EOS SIOF CAPRI MEETINGS 2015

17 > 19 September

6th EOS Topical Meeting on Optical MicroSystems (OµS’15)

2nd EOS Topical Meeting on Optics at the NanoScale (ONS’15)

FINAL PROGRAM
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Capri is a beautiful and picturesque island in the Gulf of Naples that has been attracting countless visitors for thousands of years. Its mild climate, the numerous monuments and island highlights and last but not least the excellent Italian cuisine and wine culture make Capri a perfect location for high-quality EOS Topical Meetings in an enjoyable Mediterranean atmosphere. See also: www.capri.it

**The 6th EOS Topical Meeting on Optical Microsystems (OµS’15)**

takes place at the:
Hotel LaPalma
Via V. Emanuele 39
80073 Capri (NA), Italy
phone +39 081 837 0133
fax +39 081 837 6966
congressi@lapalma-capri.com
www.lapalma-capri.com

**The 2nd EOS Topical Meeting on Optics at the Nanoscale (ONS’15)**

takes place at the:
Hotel La Residenza
Via Federico Serena, 22
80073 Capri (NA), Italy
phone +39 081 837 0833
fax +39 081 837 7564
info@laresidenzacapri.com
www.laresidenzacapri.com

**DIRECTIONS BETWEEN THE VENUES**

The two hotels are at walking distance (less than 100 meters).

**GETTING AROUND AT CAPRI**

Getting around at Capri
www.capri.com/en/come-muoversi

By car
Please note that during the tourist season (generally from Easter to the first weekend of November) non-resident vehicles are not allowed to circulate on the island of Capri. It is advisable to leave cars in one of the attended car parks close to the points of embarkation.

Further Information
> Directions to Capri island (by plane, car or train)
www.capritourism.com/en/how-to-reach-capri
> Map of the island
www.capri.net/en/map
> Tourist information
www.capritourism.com
**INFORMATION FOR AUTHORS AND ATTENDEES**

**ORAL PRESENTATIONS**

Time slots: Presenting authors are allotted 15 minutes (12 minutes presentation plus 3 minutes for discussion) in the session of ONS and 20 minutes (15 minutes presentation plus 5 minutes for discussion) in the sessions of OµS. Please plan your presentation accordingly to meet the allotted maximum.

Presentation upload: Speakers are requested to upload their presentation to the computer in the meeting room well in advance to their talk.

Presentation format: Please bring your presentation on a USB mass storage, CD-ROM or DVD and include all video files. File formats: ppt, pptx and pdf. A Windows-based presentation computer will be provided.

For Mac users: To make sure your presentation is displayed correctly, please:
- bring your presentation as pdf-file with fonts embedded or
- restrict yourself to Arial/Times New Roman (not Times)/Courier New (not Courier)/Symbol/Windings when creating your ppt- or pptx-file.

Technical equipment: All technical equipment (presentation computer, video projector, sound system, laser pointer) will be available on-site. It is also possible to use your personal laptop.

**POSTER PRESENTATIONS**

Poster authors are requested to be present at their posters during the official poster session. Please prepare and print your poster in advance to the conference. Poster set-up and removal is in the responsibility of the authors. Any posters left on the boards at the close of the poster session will be discarded. Poster numbers will be displayed on the poster boards to show authors where to place their poster.

The official poster session will be held on Thursday, 17th of September at 18.30 at the gardens of the hotel la Residenza together with the welcome cocktail. The printed posters have to follow the portrait format requirements (width = 80 cm and height = 100 cm, not landscape format).

**REGISTRATION & FEES**

At least one author of an accepted presentation is requested to register properly in advance to the conference.

<table>
<thead>
<tr>
<th>Registration category</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members of SIOF, EOS, AEIT, SIF, OSA and AIDAA</td>
<td>400 €</td>
</tr>
<tr>
<td>Non-members*</td>
<td>530 €</td>
</tr>
<tr>
<td>Student members of SIOF, EOS, AEIT, SIF, OSA and AIDAA</td>
<td>250 €</td>
</tr>
<tr>
<td>Student non-members*</td>
<td>360 €</td>
</tr>
<tr>
<td>One-day</td>
<td>170 €</td>
</tr>
</tbody>
</table>

* incl. a one-year membership in SIOF and EOS

**EOS CONFERENCE DIGEST**

The registration fee includes a USB-Stick with the complete volume of accepted abstracts (plenary, invited and contributed) of the two topical meetings - Optical Microsystems (OµS’15) and Optics at the Nanoscale (ONS’15). Please note that the EOS does not publish conference proceedings with extensive papers. Authors who wish to publish in-depth papers are welcome to take advantage of the special publication offer for J EOS:RP (see the next paragraph). The publication offer for J EOS:RP is an option but no obligation.

**BEST STUDENT PRESENTATION AWARD**

The best student oral contribution of each EOS Topical Meeting in Capri 2015 - Optical Microsystems (OµS’15) and Optics at the Nanoscale (ONS’15) - and the best student poster presentation will be awarded a diploma and a prize sponsored by Springer. All student oral and poster contributions are eligible to the prize. The criteria for the award are relevance, originality, scientific merit and clarity.

**J EOS:RP SPECIAL PUBLICATION OFFER**

Authors can optionally submit a full manuscript of the accepted paper to the Journal of the European Optical Society Rapid Publications (J EOS:RP; www.jeos.org). The paper must be an original high-quality contribution connected to the Capri meetings.

Deadline: 16 October 2015. In case of acceptance authors receive a 20% discount on the publication rate.
SYNOPSIS

OµS’15 is the 6th edition of the international conference wholly dedicated to optical microsystems organized by the European Optical Society (EOS) and the Italian Society of Optics and Photonics (SIOF), Italian Branch of the EOS. An optical microsystem can be defined as a complex system, able to perform one or more sensing and actuation functions, taking advantage of the progress in micro- and nano-technologies to integrate in a smart way optical devices with electronic, mechanical and sensing components. The increasing interest in this field arises from the perspective applications that would significantly improve the quality of life. The list of possibilities offered by these enabling technologies is very long and seems to increase day by day. Optical microsystems are finding applications not only in ICT, but also in biotechnologies, medicine, food and environmental monitoring, aerospace and automotive, homeland security, etc.

