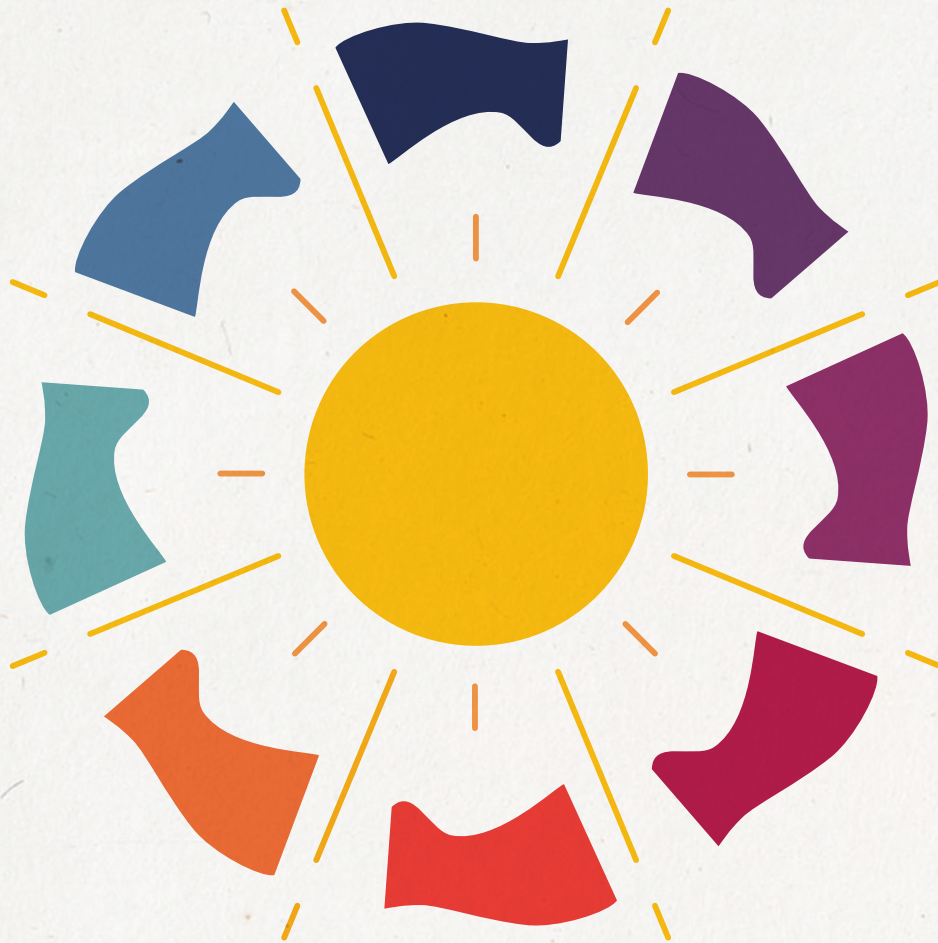


ICFOnians

Community News from the Institut de Ciències Fotòniques



**INTERNATIONAL
YEAR OF LIGHT
2015**

EDITOR'S CORNER

This is our year



BROOK HARDWICK
Coordinating Editor



When speaking with non-scientists, how many times have you mentioned Photonics and then, upon noting a blank or unresponsive expression on the listener's face, had to qualify: Photonics, you know... the science of light and light based technologies...? Photonics are now integrated into ALL aspects of our lives but far too many people have never heard the word. Well ICFOnians- THIS IS OUR YEAR- the year that 'PHOTONICS' makes definitive progress in becoming a household word!

John Dudley, President of the European Physics Society and #1 champion of the International Year of Light (see High Profile article *ICFOnians* Edition #19-Spring 2014), has been working on this project since 2009. Now, as we officially enter into this important year, we owe him and all of those who persevered through all of the challenges of gaining United Nations support for this homage to Photonics a huge THANK YOU. We have been preaching the power of light for years. We have a clear idea of the opportunities for advancement that harnessing the power of light can provide. Now that the United Nations has joined the cause and given all of "light's disciples" a huge international platform for the message, we will do all that we can in order to share the exciting possibilities of light with the world.

In honor of IYL 2015, ICFO is amplifying our already active Outreach agenda. With all of the special events that will take place throughout the year, the *ICFOnians* committee has decided to launch a new section of the newsletter to include an agenda of activities. (*Looking Forward* - page 8) ICFO's complete seminar and event agenda is far too extensive and dynamic to appear in the newsletter- for the full story you will need to keep your eye on the ICFO website calendar- but the idea of publishing a few of the upcoming happenings is part of our effort to make sure that everyone takes note of all that is going on.

If 2015 is anything like the year we have just closed, it will be an amazing year. In fact, this edition is overflowing with news and achievements. Not only have we recently had the occasion to congratulate ELEVEN new PhD graduates (check out the extensive list in the Go & Fly section), we have paved the way for the arrival of the next generation of PhD students, some of which attended the recent PhD Open Days. At the same time, we celebrated a number of special awards and decorations, from the ICFO PhD theses awards to awards from other international and national entities (lots to be proud of in the NEWS section).

