oscillators. In “Beyond ICFO”, we follow 2011 PhD Thesis Award winner Nicolas Piro in his new postdoc role which draws on the foundations laid during his PhD. We celebrate with both Professors Maciej Lewenstein and Frank Koppens as they were granted important awards in recognition for advances in their respective areas.

ICFOonians are working as part of a larger community effort to expand the impact of Photonics in industry, health, communication and many other areas affecting society. Partnerships and collaborations happen on many different levels. The Nanophotonics for Energy Efficiency Network of Excellence brings together centers across Europe to find solutions for common problems related to energy usage and climate change. SLN@BCN, an alliance between ICFO and the Centre for Genomic Regulation (CRG) gains recognition within the Euro-BioImaging research infrastructure project. Prof. Romain Quidant is using his ERC Proof-of-Concept Study to work towards marketable innovations. Fortunately, entities such as CatalunyaCaixa-Obra Social, headed by Marta Lacambra, lend their support to the important task of preparing the next generation of young scientists to keep up the important work that has only just begun!

We hope that 2012 and the 10th anniversary that we will celebrate throughout this year will give us all the opportunity to reflect on how far we have come as well as the journey that we have ahead.

Happy new year, happy anniversary and happy reading!

COVER



Think of Outreach at ICFO as a museum dedicated to light that showcases concepts and applications of research carried out by ICFOonians for all audiences. The ICFOseum is now officially open for visitors!

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ICFO NEWS



ICFOSEUM OPEN TO EVERYONE

ICFOseum –our colorful museum dedicated to light– is now officially open. Three rooms located on the bottom floor of the building display information on several light-based applications, show the science of photonics with a variety of hands-on experiments and games, and exhibit ICFO’s industrial prototypes. An experimental lab and a series of panels throughout the corridors of the center complete this project to give visitors with varying levels of scientific understanding insights into the nature and applications of photonics – as well as ICFO’s role in making Light work! ICFOseum is sponsored by FECYT, CatalunyaCaixa-Obra Social and Fundació Privada Cellex Barcelona. It is the result of the work of ICFO’s KTT team together with ICONS-ICFO’s student chapter and several ICFOnians.

INTERNATIONAL RECOGNITION

SLN@BCN, the Super-resolution Light Nanoscopy Alliance established by ICFO and the Center of Genomic Regulation in Barcelona is one of the four super-resolution sites selected as a proof-of-concept within the Euro-BioImaging research infrastructure project. The objective is to provide access for scientists to conduct bio-related research projects using cutting edge imaging instruments. Euro-BioImaging is set to become an engine to drive European innovation in imaging research and technologies. The project is part of the European Strategy Forum on Research Infrastructures roadmap.

TEAMING UP WITH HIGH-SCHOOL TEACHERS

ICFO contributed along with six other research centers in Catalonia to a new program of CaixaCatalunya-Obra Social for the training and specialization of teachers in different areas of science. Twelve high-school teachers participated in a day-long session with a special focus on lasers and their role in health and communications. Each attendant received a kit for in-class experimental demonstrations. This initiative is part ICFO’s Life Long Learning program, providing training to teachers and professionals. The course was imparted by Ph.D. Student Mario Napolitano and Dr. Alejandra Valencia from the Outreach team in the KTT Unit.

AWARDS AND PRIZES

ICREA Prof. Maciej Lewenstein, leader at ICFO of the Quantum Optics group, was awarded the 2011 Foundation for Polish Science (FNP) Prize in exact sciences for his achievements in the area of quantum optics and the physics of ultracold gases. The FNP prizes –informally called the “Polish Nobel Prizes”– are the most important scientific distinction in Poland. The awards have been given annually in 4 categories since 1992: social sciences and humanities, exact sciences, life sciences and technical sciences.

Prof. Frank Koppens, Nest Fellow and leader of the Nano-Optoelectronics group, was awarded by The Christiaan Huygensprijs Foundation with the Science Award 2011 for theoretical and applied physics. Established in 1998, the award is presented annually to a researcher whose doctoral dissertation has made an innovative contribution to a specified discipline –this year considered information and communication technology, physics, space studies, economics, and actuarial studies.