The conference programme will focus on fundamental as well as more applied topics. Biosensors, biochips and lab-on-chip, microfluidic and optofluidic systems, non-linear and quantum optical devices, silicon-based optoelectronics and MOEMS, chemical and physical optical microsensors, new characterization methods for materials and devices, novel imaging techniques, biomimetic devices and systems are among the hot topics of the conference.

GENERAL CHAIRS

Ivo Rendina  
Consiglio Nazionale delle Ricerche (IT)

Eugenio Fazio  
Sapienza Università di Roma (IT)

Pietro Ferraro  
Consiglio Nazionale delle Ricerche (IT)

OµS’15 is organised in cooperation with the Italian Branch of the EOS:

TECHNICAL COMMITTEE

Francesco Baldini, SIOF president (IT)  
Mario Bertolotti, Sapienza Università di Roma (IT)  
Mathieu Chauvet, Univ. Franche Comté (FR)  
Stefano Cabrini, Lawrence Berkeley National Lab. / Ca (US)  
Giuseppe Coppola, Consiglio Nazionale Ricerche (IT)  
Giuseppe Coccorullo, Università della Calabria (IT)  
Principia Dardano, Consiglio Nazionale delle Ricerche (IT)  
Richard De La Rue, University of Glasgow (GB)  
Luca De Stefano, Consiglio Nazionale delle Ricerche (IT)  
John Dudley, EPS President (FR)  
Maria Antonietta Ferrara, Consiglio Nazionale Ricerche (IT)  
Simonetta Grilli, Consiglio Nazionale delle Ricerche (IT)  
Marco Iodice, Consiglio Nazionale delle Ricerche (IT)  
Bahram J alali, UCLA / Ca (US)  
Bahram J avidi, University of Connecticut (US)  
Lisa Miccio, Consiglio Nazionale Ricerche (IT)  
Francesco Merola, Consiglio Nazionale Ricerche (IT)  
Giampiero Pepe, Consiglio Nazionale Ricerche (IT)  
Angela Piegari, ENEA (IT)  
Sandro Rao, Università degli Studi “Mediterranea” di R.Calabria (IT)  
Graham Reed, University of Southampton (GB)  
Ali Serpenguezel, Koç University (TR)  
Luigi Sirleto, Consiglio Nazionale delle Ricerche (IT)  
Corrado Spinella, Consiglio Nazionale Ricerche (IT)  
Ralph PeterTatam, Cranfield University (GB)  
Ionel Valentin Vlad, Academiei Române (RO)  
Zeev Zalevsky, Bar-Ilan University (IL)

LOCAL ORGANIZING COMMITTEE

IMM, CNR  
Francesco De Icco  
Monica Gigliotti  
Vincenzo Palmieri  
Domenico Passaro  
Jane Politi  
Silvia Romano  
Stefania Torino

ISASI, CNR  
Loredana Salzano
### PLENARY SPEAKERS

**Thursday, 17 September 2015**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:10–10:50</td>
<td>Optical-Antenna-Enhanced Spontaneous Emission</td>
<td>Eli Yablonovitch, University of California (USA)</td>
<td>Pagano, Hotel La Palma</td>
</tr>
</tbody>
</table>

Antennas emerged at the dawn of radio for concentrating electromagnetic energy to a small volume $< \lambda^3$, allowing for nonlinear radio detection. Such coherent detection is essential for radio receivers, and has been used since the time of Hertz.

Conversely, an antenna can efficiently extract radiation from a sub-wavelength source, such as a small cellphone. Similarly antennas can accelerate spontaneous emission from a small quantum dot or molecule, whose emission rate can become faster than stimulated emission. Antennas interact equally with real electromagnetic fields, as well as quantum zero-point field fluctuations that are responsible for spontaneous emission.

**Friday, 18 September 2015**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30–11:10</td>
<td>Efficient visible photoluminescence from silicon nanostructures</td>
<td>Leigh Canham, PSiMedica Ltd (UK)</td>
<td>Pagano, Hotel La Palma</td>
</tr>
</tbody>
</table>

Nanostructuring the semiconductor silicon can dramatically change its properties. I will review progress over the last 25 years in optimizing and understanding its efficient visible luminescence. Quantum confinement effects and optimized surface passivation can produce tunable wavelength photoluminescence of remarkably high quantum efficiency. Some other remarkable properties of “nanosilicon” will also be mentioned that are relevant to microchip-based systems, medicine and consumer products.

<table>
<thead>
<tr>
<th>Time</th>
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<th>Speaker</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>16:20–17:00</td>
<td>On-demand optical properties at any given point in space and at any moment of time</td>
<td>Nikolay I. Zheludev, University of Southampton (UK) TIP &amp; Centre for Disruptive Photonic Technologies, NTU (China)</td>
<td>Hotel La Residenza</td>
</tr>
</tbody>
</table>

The next grand challenge for nanophotonics is to develop metamaterials with on-demand optical properties “on demand” when every individual metamolecule may be independently controlled at any given point in space and at any moment of time.

### INVITED SPEAKERS

**Thursday, 17 September 2015**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:20–11:50</td>
<td>Modern concepts for sensing molecular interactions</td>
<td>Antonio Varriale, Maria Strianese, Alessandro Capo, Angela Pennacchio, Maria Staiano and Sabato D’Auria (Institute of Food Science, Consiglio Nazionale delle Ricerche, Avellino, Italy)</td>
<td>Pagano, Hotel La Palma</td>
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</tbody>
</table>

The function of a protein is largely mediated through its interactions with other molecules. Consequently, molecular interactions are responsible of the regulatory processes of cellular functions. Hence it is of critical importance the mapping of protein-protein interactions. We will highlighting the progress that has been achieved in our labs for advanced sensing molecular interactions.