In short, this edition is about getting the word out on the wonders of Photonics. There is something for everyone- not just in this addition of ICFOnians, but in the International Year of Light.

Wishing you all a HAPPY 2015- HAPPY NEW YEAR OF LIGHT!

COVER



The United Nations (UN) General Assembly 68th Session has proclaimed 2015 the International Year of Light and Light-based Technologies (IYL 2015). This International Year is the initiative of a large consortium of scientific bodies together with UNESCO, bringing together many different stakeholders including scientific societies and unions, educational institutions, technology platforms, non-profit organizations and private sector partners. ICFO's director, Lluís Torner, joined the project in its inception stage in 2010, lending his support to the proposal for a year celebrating the power of LIGHT. Get ready for a year full of photonics activities- you will be seeing a lot of this logo!

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ICFO NEWS

ICFO NEWCOMERS



L'ORÉAL-UNESCO FOR WOMEN IN SCIENCE

The L'ORÉAL-UNESCO Program For Women in Science gives recognition to female researchers all over the world. This year the program has awarded 5 prizes each aimed at young female researchers dedicated to Material Sciences (understood in the widest possible sense) to develop a research project during 2015 in a laboratory in Spain. Prof. Leticia Tarruell, leader of the Ultracold quantum gases group at ICFO, has been awarded one of these prestigious prizes to carry out the project entitled "Artificial materials with cold atoms" which involves the development of a high resolution imaging system for observing different types of ultracold atoms, artificial materials which will be produced in the quantum simulator that Leticia and her group are currently constructing at ICFO.

PIONEER AWARD

The umbrella organization *Institució CERCA* (I. Cerca) has recently introduced the PIONEER Awards. The objective of these new awards is to recognize PhD students working in one of the CERCA institutes who, during the course of the past 12 months, have presented a doctoral thesis through which they propose to initiate or strengthen a technology or product that may have an industrial or commercial application or make a significant specific contribution to the development of public policy. Congratulations to Dr. Jon Donner, who did his PhD Thesis entitled "Thermo-Plasmonics: controlling and probing temperature on the nanometer scale" in the Plasmon Nano-Optics Group at ICFO under the supervision of Professor Romain Quidant, for being one of three first recipients of this award.

ERC STARTING GRANT

ICFO Group Leader Professor Darrick Chang has been awarded a European Research Council Starting Grant to pursue the project "Frontiers of Quantum Atom-Light Interactions (FoQAL)". This project aims to completely re-define our ability to control light-matter interactions at the quantum level. This potential revolution will make use of cold atoms interfaced with nanophotonic systems, exploiting unique features such as control over the dimensionality and dispersion of light, the engineering of quantum vacuum forces, and strong optical fields and forces associated with light confined to the nanoscale. It seeks to develop powerful and fundamentally new paradigms for atomic trapping, tailoring atomic interactions, and quantum nonlinear optics, which cannot be duplicated in macroscopic systems even in principle. Congratulations Darrick!

NATIONAL RESEARCH AWARD FOR YOUNG TALENT

The Catalan Foundation for Research and Innovation (FCRI), with support from the Government of Catalonia, announces this year's National Research Awards, which aim to promote the recognition of science, with a particular focus on educating Catalan society on the scientific activity carried out by researchers working here. The 2014 National Research Award in the Young Talent category recognizes the efforts of young researchers who stand out for the quality and excellence of their scientific work and research. This year's award goes to ICREA Professor at ICFO, Romain Quidant. Congratulations as well to awardees in all of the categories, including Prof. Dr. Lourdes Ibáñez, winner of the 2014 National Research Award; The Fundació Botín in the category of Scientific Patronage; the Consorci Residència d'Investigadors CSIC - Generalitat de Catalunya in the category of Scientific Communication; and the company Matgas 2000 AIE, with the participation of Carburos Metálicos, CSIC and the Universitat Autònoma de Barcelona (UAB), in the category of Public-Private partnerships.



Núria Charles-H.
European Projects Mngmt.



