

ICFONians

Community News from the Institut de Ciències Fotòniques



EDITOR'S CORNER

Where $1 + 1 > 2$



BROOK HARDWICK
Coordinating Editor



As we head into a new year in which the world is anxiously awaiting both economic growth and improvements for society, it is fitting that *ICFOnians* celebrate happenings in our centre that are constructive and optimistic in both of these areas. The global theme of this edition is COLLABORATION- where two or more entities come together to create something much larger than the sum of the individual parts.

In this sense, we rounded 2013 off quite well with the celebration of our 5th CLP Day. In this annual event, ICFO reinforces relationships with companies that support our research and inspire us to focus on challenges that may produce benefits in the short and long term. Successful companies are on the lookout for ways in which to innovate and stay competitive. ICFO's Corporate Liaison Program (CLP) helps to strengthen relationships between industry and science, forming a bridge to all types of businesses, and creating trusting and long lasting relationships which enable the achievement of common goals.

As all ICFOnians are acutely aware, collaboration in science is critical in order to build new knowledge, capitalizing on the strengths and resources of colleagues both near and far while sharing our own knowledge. 2014 marks the launch of the European Commission's 8th Framework program- Horizon 2020 (H2020). As we turn the page from FP7 to H2020, we highlight ICFO collaborations, giving a brief insight into the European Projects coordinated by ICFO group leaders on subjects ranging from energy, to outreach, photonic antenna, early cancer detection, and Graphene-based single-photon nonlinear optics.

This brings me to ITER- an example of collaboration between governments, science and industry such as the world has never known. Having participated in the November CLP Day as a keynote speaker, we asked Prof. Henrik Bindslev, Director of Fusion for Energy, the EUs joint undertaking for ITER, to share a bit more information with us as to the project and keys for collaboration.

Prof. Bindslev, both in his interview and his presentation in the CLP Day, was adamant about the need for training of the next generation of scientists in all areas, noting that rigorously trained scientists are able to bridge disciplines and bring with them synergies and ideas that help solve complex problems. In this issue, we also cover the ICFO PhD Open Day where potential candidates for ICFO's PhD program visited the centre to assess the possibility of pursuing a career in science. In addition, we celebrate the brightest PhD theses presented at ICFO in 2012 with the Thesis Award.

We hope you enjoy this issue - full of celebration, opportunity, and shared knowledge. Wishing our readers all of these things and more for 2014!

COVER



The theme of this edition is "COLLABORATION" and these images represent the wide range of stakeholders who collaborate with ICFO to produce frontier research. We are grateful to the industries who confide in ICFO research groups for collaborative research projects, the ERC and other international funding agencies which make many of the most ambitious projects possible, Fundació Cellex which has expressed a special interest in and support of our work, and the brave, creative and ambitious friends and colleagues who inspire us and work beside us within ICFO and at the local, national, European and global levels.

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ICFO NEWS



ILLUMINATING CURIOSITY

Why are insects attracted to light? What makes us see things in one colour and not another? What makes 3D movies possible? ICFO announces “Illuminating Curiosity”- a contest which aims to reward creativity and the communication of ideas that answer the questions posed by Mònica Terribas, Jordi Ríos, Natxo Tarrés, Aina Clotet, as well as many other well-known personalities who share their experiences which have led them to wonder and puzzle over these questions. The challenge is to submit a creative, engaging, original video that responds to these curiosities. The contest is open until 23 April 2014 to all those with an inquisitive and creative spirit.

EMBO YOUNG INVESTIGATOR PROGRAM GRANT

Nest Fellow Prof. Melike Lakadamyali, leader of the Advanced fluorescence imaging and biophysics group at ICFO is among the young investigators who have been selected to receive the EMBO Young Investigator Program Grant. The major goals of The European Molecular Biology Organization (EMBO) are to support talented researchers at all stages of their careers, stimulate the exchange of scientific information, and help build a European research environment where scientists can achieve their best work. Each year, EMBO selects around 20 of the best young group leaders in Europe through a highly competitive selection process to join the EMBO Young Investigator Program (EMBO-YIP).

IYL 2015

The UN General Assembly 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 will actively participate in this initiative in a wide range of outreach activities through its coordination of ECOP (European Centres for Outreach in Photonics), a founding science partner of IYL 2015. In particular, ICFO will coordinate the pan-European project, “GoPhoton!”, which will officially launch in 2014 and enter into full force to coincide with IYL 2015.