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<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Location</th>
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<tbody>
<tr>
<td>11:20–11:50</td>
<td>Group IV Mid-IR Photonics</td>
<td>Goran Mashanovich (University of Southampton, Optoelectronics Research Centre, United Kingdom)</td>
<td>Relais, Hotel La Palma</td>
</tr>
</tbody>
</table>

In this paper several Si and Ge mid-IR (MIR) photonic devices are reported. It is shown that SOI is a viable platform for wavelengths up to 4 m. For longer wavelengths, suspended Si platform is a good candidate and a novel approach that employ only one dry etch step is presented. For even longer wavelengths, Ge is the best candidate. Record low loss Ge-on-Si passive devices have been fabricated. All optical modulation has been achieved in Ge, and two photon absorption experiments conducted.
### INVITED SPEAKERS

**Thursday, 17 September 2015**

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>14:30–15:00</td>
<td>Functional Photonic Crystals From Porous Silicon</td>
<td>Michael Sailor (University of California, San Diego, United States of America)</td>
<td>Hotel La Palma</td>
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<tr>
<td>Pagano</td>
<td>The interplay of photoluminescence, structural color, high porosity, and large surface area in porous silicon presents many opportunities for chemical and biological sensing. Examples in this talk will include self-reporting drug delivery materials and end-of-service-life indicators for personal respirators.</td>
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<tr>
<td>14:30–15:00</td>
<td>Holographic sensors: advances, challenges and applications</td>
<td>Izabela Naydenova (Dublin Institute of Technology, Ireland)</td>
<td>Hotel La Palma</td>
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<tr>
<td>Relais</td>
<td>Holographic sensors are three-dimensional nanostructures created in functionalized polymers or natural organic polymer matrices that are sensitive to chemical or physical stimuli. This paper reviews the fabrication strategies for holographic sensors and describes holograms, which are sensitive to different chemical analytes and pressure.</td>
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<tr>
<td>16:30–17:00</td>
<td>Coherent Raman Scattering Microscopy</td>
<td>Martin Winterhalder and Andreas Zumbusch (University of Konstanz, Germany)</td>
<td>Hotel La Palma</td>
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<tr>
<td>Pagano</td>
<td>Coherent Raman Scattering (CRS) microscopy is a label free approach which provides an attractive complement to fluorescence based methods. While it does not feature the high sensitivity of fluorescence microscopy, its contrast generation based on vibrational molecular spectra circumvents both the labeling and the photobleaching problem. We will present the principles of CRS microscopy and highlight biological and material scientific applications.</td>
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<tr>
<td>16:30–17:00</td>
<td>Photonics-enhanced multifunctional polymer optofluidic chips</td>
<td>Heidi Ottevaere, Diane De Coster, Tom Verschooten, Jürgen Van Erps, Michael Vervaeke and Hugo Thienpont (Vrije Universiteit Brussel, Belgium)</td>
<td>Hotel La Palma</td>
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<td>Relais</td>
<td>We will touch upon various polymer-based micro-optical detection systems. For each system we will present the complete development process from optical design, to fabrication and proof-of-concept demonstration. We have created designs with a high sensitivity but yet with a relatively simple layout to ensure their manufacturability and robustness paving the way towards multifunctional, low-cost and portable lab-on-a-chip systems.</td>
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<tr>
<td>08:30–09:00</td>
<td>Key Enabling Technologies in the new concept of Smart Living</td>
<td>P. Siciliano, A. Leone and L. Francioso (CNR IMM, Italy)</td>
<td>Hotel La Palma</td>
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<tr>
<td>Pagano</td>
<td>This work refers to the use of Key Enabling Technologies for the development of advanced technological solutions for the realization of products (sensors, devices, etc.) and services which, according to a pattern of &quot;Ambient Assisted Living&quot; and &quot;Ambient Intelligence&quot;, enable to redesign the sense of “Smart Living” to ensure inclusion, safety, welfare, comfort, care, health care, environmental sustainability.</td>
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<tr>
<td>08:30–09:00</td>
<td>Mini-satellites: Small Missions?</td>
<td>Mario Cosmo (CIRA, Italy)</td>
<td>Hotel La Palma</td>
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<td>Relais</td>
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<tr>
<td>09:00–09:30</td>
<td>Opto-fluidics: do we really need only “new” materials for getting smart and fully integrated devices?</td>
<td>Cinzia Sada (University of Padova - Physics and Astronomy Department, Italy)</td>
<td>Hotel La Palma</td>
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<tr>
<td>Pagano</td>
<td>Opto-Microfluidics holds great promise to develop a lab-on-chip system that integrates different functionalities with applications to the chemical synthesis, biological analysis and optical sensing. Most of the challenges rely on the exploitation of materials hosting fully integrated stages. New perspectives will be presented on the use of &quot;old&quot; materials, such as lithium niobate and glasses, in comparison to &quot;new&quot; ones, with a special focus on particle manipulation and optical sensing.</td>
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### INVITED SPEAKERS

**Friday, 18 September 2015**

<table>
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<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
</tr>
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<tbody>
<tr>
<td>09:00&gt;09:30</td>
<td>Moving from photonics to microphotonics: The case in spacecraft engineering</td>
<td>Iain McKenzie (Optoelectronics Section (TEC MME), European Space Agency)</td>
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<td><strong>Relais, Hotel La Palma</strong></td>
</tr>
<tr>
<td>09:50&gt;10:20</td>
<td>Towards a two-photon multimode fiber endoscope</td>
<td>Christophe Moser, Edgar Morales, Salma Farahi, Demetri Psaltis and Ioannis Papadopoulos (EPFL, Switzerland)</td>
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<td><strong>Pagano, Hotel La Palma</strong></td>
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<td><strong>Pagano, Hotel La Palma</strong></td>
</tr>
<tr>
<td>11:20&gt;11:50</td>
<td>Q-plates and their applications: an overview</td>
<td>Lorenzo Marrucci (Università di Napoli Federico II, Italy)</td>
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<td><strong>Relais, Hotel La Palma</strong></td>
</tr>
<tr>
<td>14:30&gt;15:00</td>
<td>New methods for label-free optical computed tomography of live cells</td>
<td>Natan T. Shaked and MorHabaza (Tel Aviv University, Israel)</td>
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<td><strong>Pagano, Hotel La Palma</strong></td>
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<tr>
<td>14:30&gt;15:00</td>
<td>Engineering polymer micro and nanoparticles with controlled size, composition and morphology by microfluidics-assisted emulsification</td>
<td>Christophe Serra (University of Strasbourg, France)</td>
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<td><strong>Relais, Hotel La Palma</strong></td>
</tr>
<tr>
<td>15:40&gt;16:10</td>
<td>Biological Cells Tomography by Digital Holography: A short review</td>
<td>Christian Depeursinge (King Abdullah University of Science &amp; Technology Thuwal, Saudi Arabia)</td>
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<td><strong>Pagano, Hotel La Palma</strong></td>
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</table>
### INVITED SPEAKERS