Anian Rabasco
Finance Support



Alexia Salavrakos
PhD Student



Alexander Block
PhD Student



Vikas Remesh
PhD Student



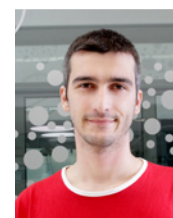
Rinu A. Maniyara
PhD Student



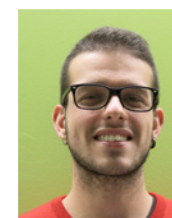
Sergio L. De Bonis
PhD Student



Peter Schmidt
PhD Student



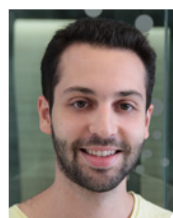
Ivan Supic
PhD Student



Nicola Di Palo
PhD Student



Peter Wittek
Postdoctoral Researcher



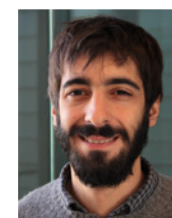
Adrien Noury
Postdoctoral Researcher



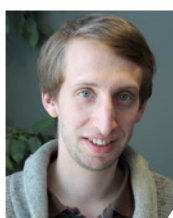
Jan Kolodynski
Postdoctoral Researcher



Yugeng Wen
Postdoctoral Researcher



Luca Tanzi
Postdoctoral Researcher



Matz Liebel
Postdoctoral Researcher



Jordi Gomis
Postdoctoral Researcher



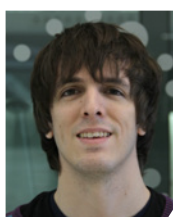
Miguel A. Garcia
Postdoctoral Researcher



Michal Tomza
Postdoctoral Researcher



Jacob Licea
Postdoctoral Researcher



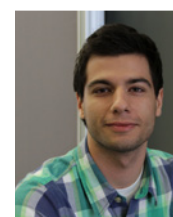
Ignacio Bosch
Research Engineer



Julio Sanz
Research Engineer



David Castillo
Postgraduate Student



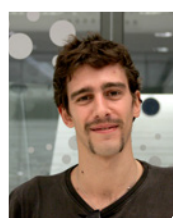
Marcel Buen
Undergraduate Student



Israel Rocha
Visiting Scientist



Pierre Verlot
Visiting Scientist



Francesco Sottile
Visiting Scientist



David Busch
Visiting Scientist



Maria A. Ricci
Visiting Scientist

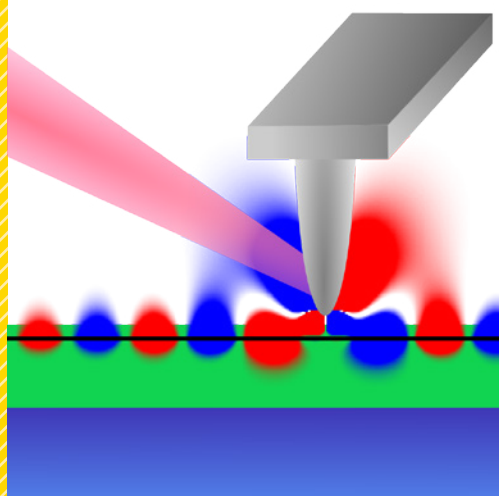
Many of us joined ICFO or took a new position at the Institute between October and December 2014. Welcome to ICFO!



LATEST ADVANCES

GRAPHENE PLASMONS GO BALLISTIC

■ Plasmons guided by graphene are remarkable as they can be confined to length scales of nanometers, up to two hundred times below the wavelength of light. An important challenge up to now has been the rapid loss of energy that these plasmons experience, limiting the range over which they could travel. Researchers from ICFO in a collaboration with CIC nanoGUNE, and CNR/Scuola Normale Superiore, all members of the EU Graphene Flagship, and Columbia University (New York), have solved this problem in a study recently published in *Nature Materials*. A combination of graphene and boron nitride, both two-dimensional materials, has provided the solution to the quest for controlling light in tiny circuits and suppression of losses. When graphene is encapsulated in boron nitride, electrons can move ballistically for long distances without scattering, even at room temperature. This research now shows that the graphene/boron nitride material system is also an excellent host for extremely strongly confined light and suppression of plasmon losses.



CARBON NANOTUBE RESONATORS WITH ULTRA-HIGH QUALITY FACTOR

■ Key to the remarkable performances of mechanical resonators in diverse contexts is the combination of low mass and high quality factor. For many years, researchers observed that quality factors would decrease with the volume of the resonator, and thus it was unthinkable that nanotubes could exhibit giant quality factors. In a recent paper published in *Nature Nanotechnology*, Joel Moser and ICFO colleagues of the group led by Prof. Adrian Bachtold, along with Marc Dykman (University of Michigan), present a carbon nanotube mechanical resonator exhibiting quality factors of up to 5 million - a 30 fold improvement over the best quality factors measured in nanotubes to date. These giant quality factors that ICFO researchers have measured have not been observed before in nanotube resonators because they are associated with vibrational states that are extremely fragile and easily perturbed by the measurement. This work reveals a new strategy to improve the quality factor of mechanical resonators, opening a new realm of possibilities for sensing applications.

FRACTAL FUTURE

■ Fractals are beautiful patterns based on the principle of self-similarity. Well-known examples include the branching arrangements of trees, river networks or blood vessels. In a recent collaboration between Stanford and ICFO, Farzaneh Afshinmanesh in the Brongersma group and Alberto Curto from the Molecular NanoPhotonics group led by ICREA Professor at ICFO Niek van Hulst, have discovered that fractals can be put to good use in photonics by creating transparent ultrathin metallic electrodes. They have fabricated Siphoto-detectors with fractal electrodes, resulting in superior performance both in broad-band and flat polarization response. The work has been published in *NanoLetters* and highlighted in the November issue of *Nature Photonics*.