MANAGING FOOD PROCESSES

The Optoelectronics group led by Prof. Valerio Pruneri will participate in the FP7 project coordinated by IRTA called “MUlti SEnsor Technology” (MUSE-Tech) for management of food processes. This collaboration includes research institutions as well as several technological corporations and industries in Spain, Finland, Czech Republic, Italy, United Kingdom and The Netherlands. The MUSE-Tech consortium will develop three single sensor prototypes which will be integrated in a versatile and affordable Multi Sensor Device (MSD) and tested for validation in three different food elaboration processes. The goal is to achieve targeted and consistent levels of quality and chemical safety in final products.

TADEO JONES

Tadeo Jones is a fearless explorer who presents bite size insights on science and technology to children of all ages in a cartoon program appearing on Telecinco. FECYT, the Spanish Foundation for Science and Technology, initiated collaboration with Telecinco to introduce work being conducted at research centres around the country to young audiences in a fun but factual format. In Tadeo’s visit to ICFO, he learns about the exciting properties and potential of graphene.

ICFO NEWCOMERS



Roland Terborg
PhD Student



Miguel Montes Bajo
Postdoctoral Researcher



Francisco Bezares
Postdoctoral Researcher



Clara Gregori Pla
PhD Student



Senaida Hernández
PhD Student



Nicolas Maring
PhD Student



Lydia Sanmartí Vila
Outreach



Daniel Cavalcanti
Postdoctoral Researcher



Samuel Mugel
Visiting Scientist



Michael Pullen
Postdoctoral Researcher



Aitor Villar Zafra
Undergraduate Student



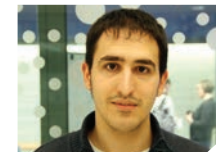
Bárbara Buades
PhD Student



Silvia Colodrero
Postdoctoral Researcher



Nikola Bralovic
PhD Student



Juan Manuel Plaza
PhD Student



María Casademont
Postgraduate Student



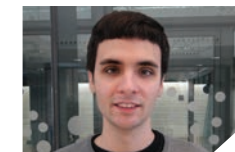
Marinko Jablan
Postdoctoral Researcher



Pierrick Cheiney
Postdoctoral Researcher



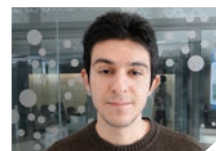
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Postdoctoral Researcher



Victor Chamizo
Research Engineer



Valeria Mondiali
Visiting Scientist



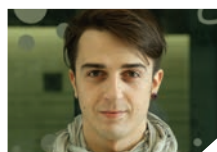
Armin Tavakoli
Undergraduate Student



Pau Santos Vives
Postgraduate Student



Ioachim Pupez
Visiting Scientist



Francesco Ricci
PhD Student



Quan Liu
PhD Student



Romain Parret
Postdoctoral Researcher



Manel Bosch Aguilera
Postgraduate Student



Pascal Berto
Research Engineer



Anna Tor Font
Project Management



Juan Esteban Calle
Visiting Scientist

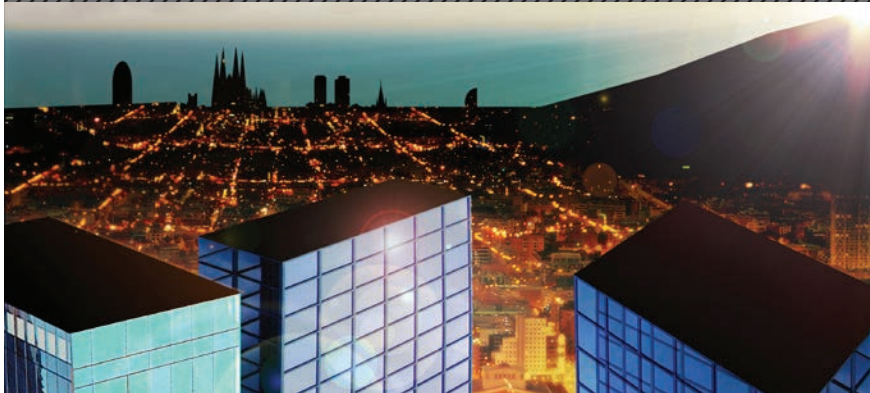


Joel Cox
Postdoctoral Researcher

Many of us joined ICFO or took a new position at the Institute between October and December 2013.