#### Friday, 18 September 2015

<table>
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<th>Time</th>
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<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:10-17:40</td>
<td>Learning from examples in optical imaging systems</td>
<td>Demetri Psaltis (EPFL, Switzerland)</td>
<td>Pagano, Hotel La Palma</td>
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<td></td>
<td>We show that we can learn the shape of an object from examples formed by reconfiguring the optical system. We demonstrate this modality by constructing a neural network that models the optical system and training the network to match the experimentally measured data. The variables of the trained network yield the image of the unknown object at the end of training phase.</td>
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#### Saturday, 19 September 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>09:00-09:30</td>
<td>Multi-dimensional Displacement Measurement based on signal separation using Holographic Interferometry</td>
<td>Pramod Rastogi (Ecole polytechnique Fédérale de Lausanne, Switzerland)</td>
<td>Pagano, Hotel La Palma</td>
</tr>
<tr>
<td></td>
<td>This talk will encompass the latest trends and developments in multi-dimensional displacement measurement techniques in holographic interferometry using high resolution methods in signal processing. Experimental results and the statistical performance of the algorithms will be presented when applied to a multi-wave holographic interferometry setup for the simultaneous measurement of in-plane and out-of-plane displacements on a deformed object submitted to load.</td>
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<tr>
<td>09:00-09:30</td>
<td>New developments in lithium niobate nanophotonics</td>
<td>Maria-Pilar Bernal, Abdoulaye Ndao, Wentao Qiu, Nadège Courjal, Gwenn Ulliac, Roland Salut, Fadi I. Baida and Venancio Calero (CNRS FEMTO-ST, France)</td>
<td>Relais, Hotel La Palma</td>
</tr>
<tr>
<td></td>
<td>The optics community has used since decades lithium niobate (LN) material. Due to its multiphysical nature it is straightforward to imagine a LN chip in which thousands of optical functions are integrated. I will present our work in order to achieve this goal. Different active LN nanoophotonic functions will be presented. The possibility of using LN thin films has allowed us to improve the performances. Tunable Fano LN photonic crystals attached to a fiber for sensing will be demonstrated.</td>
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<tr>
<td>09:30-10:30</td>
<td>Simultaneous 3-D visualization and position tracking of optically trapped particles using optical diffraction tomography</td>
<td>Yongkeun Park (Department of Physics, KAIST, Republic of Korea)</td>
<td>Pagano, Hotel La Palma</td>
</tr>
<tr>
<td></td>
<td>We present a combined system employing optical diffraction tomography and holographic optical tweezers capable of simultaneous 3-D visualization of the shapes and tracking positions of trapped microscopic samples. We demonstrated the manipulation of a silica bead toward a white blood cell having complicated internal structures, and the tomographic measurements of 3-D dynamics of the white blood cell as it responded to an approaching glass bead in the high acquisition rate.</td>
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SYNOPSIS

New properties in nanoscale structures can be dramatically tuned with size and shape of the nanostructures. Completely different optical behaviors are produced compared to the bulk counterparts, such as narrow line widths for emission, solar energy conversion, etc. Indeed materials and applications require strong effort to develop spectroscopy and microscopy tools allowing visualization and manipulation of optical properties with nanoscale resolution. Optics at Nanoscale is a Topical Meeting that covers a spectrum from applied to basic research of this domain providing a forum for all the aspects with the purpose of advancing the state-of-the-art of nanoscale optics.

GENERAL CHAIRS

Didier Felbacq
University of Montpellier (FR)

Vito Mocella
Consiglio Nazionale delle Ricerche (IT)

Concita Sibilia
Sapienza Università di Roma (IT)

OµS’15 is organised in cooperation with the Italian Branch of the EOS:

LOCAL ORGANIZING COMMITTEE

IMM, CNR
Francesco De Icco
Monica Gigliotti
Vincenzo Palmieri
Domenico Passaro
Jane Politi
Silvia Romano
Stefania Torino

ISASI, CNR
Loredana Salzano

Publish your research

...with JEOS:RP

DISCOUNTED PUBLICATION RATES FOR ATTENDEES OF THIS EVENT

The paper submitted must be an original contribution that is connected to the topics of this EOS event. All submissions will be reviewed against JEOS:RP’s regular high standards for physical insight, quality and novelty.

JOURNAL OF THE EUROPEAN OPTICAL SOCIETY RAPID PUBLICATIONS

Paper submission deadline: 16 October 2015

Journal Management Contact:
Silke Kramprich | Phone: +49-511-2788-117 | Email: jeos-rp@myeos.org

www.jeos.org
Antennas emerged at the dawn of radio for concentrating electromagnetic energy to a small volume $\lambda^3$, allowing for nonlinear radio detection. Such coherent detection is essential for radio receivers, and has been used since the time of Hertz.

Conversely, an antenna can efficiently extract radiation from a sub-wavelength source, such as a small cellphone. Similarly antennas can accelerate spontaneous emission from a small quantum dot or molecule, whose emission rate can become faster than stimulated emission. Antennas interact equally with real electromagnetic fields, as well as quantum zero-point field fluctuations that are responsible for spontaneous emission.