NEW TOOLBOX FOR GAUGE SYMMETRIES

■ There is evidence that three out of the four fundamental interactions are a manifestation of gauge symmetries. These interactions are described by gauge theories that, despite their elegance, still have not been fully solved. As a consequence, we do not understand the role of gauge symmetry in hot and dense nuclear matter, nor do we understand which phases of matter gauge theories can ultimately describe. In a study, published in *Physical Review X* by Drs. Luca Tagliacozzo and Alessio Celi of the Quantum Optics Theory group led by ICREA Prof. at ICFO Maciej Lewenstein, the authors used tensor networks to uncover new classes of gauge theories designed for quantum simulators whose physics is still not well understood.

BUSINESS NEWS

ICFO & Thales Team Up

Thales and ICFO sign a cooperation agreement on laser technology

ICFO and Thales, manufacturer of lasers for scientific and industrial markets, have signed a cooperation agreement for developing mid-infrared lasers at high energy and high repetition rate. With this collaboration, ICFO will develop lasers in the 3 to 6 micron wavelength domain delivering ultrashort pulses. Several technologies will be developed in the frame of this program by the research group led by ICREA Professor at ICFO Jens Biegert, at the leading edge on Optical Parametric Chirped Pulse Amplification (OPCPA) and related pump laser. Thales, a leading company in the field of turn-key intense laser system, aims for scientific and societal applications, such as biophotonics. With 30 years of experience in laser design, Thales now develops and markets Petawatt-class intense laser systems.

In 2012, Thales developed and delivered BELLA system, the first turn-key intense laser, offering a power of more than 1 Petawatt (1 million of billions of watts) to the Lawrence Berkeley National Laboratory (California), then the CETAL Petawatt laser in Romania, and was recently awarded a contract by the European research program ELI-NP (Extreme Light Infrastructure for Nuclear Physics), established to produce two intense lasers of 10 Petawatts each, which will be installed in Romania.

THALES

■ THALES is a global technology leader in the Aerospace, Transportation and Defence & Security markets. In 2013, the company generated revenues of €14.2 billion with 65,000 employees in 56 countries. With its 25,000 engineers and researchers, Thales has a unique capability to design, develop and deploy equipment, systems and services that meet the most complex security requirements. Thales has an exceptional international footprint, with operations around the world working with customers and local partners.

+ INFO ► www.thalesgroup.com

New RETOS industrial projects at ICFO

Two ICFO research groups take on industrial projects with FYLA and Signadyne

RETOS is a call by the Ministry of Industry and Competitiveness, which aims to offer incentives for public-private collaborations, specifically facilitating the creation of joint R&D+i projects between research organizations and companies. These projects help to promote innovation, attracting private investment, generating employment and improving the technology base in the country. The call aims at research specifically targeting the Societal Challenges. In the most recent RETOS call, ICFO has obtained two new industrial projects, both with companies Fyla and Signadyne.

The IMAGINEWHITE project, coordinated by FYLA, a Laser manufacturer SME based in Valencia with the collaboration of Universitat Politècnica de València, and the SLN Facility at ICFO led by Dr. Pablo Loza-Alvarez, will work towards the development of advanced bioimaging systems using white lasers.

The QU-CARD project, coordinate by ICFO's spin-off company SIGNADYNE with the groups at ICFO led by ICREA Prof. Valerio Pruneri and Morgan Mitchell, will develop fast electronics for quantum random number generators.

+ INFO ► www.fyla.com | www.signadyne.com



TRAINING

PhD Open Days @ ICFO 2014

Want to see what a cutting edge research center looks like from the inside?

We asked national and international students “Are you interested in starting a research career in the science and technologies of light and its applications?” For those that answered affirmatively, on the 18th and 19th of December, ICFO opened its doors in the 3rd edition of the PhD Open Days, offering the opportunity to see how a cutting-edge and international research center looks from the inside. In this two day event, outstanding graduates, or soon-to-become graduates, visited ICFO to learn more about our research and training programs, with a special focus on the doctoral degree studies and available PhD positions.

coming from outside Catalonia, covering travel and accommodation costs. The attendees’ backgrounds included Optics & Photonics and their applications, as well as Theoretical and Experimental Physics, Material Science, and different Engineering programs such as Biomedical and Telecommunications Engineering.

For two days, the participants had the opportunity to meet our research community, above all ICFO Group Leaders, postdoctoral researcher, and current PhD-students, to learn about the reality of the ICFO PhD experience. The event was inaugurated by Prof. Nick van Hulst, Head of Academic Programs, who pre-



sented the institute and its research activities in general. On the first day of the event, participants also had the chance to listen to the testimonials of recent ICFO PhD recipients, Dr. Chaitanya Suddapalli and Dr. Marc Almendros in a session titled “ICFOnians: PhD and the career beyond”, in which they offered interesting insights from their highly successful PhD experiences. Ms. Federica Beduini, a current PhD Student in the last stage of her PhD appointment, complemented their talks by offering her own insights as her PhD work comes to a close.