LATEST ADVANCES



SEMI-TRANSPARENT ORGANIC SOLAR CELLS

The Organic nanostructured photovoltaics group led by Prof. Jordi Martorell has fabricated semi-transparent Organic Photovoltaic (OPV) cells utilizing a light-trapping layered architecture to obtain an optimal light harvesting. In a paper published in *Nature Photonics*, the group reported that thinning the back metal electrode in solar cells to just a few nanometers to turn opaque cells into semi-transparent ones, the device's capacity to collect sunlight is dramatically diminished. However, they implemented a semi-transparent cell incorporating a photonic crystal to trap near infrared and ultraviolet light while reaching a cell performance almost as good as its opaque counterpart. The combined high levels of efficiency and transparency make these cells an extremely competitive product for Building-Integrated Photovoltaics (BIPVs).

DOUBLE HIT FOR PLASMON NANO-OPTICS

Two studies carried out by the Plasmon Nano-optics group led by Prof. Romain Quidant have been published in same *Nature Physics* issue. The study "Fast Optical modulation of the fluorescence from a single NV center" demonstrates that a nano-size diamond at room temperature can act as an efficient optical switch while the second study, "Thermal nonlinearities in a nanomechanical oscillator" describes the highest force sensitivity ever observed with a nano-mechanical resonator.

SYMMETRY BREAKING IN A MECHANICAL RESONATOR

The NanoOptoMechanics group led by Prof. Adrian Bachtold announced in *Nature Communications* the first experimental observation of a fundamental property of mesoscopic vibrational systems using a nanomechanical resonator based on a single carbon nanotube. Nanotubes behave as semi-flexible polymers in the sense that they can bend by a sizeable amount, but, when integrating a nanotube in a mechanical resonator, the bending is expected to break the symmetry of the restoring potential. The study allowed researchers to detect and measure motion in the resonator at nearly zero-frequency, in response to resonant excitations at high-frequencies. The observed effect is actually a consequence of the lack of inversion symmetry of mechanical vibrations.

PLASMONIC FS CONTROL WITH NANOANTENNAE

"PNAS First Look" highlighted a *PNAS* article published by the Molecular NanoPhotonics group led by Prof. Niek van Hulst, in which they were able to demonstrate a sub-wavelength resolution phase shaper and an ultrafast nanometric hotspot switch for pump-probe experiments. The paper presented pre-engineered plasmonic structures to amplitude-phase shape excitation pulses in a designed way, delivering simultaneous deterministic spatial and temporal control. The focus of ultrafast science is rapidly moving toward increasingly complex systems, both on a fundamental level (such as quantum networks in diamond or excitonic coherence in photosynthesis) as well as in concrete applications (such as multiphoton microscopy in membranes and cells).

IMPRINTED ELECTRODES IN QUANTUM DOT SOLAR CELLS

In a recent study published in *Advanced Materials*, researchers led by Prof. Gerasimos Konstantatos presented a new light trapping scheme relying on a low-cost, large area and low-temperature soft nanoimprinting procedure. This promising technique is employed to fabricate nanostructured electrodes that have been optically designed to facilitate enhanced light trapping in thin films of colloidal quantum dot solar cells while acting as a charge collecting electrode. These imprinted electrodes produce a 17.5% increase in photocurrent as a result of improved light absorption without deteriorating other critical figures of merit of the solar cell (Voc, FF), favouring a seamless integration of these electrodes in solar devices.

BUSINESS NEWS

2013 ICFO Corporate Liaison Day

The 5th edition of CLP Day was dedicated to Photonics in large international research initiatives

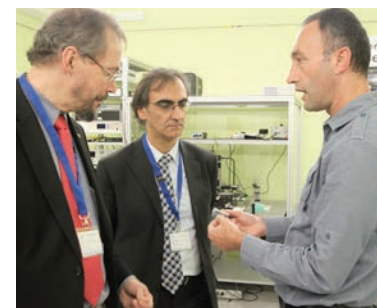
ICFO's Corporate Liaison Day, which took place this year on 22nd November, is a one-day program where ICFOians, representatives of international platforms, multinational corporations, local business representatives and researchers of other institutions have the opportunity to interact with world renowned experts to review the latest advances and issues related to photonic technologies while focusing on the generation of joint research projects.