Nanostructuring the semiconductor silicon can dramatically change its properties. I will review progress over the last 25 years in optimizing and understanding its efficient visible luminescence. Quantum confinement effects and optimized surface passivation can produce tunable wavelength photoluminescence of remarkably high quantum efficiency. Some other remarkable properties of “nanosilicon” will also be mentioned that are relevant to microchip-based systems, medicine and consumer products.

The next grand challenge for nanophotonics is to develop metamaterials with on-demand optical properties “on demand” when every individual metamolecule may be independently controlled at any given point in space and at any moment of time.

The development of advanced photonic circuits working in the visible light promises a revolution in a broad range of areas from bio-chemical sensing to quantum computing. We present here the first printed active photonic crystals with embedded quantum dots, fabricated by a powerful route, for nanolaser applications. This work represents a powerful and cost-effective route for the development of numerous nanophotonic structures and devices that will lead to the emergence of new applications.

This presentation will review literature results on the properties and behaviour of reduced graphene oxide (rGO) and it will present some new results related to the photo-thermal properties of rGO. Both graphene and rGO films clearly have the potential to be useful in adding a variety of compact functionalities to planar integration platforms such as the all-polymer and silicon-on-insulator (SOI) waveguide systems that are already accepted for applications in optical communications and sensing.
Thursday, 17 September 2015

14:30>15:00  Spin-Hall effects of light for polarisation control of guided waves
Anatoly Zayats (King’s College London, UK)

We will discuss spin-orbit coupling in optical waves interacting with plasmonic nanostructures. Spin-dependent directional excitation of guided modes, inverse spin-Hall effect and spin-controlled optical forces associated with unusual transverse spin of surface waves will be discussed.

15:00>15:30  Mapping optoelectronic processes at the native length scale in organic and inorganic nano composites
Alexander Weber-Bargioni (Molecular Foundry, LBNL, California)

Here we present insight into the local exciton transport through organic and inorganic semiconducting nano building block assemblies using state of the art near field optics, hyperspectral mapping, conductive AFM and photo Scanning Tunneling Microscopy. Controlling individual excitons and their deliberate movement through a material will provide the access to a new parameter space for the development of next generation light harvesting materials. E.g. with such control the captured energy in form of an excitons could be transported to predetermined sites in the material where the energy can be efficiently harvested. However, the lack of spatial resolution has so far prevented the insight needed to control the transport of optically excited electronic states at their native length scale. Using nano optics, modified confocal microscopy and scanning probe microscopy we study exciton transport through three model systems: Inorganic nano wires, 2-D assemblies of inorganic nano crystals, and through organic PV materials.

16:00>16:30  Ultra-short pulse chirp determination via transverse auto-correlation in SBN crystal
Crina Cojocaru (Universitat Politecnica de Catalunya, Spain)

Pulse compression in a dispersive nonlinear crystal with a random size and distribution of the anti-parallel orientated domains is observed via transverse second harmonic generation. The dependence of the transverse width of the second harmonic trace along the propagation direction allows the determination of the initial chirp parameter of ultra-short pulses down to 30 fs via single-shot transverse auto-correlation method.

Friday, 18 September 2015

09:00>09:30  Theoretical description of the interaction of light with resonant metal particle
Philippe Lalanne (Laboratoire Photonique, Numé’erique et Nanosciences, CNRS, France)

We propose an efficient and intuitive formalism (valid for lossy and dispersive resonators) to describe light scattering by a resonant metallic nanostructure. We apply it to various problems in quantum plasmonics, plasmonic sensing and spatial coherence in complex media.

11:20>11:50  Plasmonic materials and metamaterials manufactured utilizing directional solidification
Dorota Pawlak (Institute of Electronic Materials Technology, Poland)

Two novel bottom-up manufacturing methods for nanoplasmonic materials and metamaterials will be presented: (i) method based on directionally-grown self-organized eutectic structures; and (ii) NanoParticles Direct Doping method (NPDD) based on directional solidification of dielectric matrices doped with various nanoparticles. In both of these methods we can easily use all available resonant phenomena to develop materials with unusual electromagnetic properties.

12:35>13:05  Measuring polarization of light with nanoantenna arrays
Kristján Leósson (Science Institute University of Iceland, Iceland)

We introduce a new technique of polarization analysis using arrays of metal nanoantennas. A properly designed nanoantenna array allows for full Stokes vector characterization of incident light in a transmission geometry. We describe the polarimeter design and show experimentally that results of polarization measurements are comparable to those performed with a commercial terminating rotating-waveplate polarimeter, but offer much faster response and minimal signal perturbation.
### INVITED SPEAKERS

#### Friday, 18 September 2015

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<tr>
<th>Time</th>
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<tr>
<td>14:30&gt;15:00</td>
<td>A relation between Second Harmonic Generation (SHG) and superchiral light in chiral plasmonic nanostructures&lt;br&gt;Due to the favorable power-law scaling of near-field enhancements, the nonlinear optical properties of chiral plasmonic nano- and metamaterials are of prime fundamental and practical interest. The chiroptical effects in SHG are typically three orders of magnitude larger than their linear optical counterparts. We report that nonlinear chiroptical effects are also sensitive to superchiral light enhancements.</td>
<td>Ventsislav Valev (University of Bath, UK)</td>
<td>Hotel La Residenza</td>
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#### Saturday, 19 September 2015

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<tr>
<td>09:00&gt;09:30</td>
<td>Photonic thermotronics&lt;br&gt;The control of electric currents in solids is at the origin of the modern computer technology which has revolutionized our daily life. Until the 2000s no thermal counterpart had been developed to control the flow of heat. In this talk we introduce basic building blocks for a contactless technology dedicated to the thermal management.</td>
<td>Philippe Ben-Abdallah, Laboratoire Charles Fabry,CNRS, Institut d’Optique, France</td>
<td>Hotel La Residenza</td>
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<td>09:30&gt;10:00</td>
<td>PhoXonic crystals as phonon sources&lt;br&gt;Simultaneous confinement of light and sound in the same cavity enhances the phonon-photon interaction resulting in the optomechanical (OM) effect. A particular case are phoXonic crystals based on the concepts of photonic and phononic crystals, targeting high frequency phonons. We report OM transduction modes inside the complete bandgap, a novel spontaneous synchronization process and phonon generation in a Si 1D photonic crystal cavity at 300K.</td>
<td>Clivia M. Sotomayor Torres (ICREA and Catalan Institute of Nanoscience and Nanotechnology, Spain)</td>
<td>Hotel La Residenza</td>
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**O|S’15 & ONS’15 at a Glance**