Central to the event’s first day was the PhD Poster Session, during which the

participants could directly interact with researchers, primarily on the PhD-level, but also with Postdocs and even Group Leaders, as well as participate in lectures given by Group Leaders, presenting the variety of research areas present at ICFO.

During the second day, participants took part in additional informal meetings to present themselves and discuss potentially available PhD-projects. They visited labs and also attended the Annual PhD Poster Session and the PhD Theses Award ceremonies. The PhD Open Days @ ICFO 2014 concluded with a pizza lunch, hosted by the ICFO PhD Student Chapter ICONS.



Sixty participants joined this 2014 event from universities in Barcelona including UPC, UB, and UAB, universities in Spain such as the Universities of Seville, or Santiago de Compostela, and still others from universities such as ETH Zurich, Universities of Florence and Rome, the Karlsruhe Institute of Technology, or the University of Marseille. In order to assure that highly competitive candidates for ICFO positions would be able to attend, an internal committee awarded travel grants to 15 talented students

Phd Poster Session & Award

Congratulations to the winners of 5th edition of the ICFO PhD Student Poster Session



From left to right:
Prof. David Artigas (ICFO Academic Affairs); Boris Albrecht (3rd place); Benjamin Wolter (1st place); Dominik Kufer (2nd place); Jordi Morales (ICONS VP)

The annual PhD Poster Session promotes the exchange of ideas and knowledge among ICFO PhD Students of different groups and areas with the aim of crossing traditional boundaries between fields. Celebrated in the framework of the PhD Open Days, it also allows potential future PhD Students to interact with current students and gain insights into their work.

*The Best Poster Award was sponsored by ICONS with the support received from OSA-SPIE.

- **1st Place: BENJAMIN WOLTER** in the Attoscience and ultrafast optics group. **Poster:** “Atomic-scale imaging of molecular bonds with laser-induced electron diffraction”.
- **2nd Place: DOMINIK KUFER** in the Solution-processed nanophotonic devices group **Poster:** “Hybrid 2-dimensional 0-dimensional MoS₂-PbS Quantum Dot Photodetectors”.
- **3rd place: BORIS ALBRECHT** in the Quantum photonics with solids and atoms group. **Poster:** “Active rephasing of single collective spin excitations in a cold atomic quantum memory”.
- **Finalists**
ELSA PASSARO
PETER WEBER
IVAN SILVEIRO

LIFE SCIENCES AT ICFO

LAH 2014: LIGHT AND PEDIATRICS @ ICFO

The fifth edition of the Light for Health Forum was dedicated to “Light & Pediatrics- Photonics for Non-Invasive Pediatric Monitoring”. As part of the Light for Health focus program, this event aimed to create synergies between the world of medicine and photonic sciences, acting as a meeting point for experts from the pediatrics and biophotonics fields.

THE SPEAKERS

Speakers in this event included:

- DANIEL LICHT · Children’s Hospital of Philadelphia
- GORM GREISEN · Rigshospitalet Hospital, University of Copenhagen
- TOPUN AUSTIN · University of Cambridge
- EDUARD GRATACÓS · BCNatal, Hospital Clínic, Hospital Sant Joan de Déu, UB
- TURGUT DURDURAN · ICFO
- MARTIN WOLF · University Hospital Zurich
- ALESSANDRO TORRICELLI · Politecnico di Milano



YOUNG TALENT



LIGHT ON THE WAVES... OF THE SEA

The 3rd edition of ICFO's outreach initiative brings together science, music and literature in a singular event

The authors of the winning texts for this year's literary contest, "La Llum a les Ones" (Light on the Waves), along with groups from the Catalan music scene, ICFO-nians, friends, family, teachers and supporters of science, gathered at CCCB (Centre de Cultura Contemporània de Barcelona) for the

culmination of a year-long Outreach initiative aimed at motivating high school students to think and write poems or short stories about light. From all the submitted texts, a selection of the best writings were musicalized by up-and-coming Catalan music groups and recorded on a CD-book.

A number of friends have made this annual event possible, starting with all of the teachers who motivate their students to take part of this contest, in some cases incorporating the contest into the semester's curriculum. Thanks also go to colleagues at the Institute of Marine Sciences (ICM/CSIC) who joined ICFO's efforts, adding this year's nauti-

cal perspective to the mix and giving the authors an even wider range of themes to consider.

ICFO is grateful for the collaboration and support of CCCB Educació for generously hosting the concert and Daniel Arbós and Màrius Belles from the Scientific outreach radio show "Pa ciència, la nostra" for MC'ing the event, bringing new insights and lots of humor to the evening. Thanks also go Màrius Serra and all of the musicians who volunteered their time and creative energy to the project. (FF-FOC, El Gremio, Maria Coma, Renaldo&Clara, Samitier, Sanjays, Islandia Nunca Quema, and the Entangled ICFO Band).