The theme of each edition of the CLP Day changes in order to highlight topics of interest and relevance to ICFO's corporate partners and collaborators. This year's focus was on a range of large international photonics initiatives that are ambitiously supporting science and technology advancement worldwide.

A morning series of talks began with Dr. Henrik Bindslev, Director of Fusion for Energy, who summarized ITER and outlined how the biggest scientific collaboration in the field of energy is paving the way for fusion, while identifying the role that photonics could play in this extraordinary challenge. Professor Jari Kinaret from the Chalmers University of Technology and leader of the European Graphene Flagship initiative offered an overview of the opportunities that the flagship could bring to researchers and industry across Europe. Dr. Gyan "John" Prakash, Associate Director for International Programs Activities at the National Eye Institute - NIH, MD USA described the innovative global partnerships and collaborative research opportunities at NIH, mentioning the European institutions participating in those schemes. The session was completed with a talk by Dr. Thomas Skorda, head of the Photonics Unit, DG Connect at the European Commission, who summarized the new funding schemes and collaboration opportunities for Photonics in *Horizon 2020*.

The program also featured an ICFO Award ceremony to congratulate ICFOians who received prestigious awards and prizes during 2013, followed by ICFO's Ph.D. Student Poster Session, tours of the research labs, and different project meetings throughout the afternoon.

Around 150 attendees participated in this 5th edition of the ICFO Corporate Liaison Day including industry representatives from more than 50 companies. To date, ICFO has more than 30 members in its CLP Program which is dedicated to generating shared knowledge, mutual trust, and common benefits with corporations of all kinds.



1. More than 150 attendees participated in this 5th edition of the ICFO Corporate Liaison Day.
2. Gyan "John" Prakash presented "Innovative global partnerships and collaborative research opportunities at NIH".
3. Jari Kinaret (Graphene Flagship) and Thomas Skordas (Photonics in H2020) participate in lab tours with Prof. Valerio Pruneri.



YOUNG TALENT

ICFO takes the lead on European Projects

7 European projects focusing on energy, photonic outreach, photonic antenna for biology, early cancer detection, and graphene-based single-photon nonlinear optics are being coordinated by ICFO.

European collaborative research projects take many shapes and sizes, with a typical budget from €2-4 million in total and 4-8 partner institutions (under FP7), all working towards a common goal through their corresponding PIs and their research teams. The coordi-

nator of each project is chosen by all of the participating partners and must act as the liaison between the consortium and the European Commission to assure that the approved project proposal is delivered in time and form.

The fierce competition of these calls signals that the chosen coordinator is the true leader of that consortium, having not only excellent scientific skills but also experience in the overall management of the project. ICFO is currently coordinating 7 projects.



Coordinator: ICREA Prof @ICFO Romain Quidant
Participating institutions: UB, INSERM, EPFL, COSINGO

The **SPEDOC** project gathered forces of photonics experts, biotech engineers and oncologists to develop novel ultrasensitive cancer-marker sensing platforms for early detection and accurate treatment monitoring. By using the latest advances of surface plasmon nanophotonics, the **SPEDOC** action investigated different configurations of compact and ultra-sensitive sensors able to detect cancer markers both in the peripheral blood and at the surface of cells. The developed

sensors were implemented in a microfluidics environment to increase reproducibility, reduce the volume of analyte involved and enable parallel detection experiments on a single chip. The **SPEDOC** technologies bring us closer to early cancer screening and treatment monitoring from a simple blood sample. Beyond improving the quality of life of patients, fast and low cost early diagnosis would also have dramatic consequences on the reduction of healthcare expenses.

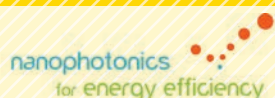
GRASP



Coordinator: Prof @ICFO Darrick Chang
Participating institutions: UNIVIE, UBER, UNEXE

Finding an approach to actuate nonlinear optical effects at ultra-low powers and on chip-scale devices is one of the outstanding challenges in optics. **GRASP** will pursue a fundamentally new paradigm – graphene-based single-photon nonlinear optics – that can potentially eliminate all of the current barriers. Specifically, we believe that the unique properties of graphene, such as extremely tight field confinement of surface plasmons and nonlocal interactions

between carriers, should enable giant optical nonlinearities even at the single-photon level. This research could lead to the first viable route to widely deployable, chip-scale classical and quantum nonlinear optical technologies.