ICFO NEWCOMERS



Mercedes Santacana Puig
Admin Assistant



Cristian Vilar Giménez
Electronics Technician



Darrick Chang
Group Leader



Daniel Rieländer
Ph.D. Student



David So
Ph.D. Student



Elsa Passaro
Ph.D. Student



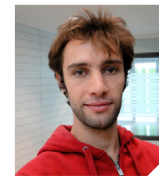
Miquel Rudé
Ph.D. Student



Olivier Tieleman
Ph.D. Student



Tieh-Ming Chang
Ph.D. Student



Emanuele Distante
Ph.D. Student



Biagio Mandracchia
Ph.D. Student



Anshuman Singh
Ph.D. Student



Christine Muschik
Postdoctoral Researcher



Marko Spasenovic
Postdoctoral Researcher



Simon Moulieras
Postdoctoral Researcher



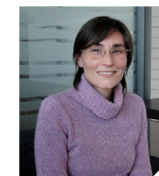
Johann Berthelot
Postdoctoral Researcher



Michele Dall'Arno
Postdoctoral Researcher



Agustín Mihi
Research Fellow



Iliaria Mannelli
Research Fellow



Domenico Demasi
Undergraduate Student



Tomeu Coll Mulet
Postgraduate Student



Waiz Karim
Postgraduate Student



Gabriele Navickaite
Postgraduate Student



Pau Mestres Junque
Postgraduate Student



Pankaj Kumar Joshi
Visiting Scientist



Michal Studzinski
Visiting Scientist



Sonja Buschow
Visiting Scientist

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



LATEST ADVANCES



Go & Fly

These ICFOonians have successfully defended their PhD Theses.

Honoring ICFO's tradition, ICFOonians gather together to celebrate your accomplishments and to encourage you to Go & Fly! Remember that wherever you go, you will always be part of the ICFO community!



Dr. Osamu Takayama graduated on November 25 with a thesis describing what constitutes the first experimental observation of Dyakonov surface waves. His thesis was supervised by Prof. Lluís Torner ICFO Director and leader of the group of Nonlinear Optics and UPC Prof. David Artigas.



Dr. Tim Taminiau graduated on November 21 with a thesis on optical antennas for single emitters. His thesis was supervised by ICREA Prof. Niek van Hulst, leader at ICFO of the Molecular nanophotonics group.



Dr. Thomas van Zanten graduated also on November 21 with a thesis on near-field nanoscopy for mapping organization and function. His thesis was supervised by ICREA Prof. Maria Garcia-Parajo, leader at ICFO of the Single molecule nanophotonics group.



Dr. Chaitanya Kumar Suddapalli graduated on January 18 with a thesis on high power, fiber-laser-pumped optical parametric oscillators. His thesis was supervised by ICREA Prof. Majid Ebrahim-Zadeh, leader at ICFO of the Optical Parametric Oscillators group.

Congratulations!

ICFOonians

BUSINESS NEWS by Silvia Carrasco

Romain Quidant receives funding for ERC Proof-of-Concept study



In March 2011, the European Research Council (ERC) launched a new funding initiative, called "Proof-of-Concept", open to researchers who have already been awarded an ERC grant. ERC grant holders can apply for this additional funding to establish the innovation potential of ideas arising from their ERC-funded frontier research projects.

The type of high-risk/high-gain research at the frontiers of knowledge that the ERC promotes often generates unexpected or new opportunities for commercial and societal applications. The Proof-of-Concept funding helps ERC grant-holders bridge the gap between their research and the earliest stage of a marketable innovation.

In the first call, ERC received 78 applications, out of which 33 have been granted. ICREA Professor Romain Quidant is one of 33 recipients –the only one in Spain– of the Proof-of-Concept grant to explore the market potential of plasmonics in the cosmetic sector. Prof. Quidant is leader at ICFO of the Plasmon nano-optics group and was awarded last year an ERC Starting Grant to pursue the project "New frontiers in plasmon optics: From nanochemistry to quantum optics".



High Voltage Electric Field Sensing

ICFO and ABB sign a research agreement to explore the opportunities that integrated optics sensors can offer to high voltage electric field sensing.



The project will be developed by the group led by ICREA Prof. Valerio Pruneri, which includes Research Fellow Davide Janner and PhD student Domenico Tulli. Prof. Pruneri leads the Optoelectronics research group at ICFO, focused on applied research topics and involved in about ten industrial projects in areas including optical telecommunication, displays, sensing, aerospace, energy efficiency and quantum cryptography.

ABB is a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs about 130,000 people. The Power Systems division offers turnkey systems and services for power transmission and distribution grids, and for power plants. Substations and substation automation systems are key areas. Additional highlights include flexible alternating current transmission systems (FACTS), high-voltage direct current (HVDC) systems, and network management systems. In power generation, Power Systems offers the instrumentation, control and electrification of power plants.