CONGRATULATIONS

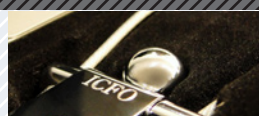
to this year's winners

- ÓSCAR FONT SOLÉ · (ESO) *Col·legi Sant Miquel*
- XAVIER SIRÉS · (ESO) *Maristes Valldemia*
- ADRIÀ IBÁÑEZ · (ESO) *INS Tremp*
- MARIA COSTA i ANDREU MONCLÚS · (BAT) *Jesuïtes Casp*
- NOELIA GONZÁLEZ · (BAT) *INS Jaume Huguet*
- BERTA LLANAS · (BAT) *Escola Sant Gregori*
- GERMÁN CÁNOVAS

+INFO & MUSIC

<http://lallumalesones.icfo.eu>

GO & FLY



92 women and men have successfully defended their theses at ICFO since its founding in 2002 and have helped us to measure what we have learned, how far we have come, and how much we have yet to learn. These ICFO-nians have recently succeeded in defending their

PhD Theses. Honoring ICFO's tradition, ICFO-nians gather together 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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October 13
2014

CHRISTIN DAVID

Nonlocal and Collective Phenomena in the Plasmons of Metallic Nanostructures.
TD: ICREA Prof. at ICFO
Dr. Javier García de Abajo



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October 13
2014

WIKTOR WALASIK

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2014

PARISA FARZAM

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TD: Prof. Dr. Turgut Durduran



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2014

JIRÍ SVOZILÍK

Photonic Entanglement: New Sources and New Applications.
TD: UPC Prof. at ICFO
Dr. Juan P. Torres



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October 21
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MARINA MARIANO

Light Harvesting in Fiber Array Organic Solar Cells.
TD: UPC Prof. at ICFO
Dr. Jordi Martorell



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2014

LUIS MARTÍNEZ

N-Type Bismuth Sulfide Colloidal Nanocrystals and their Application to Solution-Processed Photovoltaic Devices.
TD: Prof. Dr. Gerasimos Konstantos



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2014

ULRICH EBLING

Dynamics of Spinor Fermions.
TD: ICREA Prof. at ICFO
Dr. Maciej Lewenstein and
Dr. André Eckardt



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2014

ALEXANDER GRÜN

Nonlinear Pulse Compression.
TD: ICREA Prof. at ICFO
Dr. Jens Biegert



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2014

V. RAMAIAH BADARLA

Ultrafast Optical Parametric Oscillators-Novel Systems, Techniques, and Concepts.
TD: ICREA Prof. at ICFO
Dr. Majid Ebrahim-Zadeh



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2014

PIORT MIGDAL

Symmetries and self-similarity of many-body wavefunctions.
TD: ICREA Prof. at ICFO Dr. Maciej Lewenstein; co-advisor
Dr. Javier Rodríguez-Laguna



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ALEJANDRO ZAMORA

Quantum gauge theory simulation with ultracold atoms.
TD: ICREA Prof. at ICFO
Dr. Maciej Lewenstein



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December 15
2014

CLAUDIA VALDÉS

New laser speckle methods for in vivo blood flow imaging and monitoring.
TD: Prof. Dr. Turgut Durduran

PHD THESES AWARDS

Dr. Philipp Hauke, Dr. Alberto Curto and Dr. Marc Jofre receive the PhD Thesis Award for theses presented in 2013.



Theoretical, Experimental & Industrial RESEARCH AWARD RECIPIENTS

Since its launch in 2010, the ICFO PhD Thesis Award has aimed to commemorate the dedication and success of exemplary PhD Students. Recipients of this award have produced PhD Theses which stand out for their particularly successful results and for their contribution to significantly extend the frontier of science and technological knowledge worldwide. They also have proven to be highly creative and ambitious.

DR. MARC JOFRE:

"I am honored to receive this award which aims to reduce the gap between new technology and society. I share this with all my teammates for the great work together over these years."

DR. MARC JOFRE

Integrated Photonic Transmitters for Secure Space Quantum Communication.

► Supervised by ICREA Professor at ICFO VALERIO PRUNERI

Marc's thesis has contributed to bringing together the wonderful and breathtaking world of quantum information with useful applications for society. For instance, as a result of his work, in collaboration with other colleagues, an integrated photonic transmitter of quantum information up to 100 MHz repetition rate was built and tested. The optoelectronic components forming the transmitter were space-qualified, which makes it suitable for highly demanding satellite and future space missions. The applicability of the source was demonstrated through a free space quantum key distribution experiment which makes use of the decoy state BB84 protocol. The team achieved a lower bound secure key rate of the order of 3.64 Mbps with a low quantum bit error ratio. At that moment, this was the fastest polarization encoded QKD system which reported so far. In another example, Marc and colleagues demonstrated efficient conversion of vacuum fluctuations to true random bits using optical amplification of vacuum and interferometry. Importantly, using commercially-available optical components, they demonstrated a quantum random number generator with a bit rate of around 1 Gigabit per second. The proposed scheme has the potential to be extended to 10 and even up to 100 Gigabits per second, by taking advantage of high speed modulation sources and detectors for optical fiber telecommunication devices.