Coordinator: Dr. Gonçal Badenes
Participating institutions: TUD, US, CEA-LETI, LENS, CSIC, BILKENT, KTH, UPC

The **Nanophotonics for Energy Efficiency** Network of Excellence aims at focusing nanophotonics research towards challenges in energy-efficient applications and enhancing information flow and collaborations between academia and industry. The project is open to participation by all stakeholders active in nanophotonics for lighting and photovoltaics applications and has created stable links with Photonics21, the Nanophotonics Europe Association and the European

Photovoltaics Technology Platform. Among other activities, it offers services to industry and research organizations, organizes scientific and industrial workshops, and training sessions.



Coordinator: UPC Prof @ICFO Jordi Martorell
Participating institutions: Specific Polymers, Nanograde Ag, Comsa Emte, Fraunhofer, FAU, RENT-A-SCIENTIST GMB

The impetus behind **SOLPROCEL** came from the realization of COMSA EMTE and ICFO of the potential that an organic photovoltaic (OPV) based technology has to be incorporated in transparent modules to generate electricity. Indeed, the OPV based technology can potentially be incorporated in transparent modules to generate electricity and is the only one capable of producing semi-transparent colourless cells providing clear and undistorted images when looking

through the device. It can be perfectly integrated in façades offering an enormous potential for electricity production units to penetrate in urban areas. However, transparent OPV cells are not yet ready for a module production. **SOLPROCEL** aims to obtain the materials needed for fully solution-processed high performance transparent OPV cells.



Coordinator: Prof @ ICFO Gerasimos Konstantatos
Participating institutions: Imperial, EPFL, TU/e, G24 Power

NANOMATCELL is a FET-ENERGY EU Funded project whose aim is to develop the next generation of low cost high efficiency solar cells to address the TW challenge. Research groups from ICFO, EPFL, ICL, TU/e and an industrial partner G24Power have united forces to develop new materials and new architectures for green solar cells that can provide for high efficiency, can be made at very low cost following solution processed manufacturing strategies and are based on Earth

abundant and environmentally friendly elements. We will design our materials from the atomic scale in order to control their electronic properties looking at different crystal structures and new inorganic semiconductors as well as design molecular semiconductor with tailored electronic properties. We will then devise novel architectural platforms to accommodate these materials and transform them into highly efficient cells.

nanovista



Coordinator: ICREA Prof @ ICFO María García-Parajo
Participating institutions: CNRS, RUNMC, EPFL, COSINGO.

The goal of **NANO-VISTA** is to generate new bionanophotonic tools for ultrasensitive detection and nanoimaging in-vitro and in living cells. By taking advantage of the extraordinary field enhancement and nanofocusing of photonic antennas, our approach will allow single-biomolecule detection in ultra-reduced volumes. **NANO-VISTA** partners include European specialists with long-standing expertise in nanophotonics, large-scale nanofabrication and nanoimmunology. In

the mid-long term we expect that biologists as well as industrial sectors (biophotonic, microscopy and biotechnology enterprises) will benefit from this novel technology.

GoPhoton!

Coordinator: ICFO KTT Unit through the ECOP Alliance
Participating institutions: Imperial, VUB, ILC, IOTA, Forschungsverbund Berlin E.V., Polimi, NUI Galway.

The mission of **GoPhoton!** is to make a significant contribution to raising awareness about the importance of Photonics among young minds, entrepreneurs and society as a whole. It aims to transmit across Europe that Photonics is ubiquitous and pervasive, it is a key enabler of the economy and job creation, and it offers outstanding career and business opportunities. The project addresses these goals through a series of actions that will be developed through ECOP (European

Centres for Outreach in Photonics) in eight European cities. These actions include activities, such as opening events, exhibitions, TEDx-like events and photonics congresses for children.