COLLABORATION by Mireia Casanovas

Nanophotonics for Energy Efficiency Network of Excellence

ICFO coordinates the N4E Network with 9 participating institutions in 6 European countries, representing more than 130 scientists, engineers, technicians, and managers in the field.

How to boost energy efficiency to help curb climate change is a thorny scientific question that today's society must find answers to quickly. Photonics is set to be among the solutions. Photonics could thus help us design more efficient ways to convert electricity into light, and light into electricity, to meet our energy needs much more sustainably. Increasing the efficiency of light-matter interaction at the nanoscale, for example, could lead to important advances in the performance of both light-emitting and light-harvesting devices. With the sun sending to the Earth's surface, in less than an hour, an amount of solar energy equivalent to the energy consumed by the entire world population over a year, the potential for real solutions is huge.

Starting in January 2010, ICFO has been part of the effort through its involvement as coordinator of the Nanophotonics for Energy Efficiency (N4E) Network of Excellence, a project supported by the 7th Framework Programme of the European Commission. N4E aims to promote nanophotonics research in energy-efficient applications by bringing together different nanophotonic laboratories and research groups across Europe. To date, nine institutions in six

European countries are participating in the network, representing more than 130 scientists, engineers, technicians, and managers in the field.

With the view to speed up the development of disruptive approaches to lighting and solar cell technology, N4E fosters collaborations for the exchange of scientific knowledge and best practices and paves the way for the establishment of common research agendas. N4E organizes workshops and summer schools for young researchers and technicians to learn about scientific and technological issues and hone their communication, entrepreneurship, and intellectual property skills. Every six months, the N4E Network also offers seed funding for collaborative projects to investigate disruptive nanophotonics concepts toward increased energy efficiency.

WANT TO JOIN IN?

If you are interested in knowing more about N4E activities and contacting any of the current N4E Partners, or if you would like to enter N4E's free Associate Membership Scheme or participate in Seed Projects, please visit the N4E website at www.n4e.eu or send us an email to n4e-office@icfo.es.



nanophotonics
for energy efficiency

ICFO turns 10

ICFO will celebrate its 10th Anniversary throughout 2012 with special events that will help to light the path for the bright future that lays ahead.

In March 2002, ICFO was born in rented premises of the UPC campus in Barcelona. 10 years later, we have grown into a 14,000 sqm purpose built facility, we have over 1000 publications in leading journals, we are teaming up with visionaries such as the Fundació Cellex Barcelona, and we are proud members of a network of several hundred ICFOnians now working around the world. To celebrate the achievements of the past 10 years and to light the path for the bright future ahead, ICFO will celebrate its 10th Anniversary throughout 2012. Be on the lookout for this special anniversary logo denoting special events all through the year.



IN FOCUS by Montse Vinyes Barrera

Montse Vinyes Barrera: “When I began... ICFO was a recently planted seed that was starting to grow”

I have always been a person with varied interests. I enjoy sculpting, drawing and painting and have a great love for all activities that allow me to be in contact with nature. I do cross country skiing, mountain biking, swimming and above all hiking, which has given me an appreciation for the beautiful natural areas of Catalonia like the Parc Natural de Sant Llorenç, the Pyrenees, the Empordà as well as the Balearic islands.

My career to date has also reflected diverse interests. A designer and entrepreneur at the very beginning of my professional carrier, I slowly modified my focus studying business administration and advanced finances. Initially combining studies and work, I soon had the chance to manage the creation and development of an accountancy department at EDDA Design.

It was April 2003 when I began in ICFO's accountancy department. After 16 years of experience in the private sector environment, this new position was from the start a challenging and interesting move. ICFO was then a recently planted seed that was starting to grow. In these early years, we were located at the Nexus building on the UPC campus. I have very fond memories of those days when we were only about 14 people in a new project with high expectations. The enthusiasm and vision of the director inspired us to see the ambitious project, but we all knew that there were two very real possibilities: ICFO could be a modest foundation with interesting but limited reach or it could grow into a great institution with international recognition. Lluís called it “THE BIG PLAN”.

Looking back at the evolution of ICFO, the journey has been fantastic but it has not always been

easy. I am proud of the evolution and what we have achieved on all levels. First on my own with only modest tools, and later with an excellent Accountancy team of three people and Rafa Giner, we now have a sophisticated technological infrastructure and we have been able to respond to ICFO's growing needs. ICFO exudes an international air which helps to enrich the personal relations here. There is good interaction between the different management units which continue to grow together as well as with the researchers. Especially with those of us who have been at ICFO since the early days, we have a shared understanding and a lot to be proud of.