<p>| O|S I | O|S II | ONS |
|---|---|---|---|
| <strong>Wednesday, 16 September 2015</strong> | 17:00&gt;19:00 REGISTRATION OPENING |
| <strong>Thursday, 17 September 2015</strong> | 09:00 REGISTRATION OPENING |
| Hotel La Palma | Hotel La Palma |
| 10:00&gt;10:50 PLENARY TALK | Optical-Antenna-Enhanced Spontaneous Emission |
| Eli Yablonovitch | Pagano, Hotel La Palma |
| Pagano, Hotel La Palma | Relais, Hotel La Palma | Hotel La Residenza |
| 13:00&gt;14:30 LUNCH BREAK | 13:00&gt;14:30 LUNCH BREAK | 13:00&gt;14:30 LUNCH BREAK |
| 14:30&gt;16:00 BIOPHOTONICS, BIOSENSORS&amp;BIOCHIPS | 14:30&gt;16:00 APPLICATION OF OPTICAL DEVICES&amp;SYSTEMS | 14:30&gt;16:30 SESSION II |
| 16:00&gt;16:30 COFFEE BREAK | 16:00&gt;16:30 COFFEE BREAK | 16:30&gt;16:45 COFFEE BREAK |
| 16:30&gt;18:00 OPTICAL MICROSCOPY, IMAGING&amp;CHARACTERIZATION METHODS | 16:30&gt;18:00 OPTICAL MICROSENSORS&amp;MICROSYSTEMS | 16:45&gt;18:00 SESSION III |
| 18:00&gt;19:30 Poster session and welcome cocktail |  | Hotel La Residenza |
| Hotel La Residenza |  | |
| <strong>Friday, 18 September 2015</strong> | 08:30&gt;10:20 MICROFLUIDICS&amp;OPTOFLUIDICS |
| 08:30&gt;10:10 AEROSPACE PHOTONICS | 10:15&gt;10:30 COFFEE BREAK |
| 10:20&gt;10:30 COFFEE BREAK | 10:15&gt;10:30 COFFEE BREAK |
| 10:30&gt;11:10 PLENARY TALK | Efficient visible luminescence from silicon nanostructures |
| Leigh Canham | Pagano, Hotel La Palma |</p>
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<td>17:10&gt;18:40 OPTICAL MICROSCOPY, IMAGING&amp;CHARACTERIZATION METHODS</td>
<td>17:10&gt;18:40 NONLINEAR&amp;QUANTUM OPTICAL DEVICES AND TECHNOLOGIES</td>
<td>17:10&gt;18:40 SESSION III</td>
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<td>09:00&gt;11:00 SESSION I</td>
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**Thursday, 17 September 2015**

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### 10:00–10:10 REGISTRATION OPENING

### 10:10–10:50 PLENARY TALK

**Optical-Antenna-Enhanced Spontaneous Emission**

Eli Yablonovitch

### 10:50–11:10 PLENARY TALK

**Group IV Mid-IR Photonics**

Goran Mashanovich

- In this paper several Si and Ge mid-IR (MIR) photonic devices are reported. It is shown that SOI is a viable platform for wavelengths up to 4 \(\mu\)m. For longer wavelengths, suspended Si platform is a good candidate and a novel approach that employ only one dry etch step is presented. For even longer wavelengths, Ge is the best candidate. Record low loss Ge-on-Si passive devices have been fabricated. All optical modulation has been achieved in Ge, and two photon absorption experiments conducted. [ONS'15 _03]

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<tr>
<td><strong>BIOPHOTONICS, BIOSENSORS &amp; BIOCHIPS</strong></td>
<td><strong>SILICON PHOTONICS</strong></td>
<td><strong>10:50–11:20</strong></td>
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#### 10:50–11:20 COFFEE BREAK

#### 11:20–11:50

**Modern concepts for sensing molecular interactions**

Antonio Varriale, Maria Strianese, Alessandro Capo, Angela Pennacchio, Maria Staiano and Sabato D’Auria

- The function of a protein is largely mediated through its interactions with other molecules. Consequently, molecular interactions are responsible of the regulatory processes of cellular functions. Hence it is of critical importance the mapping of protein-protein interactions. We will highlight the progress that has been achieved in our labs for advanced sensing molecular interactions. [OµS'15 _01]

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#### 11:50–12:10

**Optical biosensing in POCT: application to septic and transplanted patients**


- The design, implementation and characterization of optical biochips based on heterogeneous immunoassays are described for the determination of sepsis biomarkers in intensive care patients and of immunosuppressants in transplanted patients. [OµS'15 _02]

#### 11:50–12:10

**Strategies of 1D optical profile extraction for bulk Silicon solar cell simulations**

Silvio Pierro, Paul Procèl, Andrea Ingenito, Olindo Isabella, Miro Zeman, Marco Guevara, Noemi Guerra, Felice Crupi and Giuseppe Cocorullo

- The aim of this work is to propose an accurate procedure for the extraction of the 1D optical profile generation for back contact-back junction (BC-BJ) solar cells simulation, allowing the electrical model to consider a flat surface on the top. This procedure requires the inclusion of corrections like the effects of the surface texturization in the optical model. [ONS'15 _04]