HORIZON 2020

The European Commission's 8th Framework Programme, a.k.a. **Horizon 2020**, goes into effect in 2014 and is the biggest ever EU research and innovation programme (€70 billion budget). H2020 places more emphasis than ever on bringing Europe's promising ideas from the laboratory to the market. In comparison to FP7, H2020 will provide more resources to encourage innovative small firms, fund

blue-sky research, and bring together different fields of science and technology, aiming to solve some of society's biggest challenges and keep Europe's economy competitive over the long term. During the recent CLP Day, Dr. Tomas Skordas discussed the role of Photonics in Horizon 2020, concluding that this Key Enabling Technology will play a major role in H2020, with funding earmarked throughout multiple calls.

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

HORIZON 2020

YOUNG MINDS



PhD
Open Days
@ICFO⁹

PhD Open Days @ ICFO 2013

ICFO opened its doors to young minds considering PhD studies

“Are you interested in starting a research career in science? Are you dreaming of making light work and converting technological advances into progress for society? Do you want to know how a cutting-edge and international research center looks from the inside?” - These were the questions ICFO addressed in the scope of the **PhD Open Days at ICFO** on November 28-29, 2013. The annual event is an excellent opportunity for the most talented and outstanding students to learn more about our research and training programs, with a special focus on doctoral degree studies and many PhD positions available each year.

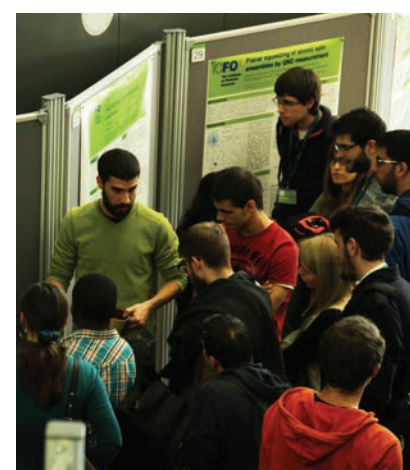
In this year's edition, 53 participants from different national and international institutions came together at ICFO. An internal committee awarded travel grants to 12 talented students coming from outside Catalonia, covering travel and accommodation costs, and ensuring the participation of students from around Europe. The attendees' background 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.

During the two day event, the participants had the opportunity to meet ICFO Group Leaders and other members of

the institute's research community, and gain insights into the reality of the PhD experience. The event was inaugurated by ICFO's Director, Lluís Torner, who gave a general presentation of the institute and the research conducted by ICFOians. The first day's activities also included:

- *“ICFOians: PhD and the career beyond”*, an interesting insight given by Dr. Chaitanya Suddapalli and Dr. Dhriti Ghosh, who recently completed their PhDs at ICFO, each receiving the ICFO PhD Thesis Award as a demonstration of the caliber of their research. The PhD Poster Session, during which the participants could directly interact with our researchers, above all on the PhD-level.
- Dedicated talks by the ICFO Group Leaders, presenting the variety of research conducted by the institute's research groups.

During the second day of the event, the attendees met with representatives of the ICFO PhD Student Chapter - ICONS in an informal breakfast gathering. Throughout the day they accomplished further informal meetings to present themselves and discuss potentially available PhD-projects, visited a number of labs, as well as attended the Annual PhD Poster Session and the PhD Thesis Award 2012 ceremonies.



PhD Poster Session & Award

PhD students share their research with CLP Day attendees as well as potential PhD candidates.



From left to right: Pelayo García de Arquer (3rd place), Ivan Nikitskiy (2nd place), Ione Verdeny (1st place), Paola Mantilla (ICONS), David Artigas (Head of Academic Affairs)

The Student Poster Session is held each year to encourage the exchange of ideas and knowledge between research groups at ICFO. This year, twenty three posters were exhibited in the hall of the Nest Building for an entire week, starting on 22 November, corresponding with the CLP Day, and continued on through Friday, 29 November, closing with an award ceremony within the framework of the PhD Open Day.

The selection of Best Poster was the result of three separate votes. All ICFOians were invited to participate in the selection of the top three posters via an online vote while the PhD Committee convened in parallel to select three best posters. These six posters were evaluated by an independent commission during the posters session which took place in the framework of the PhD Open Day, with the following results:

- **1st place:** *“Correlating cargo transport with the cytoskeletal network at high resolution”*. Presented by **Ione Verdeny**. Advanced fluorescence imaging and biophysics research group led by **Prof. Melike Lakadamyali**.