DR. ALBERTO CURTO

Optical antennas control light emission.

► Supervised by ICREA Professor at ICFO NIEK VAN HULST

First, he has experimentally demonstrated efficient unidirectional emission of a single photon emitter by coupling to a nanofabricated Yagi-Uda antenna. The few-hundred-nanometer antenna provides a route to effectively collect the emitter emission and communicate light between nano-emitters; important for bright single-photon sources, planar bio-chemical sensors and light harvesting. Second, he has demonstrated hybrid nanoscale sources beyond the simple Hertz dipole, allowing innovative quantum nano-optics components. The exceptional quality of Alberto's work has received an early recognition by the international scientific community that accepted the publication of part of his work in prestigious scientific journals such as Science and Nature Communication.

DR. ALBERTO CURTO:

"I am very grateful to the entire institute for creating such a great atmosphere to do excellent research. This is really a unique place."

DR. PHILIPP HAUKE

Quantum simulations with ultra-cold atoms: beyond standard optical lattices.

► Supervised by ICREA Professor at ICFO MACIEJ LEWENSTEIN and Dr. FERNANDO CUCCHIETTI

This thesis makes several fundamental contributions to the theory of quantum simulation using ultra-cold atoms, including theoretical analysis of anisotropic lattices, collaboration with experimentalists on generation of non-Abelian gauge fields using shaken lattices, and protocols using quantum non-demolition measurement to generate structured long-range entanglement. The thesis poses the question "can we trust quantum simulators?" and provides concrete answers in terms of disordered quantum systems. This impressive breadth of methods, results, and ideas are represented in 16 scientific publications. Another testimony to the quality, timeliness, and accessibility of Philipp's thesis work is the fact that several theoretical proposals from the thesis have already been carried out as experiments by leading laboratories.

DR. PHILIPP HAUKE:

"This award is a great honour for me, but it would not have been possible without my supervisor and collaborators. This makes me even more determined to make the very best of the training I received at ICFO to continue to make fascinating science."

BEYOND ICFO



Olivier Chalus

"Thales has recently taken the opportunity to start a collaboration with ICFO"



Jens Biegert, Denis Levaillant (Managing Director, THALES OPTRONIQUE), and Olivier Chalus at ICFO

After leaving ICFO in mid-October 2010, I went back to my native France after 8 years abroad. This led me to another career path. I gathered information from other ICFOnians and joined the international industrial group THALES, within a known domain with their laser department. Joining this team, a leader in high power ultrashort pulse laser systems, allowed me to stay at the leading edge of this technology and the people on this team, all very skilled and dynamic, helped me to feel that I was not coming from a different world at all.

I have been involved in very challenging projects since the beginning of my integration in Thales. The first project I worked on resulted in the achievement of what remains to date the highest repetition rate PetaWatt laser in the world (1.3PW, 1Hz, 42J). This system has now been running for more than two years in the Berkeley National Laboratory.

One thing that changes when switching to industry is the notion of time and engage-

ment. Projects have hard deadlines that must be met. Everything runs on a very tight schedule, especially considering the very challenging projects we are dealing with. Moreover performance specifications have to be strictly met. Even doing risk assessments and project management based on factors that we know from our previous experience as scientists, research groups always want more if not the impossible!

One thing that was difficult to adapt to was the number of meetings and the fact that functions are very delimited in big companies like Thales. You cannot place orders yourself; drawings for mechanics must be done by the mechanical bureau etc. But this is all for the best as a very strict follow up on the design and evolution of each component must be traceable. That I am still able to go to the laboratory and work to achieve things that have never been done before still brings me satisfaction.

Thales has recently taken the opportunity to start a collaboration with ICFO,

with my former group- the Attoscience and ultrafast optics group led by Prof. Jens Biegert. This gives me the chance to come back to ICFO to visit more often. I returned to ICFO a few times before the collaboration to visit friends and each time have been impressed by how fast things evolve and grow in ICFO. Back when I joined, we were less than 100 people and the corridors were only three labs long. Now ICFO has more than 300 people and soon is going to push the IN3 away! This is amazing and makes me very proud to have been for a small time part of this adventure.

I have kept in touch with some ICFOnians since I left, but seeing the joy it brings me, I am going to try to keep closer relations with ICFO and ICFOnians. I am always pleased to see that people after ICFO have great opportunities and that they are spreading out all over the world (France, Scotland, Germany, Spain, and so many more places). I hope that all ICFOnians are as proud as I am of being an ICFOnian and of ICFO's great success.

HIGH PROFILE



Dr. Peter Gruss:

“From next year onwards, I will be focusing on one of my main interests, namely to actively continue working on establishing better bridges between science and industry.”

Distinguished developmental biologist and President emeritus of the Max Planck Society.



As a distinguished developmental biologist, what motivated you to transition to the role of the President of the Max Planck Society for the Advancement of Science?