**Montse Vinyes Barrera is the head of the Accounting Unit at ICFO.*



IN THE FRAME by Darrick Chang

“So if you believe in electricity and you believe in relativity, then you have to conclude that magnetism exists too.”

That was the concluding remark in one of my first-year undergraduate physics lectures at Stanford -- that three seemingly unrelated concepts were in fact deeply linked. I remember that I spent most of the following night awake thinking about how cool that idea was, and from that moment forward, I knew that I wanted to be a physicist. I'm glad that many years later, that remains the best part of my job -- once in a while, coming across some new idea or understanding that is exciting enough to keep me awake at night.

After receiving my undergraduate degree, I went to pursue a PhD in theoretical quantum optics under the supervision of Mikhail Lukin at Harvard, where I investigated how to interface atomic systems with plasmonics for applications in quantum information processing. I then went to Caltech as a postdoctoral fellow with Jeff Kimble and Oskar Painter, investigating how to manipulate quantum effects in nano-mechanical systems. Aside from my specific research, one of the most enjoyable aspects of these experiences was being mentored by people who were really passionate about science and doing research at the highest level. I was also fortunate to be able to collaborate with experimentalists who could make equations jump off a piece of paper and turn into something concrete. I envision that close collaborations with experimental groups will remain an integral part of my research activities in the future.

At ICFO, I am building a group in the area of theoretical quantum nano-photonics. The primary

Darrick Chang:
“The best part of my job
(is) once in a while, coming
across some new idea or
understanding that is
exciting enough to keep me
awake at night.”



focus of our research will be interfacing the fields of atomic physics, quantum optics, and nano-photonics to create novel devices for manipulating light-matter interactions, and advancing theoretical tools to understand these phenomena. I think it is an extremely exciting time for this field. In the near future, we will see an increasing number of technologies that are based upon the principles of quantum physics, and I believe that rapid advances in optical sciences and fabrication techniques will push photonics to the forefront of this technological revolution. Some specific areas that I am focusing on include the manipulation of quantum behavior in mechanical systems using optical forces, graphene-based quantum nano-optical devices, and the development of atom nano-trapping techniques. I am currently looking for new PhD students and postdocs to join the group, who have good backgrounds in theoretical quantum optics and above all want to apply their knowledge in creative and challenging ways.

I look forward very much to carrying out this research at ICFO, where I feel that there is an environment that fosters collaborative and interdisciplinary work, and where a general excitement exists among everyone here to pursue new and exciting ideas. I hope that I can contribute to this great atmosphere and look forward to working with everyone here in the coming years!

**Darrick Chang is Professor, Nest Fellow and leader of the Theoretical Quantum-Nano photonics Group at ICFO.*

BEYOND ICFO By Dr. Nicolas Piro



Nicolas Piro:

“Visiting friends that I made while at ICFO -who now live all around the world- gives me a great excuse to travel!”



Nicolas Piro was awarded the 2011 ICFO PhD Thesis Award for his work at ICFO on entanglement distribution in a quantum network. He is now a postdoctoral student at École Polytechnique Fédéral de Lausanne in Switzerland.

I am currently working on a biophotonics project to develop a microscope based on the advance super-resolution techniques STORM and PALM. I am postdoc at the École Polytechnique Fédéral de Lausanne, Switzerland.

Back in 2003, I joined ICFO as a PhD student when the institute had just moved to its new building in Castelldefels. The project I developed in the group led by Prof. Jürgen Eschner was all I hoped it would be. I was involved from the very beginning in the excitement of constructing a highly technical Quantum Optics experiment and studying the interaction of light and matter (in particular single photons with single trapped atoms) at its very fundamental level. It was a very stimulating and challenging period during which I saw the institute grow and had the chance to actively contribute to its development. I must say I especially enjoyed the great atmosphere at ICFO and the opportunity to meet people from many different cultures. Visiting friends that I made while at ICFO -who now live all around the world- gives me a great excuse to travel!

After completion of my PhD, I took a break from science and decided to join a medical physics program

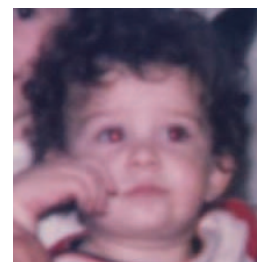
in a local Barcelona hospital. I learned many things concerning applications of physics in Medicine, but perhaps my biggest learning point was the discovery that my true desire was to work in Research and Development, which brought me to where I am today.