- **2nd place:** *“Hybrid graphene-quantum dot phototransistors for IR-imaging applications”*. Presented by **Ivan Nikitskiy**. Solution-processed nanophotonic devices and Nanophotonics research groups led by **Professors Gerasimos Konstantatos** and **Frank Koppens** respectively.

- **3rd place:** *“Hot-Electron plasmonically active Optoelectronics”*. Presented by **Francisco Pelayo García de Arquer**. Solution-processed nanophotonic devices research group led by **Prof. Gerasimos Konstantatos**.

This year, the Best Poster award was sponsored by ICONS (ICFO Organization and Network of Students) with the support received from OSA- SPIE.

PHD THESIS AWARDS

Applied, Industrial & Fundamental Research Award Recipients

Dr. Daan Brinks, Dr. Chaitanya Kumar Suddapalli and Dr. Dhriti Ghosh received the 2012 ICFO PhD Thesis Award.



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.

This year, ICFO recognizes Dr. Daan Brinks (Fundamental Research) Dr. Chaitanya Suddapalli (Applied Research) and Dr. Dhriti Ghosh (Industrial Research).

Dr. DAAN BRINKS



'Nanoscale Coherent Control: Ultrafast dynamics of single molecules, individual light harvesting complexes and discrete nano-antennas at room temperature'.
Supervised by ICREA Professor at ICFO **Niek van Hulst**.

"The main recognition is of course obtaining the PhD itself, but it is nice to get this award as a cherry on the pie; it signifies to my supervisor and all my collaborators that we did something right!"

Citation: Building on concepts from single molecule detection, pulse-shaping, ultrafast spectroscopy and plasmonics, Daan implemented during his doctoral years at ICFO a unique experimental set-up to observe and study the dynamics of single molecules at femtosecond timescales. Doing so allowed him to investigate fundamental aspects of nature such as the ultrafast quantum dynamics of complex molecular systems at room temperature. Pushing his thesis project far beyond the understanding of such fundamental aspects of light-matter-interaction, Daan was able to apply the techniques developed to investigate long lived coherence in light harvesting complexes which, in the future, may lead to novel artificial mechanisms that mimic nature in the conversion of luminous energy into other forms of energy. The exceptional quality of Daan's work has received an early recognition by the international scientific community that accepted the publication of part of his work in Science and Nature, the two top journals in the category of multidisciplinary sciences.

DR. CHAITANYA SUDDAPALLI



'High Power, Fiber-Laser-Pumped Optical Parametric Oscillators from Visible to Mid-Infrared'.
Supervised by ICREA Professor at ICFO **Majid Ebrahim-Zadeh**.

"To me, it is a great honor to receive this award, particularly for applied research. This recognition motivates me to aim at even more ambitious goals."

Citation: This thesis has demonstrated several mid-infrared optical parametric oscillators in the CW and picoseconds regimes using a fiber laser as a pump source. Many of his research tasks involved the most challenging experiments in OPOs and nonlinear frequency conversion systems. These have resulted in more practical, compact and low-cost systems, obtaining several world-record and world first breakthroughs in the field. These include the development of the first high-energy optical source in the mid-infrared for minimally invasive human surgery, the first demonstration of a fiber-pumped Ti:sapphire laser and the first application of an antiresonant ring interferometer for optimum output coupling in a ring optical oscillator. Testimony to his valuable contributions to the field are the 24 papers published since the start of his PhD, with more than 230 citations, a remarkable achievement for a PhD student in the field of applied photonics.

DR. DHRITI GHOSH



'Ultrathin metal transparent electrodes for the optoelectronics industry'.
Supervised by ICREA Professor at ICFO **Valerio Pruneri**.

"In my PhD, I came across many things, inside the lab and out. I learned the importance of concentrating on the aimed research work and giving one hundred percent without getting obsessed about the number of publications."

Citation: The thesis intended to develop transparent electrodes which could replace the more expensive Indium Tin Oxide (ITO) electrodes, and to integrate such technology into industrially relevant devices. His outstanding achievements are already having an impact on a wide range of photonic devices, including solar cells, light emitting diodes, displays and modulators. Over his time at ICFO, Dhriti has proven extraordinary scientific skills, combined with exceptional rigor, perseverance and creativity. These attributes led to a truly outstanding PhD thesis that has been widely acknowledged by the international community through 15 papers published in high-quality topical journals, 5 invited talks, 4 patent applications, the 2011 Student Innovation Prize awarded by the European Technology Platform Photonics21, and the selection of this Thesis by Springer Verlag in its annual selection "Springer Thesis Series – the best of the best". His contributions paved the way to the establishment of numerous one-to-one industrial projects with prominent companies worldwide, including Ficoso International, SEAT-Volkswagen, BASF, Carl Zeiss, Oclaro Inc., IBM and Corning Incorporated.