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#### 11:50–12:10

**Properties of Gold 2D Array of Nanoholes Obtained by means of Absorption Spectra**

Fabio Bovino, Valentina Mussi and Concita Sibilia

- Tailoring and manipulation of surface plasmon polaritons (SPPs) could lead to unprecedented improvements in design and development of high performance optical components and circuits. In this work we examine both experimentally and theoretically the coupling properties of SPPs excited by means of a 2D array of cylindrical nanoholes perforating a 50 nm thick layer of gold. [ONS'15 _02]
### Thursday, 17 September 2015

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#### BIOPHOTONICS, BIOSENSORS & BIOCHIPS

**12:10>12:30**

**Digital Holography and Total Internal Reflection Fluorescence to Image Cell/Substrate Contacts**

Biagio Mandracchia, Alejandro Calabuig, Oriella Gennari, Melania Paturzo and Pietro Ferraro

We designed and built, and tested a new optical setup, which exploit the capabilities of Total Internal Reflection Fluorescence Microscopy in combination with Digital Holography to achieve further insight on phenomena at the cell/substrate interface. [OµS'15 _05]

#### SILICON PHOTONICS

**12:10>12:30**

**Strain Assessment In Strained-Silicon Photonic Structures**

Diego Marini, Giovanni Battista Montanari, Fulvio Mancarella, Filippo Bonafè, Matteo Ferri, Roberto Balboni and Gabriele Bolognini

In this work we report a study on lattice deformations induced by the deposition of a silicon nitride (Si3N4) strain layer onto silicon photonics coupling structures. In particular, stress and strain distributions across the nitride-to-silicon interface have been simulated while strain measurements in the Si structures have been performed using the Convergent Beam Electron Diffraction technique. Finally, estimations of the optical properties of strained SOI waveguides have been carried out. [OµS'15 _07]

**12:30>12:50**

**Study Of Hybrid Gold Nanoparticles Surface Plasmon Resonance For Quantitative Biomolecular Interaction Monitoring**


Localised surface plasmon is useful for biomolecular interaction monitoring. Here we report the synthesis of gold nanoparticles and nanorods modified using dycarboxylic PEG and hydrophobins proteins as stabilizers. Interaction with bio-chemical species changing the bioprobe was evaluated as well. X-ray photoelectron, Uv-vis, infrared spectroscopy and Fourier transform surface plasmon resonance were used as characterization techniques. [OµS'15 _06]

**12:30>12:50**

**Silicon Photomultipliers with Ultra-Low Dark Current and High Gain. Biomedical Application to Near Infrared Spectroscopy and Imaging**

R. Pagano, S. Libertino, M. Mazzillo, G. Fallica and S. Lombardo

Silicon Photomultipliers (SiPM) are promising photodetectors with high speed (<1ns), gain (>1e5), low bias (<100V), and high efficiency for single photon detection. Here we discuss our SiPM design, demonstrating high gain, responsivity, speed, time resolution and the design rules to reduce dark current down to the ultimate physical limit. We also report on the application of SiPMs to functional near-infrared spectroscopy and imaging, for the investigation in neuroscience of brain activity. [ONS'15 _04]

**12:05>12:20**

**Reduced Graphene Oxide for Integrated Nano-Photonics**

Richard De La Rue

This presentation will review literature results on the properties and behaviour of reduced graphene oxide (rGO) and it will present some new results related to the photo-thermal properties of rGO. Both graphene and rGO films clearly have the potential to be useful in adding a variety of compact functionalities to planar integration platforms such as the all-polymer and silicon-on-insulator (SOI) waveguide systems that are already accepted for applications in optical communications and sensing. [ONS'15 _03]

**12:20>12:50**

**Invited Talk**

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**13:00>14:30 LUNCH BREAK**
### Thursday, 17 September 2015

#### O1:S I

**Pagano, Hotel La Palma**

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<tr>
<td>14:30–15:00</td>
<td><strong>Invited Talk</strong> Functional Photonic Crystals From Porous Silicon <strong>Invited Talk</strong></td>
<td>Michael Sailor</td>
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<td>15:00–15:20</td>
<td>Biosilica nanovectors for imaging and therapeutic applications</td>
<td>M. Teraciano, L. De Stefano, A. Lamberti, H. A. Santos, N. M. Martucci, M. A. Shahbazi, A. Correira, I. Ruggiero, I. Rendina and I. Rea</td>
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<td>15:20–15:40</td>
<td>Single-Fiber Fluorescence micro-endoscope</td>
<td>Antonio Caravaca, Aguirre and Rafael Piestun</td>
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<td><strong>Invited Talk</strong> Silicon Photomultipliers application to biosensors</td>
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<tr>
<td>14:30–15:00</td>
<td>Holographic sensors: advances, challenges and applications</td>
<td>Izabela Naydenova</td>
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<tr>
<td>15:00–15:20</td>
<td>Structured light sensor-based platform for motor and cognitive rehabilitation</td>
<td>Alessandro Leone, Andrea Caroppo and Pietro Siciliano</td>
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<td>15:20–15:40</td>
<td>Silicon Photomultipliers application to biosensors</td>
<td>M. F. Santangelo, Emanuele Luigi Scuito, Alessandro Busacca, Salvatore Petralia, Sabrina Conoci and Sebastia Libertino</td>
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<td>Francisco Rodríguez Fortuño and Anatoly Zayats</td>
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<td>Alexander Weber-Bargioni</td>
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<td>The Enhancement of Second Harmonic Generation from Single NaNbO3 Nanocrystal with Mental Tip</td>
<td>Chengjie Ding, Gengxu Chen, E Wu, Xueling Ci, Liu Yan, YouyingRong, Botao Wu and Heping Zeng</td>
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**BIOPHOTONICS, BIOSensors & BIOCHIPS**

**APPLICATION OF OPTICAL DEVICES & SYSTEMS**

**ONS’15**

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<td>Fluorescence Immunoassay in Hollow Core Whispering Gallery Mode Resonators</td>
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<td>15:40&gt;16:00</td>
<td>Photopolymer-Based Volume Holographic Optical Elements: Design and Possible Applications</td>
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<td>Dissecting the Molecular Mechanism of Apoptosis during Photothermal Therapy using Gold Nanoprisms</td>
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**Biophotonics, Biosensors & Biochips**