During my entire career as a scientist, I have always found it most rewarding to do research and follow my curiosity, in particular in the field of transcription control during development. Over the years, I was very fortunate to train as well as interact with many excellent scientists. This enabled me to extend my horizon above and beyond my own expertise. When I was asked to become President of the Max Planck Society, I was happy to accept because it also meant working on and looking further into the future research fields of the Max Planck Society. Being in close contact and working together with top minds enabled me to gain valuable insights into the broad spectrum of science, while additionally having the opportunity to promote all these fields.

What is the biggest challenge in maintaining the high level of quality for which the Max Planck Society is known?

The biggest challenge is and will be to recruit top talents from all fields in science to the Max Planck Society and to retain them.

What achievement from your Presidency are you most proud of?

During my term in office, eight new Max Planck Institutes were founded, carrying out research in such innovative areas as biology of aging, science of light, and empirical aesthetics. Additional institutes were incorporated under the auspices of the Max Planck Society, which are not being financed from its central budget. At the same time, fifteen Institutes were realigned, thematically expanded, or consolidated. To expedite a long-term strategic development process, I initiated the Perspective Council which brings together scientific ideas and concepts of all of the Max Planck Society's three sections. Moreover, I also strengthened the process of internationalization with the result that the Max Planck Society is taking a global lead in science today. To strengthen our scientific presence abroad, we established two new institutes as well as fourteen new Max Planck Centers with important scientific institutions in numerous countries.

How were you able to strengthen funding for science in Germany during some of the most turbulent economic years of modern European history? German government was favorably impressed by the

innovative achievements R&D can contribute to the wealth and welfare of our society. Our argument that we, as science organizers, need substantial funds for defined periods of time in order to plan appropriately for future development fell on fertile ground. In a mutual dialogue, it was agreed upon that despite the critical world economic affairs the Max Planck Society was to obtain a 3 % increase for an initial period of five years and subsequently a 5 % increase for the following five years. This provided the Max Planck Society with the stable funding it requires to fulfill its mission, namely to pursue high risk cutting edge research in order to meet the challenges of the future and provide a sound basis for societal and economic development.

Having stepped down from the Max Planck Society this year after 12 years as President, what is going to keep you busy?

After 12 years in office, I decided to take a creative break of six months that somehow turned out to be even busier than the last six months of my Presidency. From next year onwards, I will be focusing on one of my main interests, namely to actively continue working on establishing better bridges between science and industry.

LOOKING AHEAD



INTERNATIONAL YEAR OF LIGHT 2015

INTERNATIONAL YEAR OF LIGHT

As part of the festivities of the city-wide celebration of *Sant Eulàlia / LlumBCN*, as well as within ICFO's facilities, we will organize and host a wide range of events and activities aimed at making Photonics a household word. Some **GoPhoton!** highlights include:

- ▶ 30 JANUARY – 22 FEBRUARY **Exhibit: 'The Power of Photonics: from Fiction to Reality'** | Palau Robert, Barcelona
- ▶ 6 FEBRUARY Inauguration of **Llum BCN Opening Speech/ 'Pregó'** by Architect Benedetta Tagliabue | Barcelona City Hall **Illuminated Human Towers (Castellers)** | Plaça Sant Jaume **Illuminated 'Patis'** ICFO 'pati' designed by Artist Andrew Chappel, entitled "Light Work" | Palau del Lloctinent de l'Arxiu de la Corona d'Aragó (carrer dels Comtes, 2).
- ▶ 9 FEBRUARY **KICK-OFF** "Light on the Waves" contest (4th edition) and Young Photonic Congress registration (Congress 20 November)
- ▶ 10 FEBRUARY **"Exploradors de la Llum"** A magical introduction to Research in Photonics | CosmoCaixa
- ▶ 11 FEBRUARY **"From Science to Business: Entrepreneurship in Photonics"** | ICFO

- ▶ 12 FEBRUARY **Girls, Boys and Photonics** | ICFO
- ▶ 13 FEBRUARY **Open Day** | ICFO
- ▶ 16 FEBRUARY Academic Event for the **Opening of IYL2015 Spain** - Technology talks by Ignacio Cirac, Caterina Biscari and Jeroni Nadal and the performance of Lluís Claret, world-class violoncellist | Teatre Poliorama
- ▶ For more information please contact iyl2015@icfo.eu

KNOWLEDGE AND TECHNOLOGY TRANSFER

- ▶ 3 FEBRUARY **CLP DAY** - Wearable Technologies
- ▶ 3-4 FEBRUARY **Graphene Connect Photonics & Electronics Workshop**

COLLOQUIUM SERIES

- ▶ 16 JANUARY Ronald Hanson
- ▶ 16 FEBRUARY Juergen Eschner & Giovanna Morigi
- ▶ 10 APRIL Paul Dumas

ICFO SOCIAL

- ▶ 13 MARCH **Calçotada**

KEEP YOUR EYE on the events section of the web. There is always something interesting happening at ICFO.

SUDOKU

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