GO & FLY



66 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 ICFOnians have recently succeeded in defending their PhD Theses. Honouring ICFO's tradition, ICFOnians 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.



63 | OLGA BOROVKOVA
'Soliton generation and control in engineered materials'
TD: Prof. Lluís Torner and Dr. Yaroslav Kartashov
October 11, 2013



64 | KAVITA DEVI
'Continuous-wave optical parametric oscillators and frequency conversion sources from the ultraviolet to the mid-infrared'
TD: ICREA Prof. at ICFO Majid Ebrahim-Zadeh
October 24, 2013



65 | FRANCESCO PASTORELLI
'Light Enhancements in nanostructured solar cells'
TD: UPC Prof. at ICFO Jordi Martorell and Prof. Nicolas Bonod, Institut Fresnel-Université d'Aix Marseille (Erasmus Mundus Joint Doctorate Program Europhotonics)
December 9, 2013



66 | MARTA CASTRO
'Nanophotonic Structures for light control at the nanoscale'
TD: ICREA Prof. at ICFO Niek F. Van Hulst
December 17, 2013

HIGH PROFILE



Henrik Bindslev



In 2013, Henrik Bindslev took over as the director of Fusion for Energy (F4E), the EU's agency for ITER. He combines an extensive career in research including ten years at the Joint European Torus (JET), Europe's biggest fusion research device, with considerable experience from the European Energy Alliance (EERA), the European Strategy Forum on Research Infrastructures (ESFRI), and the Danish National Laboratory for Sustainable Energy.

Barcelona is proud to have the F4E headquarters here. What can the local community and industry gain from this proximity?

Proximity helps create awareness and connections. For example, the future presence of the UPC campus with which we would share premises will invariably help us to meet other engineers, scientists and physicists, at coffee breaks, or in the park. Likewise, if the local community perceives that proximity lowers the threshold for engagement and investment, then that is good for ITER. It is clear that we have to have an open doors policy for all of Europe, but gaining from F4E being here also depends on investments from local institutes and industries.

What are the opportunities for ICFO and our industrial partners to contribute to the ITER Project?

The opportunity for research institutes like yours arise when ITER is in need of something industry does not have on the shelf. We have contracts which are development-oriented, without specifying up front what will have to be delivered, based on consortia between industry and public research. I would think that industries would very much appreciate having an institute or a public research organization as a partner here. A centre like ICFO could actually take an active role in identifying industrial partners to

discuss how to make a consortium that might bid for a given industrial research project.

Clearly fusion requires a specialized workforce. How could a multidisciplinary centre like ICFO, devoted among other things to the training of new scientists, contribute to satisfy the workforce needs fusion will have to face in the coming decades?

Many of the engineers and physicists in fusion actually do come from other fields and bring with them a lot of synergies and ideas. For example, we have a new employee in robotics who worked in performing keyhole surgery with small robots. At F4E he has gone to almost the other end of the spectrum, working now with robots in harsh environments which weigh over 100 tons. The important thing is that he has been trained and exercised in robotics and brings with him good ideas that we will find useful in our area. Likewise, for those with training in photonics, they may go into fusion and suddenly discover a wealth of opportunities.

What happens after ITER?

ITER is a scientific experiment, an exploration tool which should bring mankind closer than ever in the exploitation of this unlimited source of energy.

DEMO, as we call the next step, will be a demonstration power plant. In DEMO, the focus would be on simplifying the overall system with a view to bringing costs down, increasing reliability. DEMO will be in very large measure designed in partnership with industry, we would want industry to take a leading role to say how we could optimize this for economy. After DEMO, it should be industry that takes over for the commercial power plants.

**ITER. Twenty-five years ago, a group of industrial nations agreed on the largest and most ambitious international scientific collaboration of all times called ITER which aims to develop fusion energy, an unlimited, clean and sustainable source of energy that is capable of covering all our needs.*

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