STORM (Stochastic Optical Reconstruction Microscopy) and PALM (Photo-activated localization microscopy) are super-resolution microscopy techniques with internal workings quite analogous to the light-matter interaction experiments I made at ICFO. They consist of imaging biological specimens by detecting on a very sensitive camera the light produced by some fluorescent molecules when they are excited by a suitable combination of lasers. The molecules fluoresce because they have been genetically treated to react to the particular light we use. We can localize each individual molecule by determining the center of the imaged spot, and we do it with precision beyond the capacity of standard optical microscopes. These techniques allow resolving biological structures with a resolution of a nano-meter! That means we can see inner details of cells, viruses or neural networks –to name a few- that were simply out of reach before these techniques were devised. Isn't light-matter interaction amazing?

WHO'S That ICFOnian

Can you put a name with the face of these well-known colleagues?

- Mario Napolitano – PhD Student.
- Alejandra Valencia – Outreach, KTT Unit.
- Monica Montana – Front Desk Assistant.
- Silke Diedenhofen – Postdoc.
- Lluís Torner – Director.
- Frank Koppens – Group Leader.



COMMUNITY PICTURE



The temperature dropped and Christmas was finally in the air as ICFOnians celebrated the holiday season at the Castle in Castelldefels.

HIGH PROFILE



Marta Lacambra:
“I feel inspired by the capabilities, motivation and talent of dedicated young people.”

**CX CatalunyaCaixa
 Obra Social**



Marta Lacambra is Director of CatalunyaCaixa-Obra Social. In her role she has supported initiatives as diverse as Mòn St. Benet, a medieval monastery and cultural landmark, educational programs to avoid scholastic failure and the Summer Fellows program at ICFO.

What led you to your role at CatalunyaCaixa - Obra Social?

There has always been a social focus to my work. After my studies in economics, I joined the Department of Education, followed by the Departments of Culture and afterwards of the Department of Environment of the Catalan Government. From there I joined Caixa Manresa as Director of Obra Social. In Obra Social I have found huge doses of agility to create strategies for different groups and situations. I have also learned a lot by constantly adjusting to new scenarios, resources, and challenges. Today we work with entrepreneurs, as well as young people leaving Universities who are adjusting to challenging scenarios. My own experience helps me to empathize with these situations.

What is for you the most fulfilling part of your work?

It is an amazing sensation to look out over the auditorium in La Pedrera and see the parents of 250 students glowing with pride to see their children completing a highschool education that would have been out of reach without a very special “push”. The merit and effort involved is overwhelming and once this potential is “uncorked” there is no stopping the

positive repercussions. A different scenario is the exceptional young students who take part in the Joves i Ciència program -in which ICFO participates. We help to provide challenges that keep these talented students motivated to reach extraordinary heights. I feel inspired by the capabilities, motivation and talent of dedicated young people.

How important is it to support the training of science teachers?

A teacher capable of finding and extracting the exceptional capabilities in students is himself / herself exceptional. Teachers involved in the Joves i Ciència program have been able to create a learning dynamic of excellence in their classrooms for ALL their students. Offering them the opportunity to share their experiences and a view of what is cooking in frontier research centers in Catalunya like ICFO, is a way to recognize and encourage the great work that they are doing.

You are particularly supportive of scientific endeavors. Can you tell me about your special relationship with science?

I am often asked if CatalunyaCaixa- Obra Social has a special preference for working with scientists. Actu-

ally, there is only a common mind-set that continually draws us together. I can assure you that if it had been a forced relationship, we would not have found so many points in common. Our first project with ICFO was the Ignacio Cirac Chair. We now have other initiatives with ICFO like the Summer Fellows program. ICFO is a center that, when you walk in the door, you can feel that it has an energy and “can do” that we share. It appears that almost whatever you set out to do, you manage to achieve.

What is the mission of CatalunyaCaixa - Obra Social:

We are obsessed with helping young people to achieve their goals, be it going to MIT, gaining experience in a state-of-the art research institution like ICFO, or graduating from highschool. Our objective even through this financial crisis is to succeed in generating education, protecting the advances that have been made over the years, and preventing, if possible, an irreversible step backwards. We must choose our partners carefully, but know the scenario very well. There are those with whom we want to share this journey. We work with people and institutions with whom we share values, motivation, passion, electricity, and enthusiasm.

SUDOKU by www.sudoku-puzzles.com

EASY

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				7				8
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