- Francesco Baldini, Andrea Barucci, Simone Berneschi, Alessandro Cosci, Franco Cosi, Daniele Farnesi, Gualtiero Nunzi Conti, Giancarlo C. Righini, Silvia Soria, Sara Tombelli, Cosimo Trono, Stefano Pelli and Ambra Giannetti

A biological assay based on a fluorescent IgG/anti-IgG reaction is obtained in optical microbubble resonators (OMBRs) by a spatially selective photo-chemical process. The procedure still maintains high Q factors (> $10^5$) for these hollow core microcavities even in a physiological buffer solution (PBS) at the excitation wavelength of 1.6 µm. [OµS’15 _15]

- Gaetano Bianco, Maria Antonietta Ferrara, Fabio Borbone, Antonio Roviello, Valerio Striano and Giuseppe Coppola

Volume Holographic Optical Elements (V-HOEs) can be considered as components of a general optical system. In this paper, V-HOEs, such as holographic gratings and spherical lens, are designed and fabricated. As sensitive substrate, we used a prototype of photopolymer and for the recording of V-HOEs we used a typical holographic interferometry configuration. Characterizations of V-HOEs are reported, too. Finally, several applications of V-HOEs in different field of use are discussed. [OµS’15 _16]

- Marta Pérez-Hernández, Pablo Del Pino, Scott G. Mitchell, Maria Moros, Grazyna Stepien, Beatriz Pelaz, Wolfgang J. Parak, Eva M. Galvez, Julian Pardo and Jesús Martinez de La Fuente

Here we report the use of photothermal therapy using gold nanoprisms (NPRs) to specifically induce apoptosis in cells. In order to understand the different molecular pathways involved in this cellular death, we have analysed the mechanism of apoptosis using embryonic fibrobast cells from different knock out mice, which are deficient in proteins involved in the different routes of apoptosis. Our results show that “hot” NPRs activate the intrinsic/mitochondrial pathway of apoptosis. [ONS’15 _08]

**Invited Talk**

- Crina Cojocaru, Bingxia Wang, Íñigo Sola, Wieslaw Krolikowski, Yan Sheng, Ramon Vilaseca and Jose Trull

Pulse compression in a dispersive nonlinear crystal with a random size and distribution of the anti-parallel orientated domains is observed via transverse second harmonic generation. The dependence of the transverse width of the second harmonic trace along the propagation direction allows the determination of the initial chirp parameter of ultra-short pulses down to 30 fs via single-shot transverse auto-correlation method. [ONS’15 _09]
16:30>17:00
Coherent Raman Scattering Microscopy
Martin Winterhalder and Andreas Zumbusch
Coherent Raman Scattering (CRS) microscopy is a label-free approach which provides an attractive complement to fluorescence based methods. While it does not feature the high sensitivity of fluorescence microscopy, its contrast generation based on vibrational molecular spectra circumvents both the labeling and the photobleaching problem. We will present the principles of CRS microscopy and highlight biological and material scientific applications. [O1S’15 _17]

17:00>17:20
Scanning Femtosecond Stimulated Raman Microscope: a versatile setup for label-free bioimaging
Maria Antonietta Ferrara, Annalisa D’Arco, Maurizio Indolfi, Vittaliano Tufano, Ivo Rendina, Luigi Zeni and Luigi Sirleto
Recently, there has been an increase in the level of interest in label-free bioimaging based on vibrational spectroscopy, particularly for Stimulated Raman Scattering (SRS) microscopy. SRS is a shot-noise limited and non-resonant background technique. In this work, we report the implementation of a microscope based on femtosecond SRS (f-SRS). To demonstrate the feasibility of this approach, preliminary f-SRS images of polystyrene beads are reported, too. [O1S’15 _18]

17:20>17:40
A method for three-dimensional holographic tracking for trapped and free-flowing particles
Pasquale Memmolo, Lisa Miccio, Francesco Merola, Paolo Antonio Netti and Pietro Ferraro
A holographic-based tracking method is employed to investigate particles motility in different experimental situations, i.e., when they are optically trapped and during their free-flow in a microfluidic channel. [O1S’15 _19]

16:30>17:00
Photonics-enhanced multifunctional polymer optofluidic chips
Heidi Ottevaere, Diane De Coster, Tom Verschooten, Jürgen Van Erps, Michael Vervaek and Hugo Thienpont
We will touch upon various polymer-based micro-optical detection systems. For each system we will present the complete development process from optical design, to fabrication and proof-of-concept demonstration. We have designed designs with a high sensitivity but yet with a relatively simple layout to ensure their manufacturability and robustness paving the way towards multifunctional, low-cost and portable lab-on-a-chip systems. [O1S’15 _20]

17:00>17:20
High-Density Arrays of Micrometer-Sized and Submicrometer-Spaced Luminescent Polymer Pixels by Drop-Casting Technology
Giovanni Polito and Giuseppe Barillaro
Scaling down luminescent pixel size and spacing is a demanding challenge for the fabrication of next-generation low-power, low-cost and large-area displays. In this work, facile, parallel, and effective synthesis of high-density (up to 40 million per square centimeter) two-dimensional (2D) arrays of luminescent polymer micro-pixels (LPMPs), with micrometric size and spacing ranging from 13 nm down to 300 nm, is demonstrated by drop-casting of conjugated polymer (CP) into 2D macropore lattices. [O1S’15 _21]

16:45>17:00
Nanoscale volume confinement using double nanohole structure25 nm gap, to concentrate the light into an apex volume down to 70 zeptoliter (10^-21 L), 7000-fold below the diffraction-limited confocal volume. Using fluorescence correlation spectroscopy and time-correlated photon counting, we measure fluorescence enhancement up to 100-fold, together with local density of optical states enhancement of 30-fold. [ONS’15 _10]

17:00>17:15
Ab orientation onto AuNPs: towards improved sensing performance
Maria Moros, Ana Claro and Jesus Martinez de La Fuente
Latest advances in the fields of microelectronics and nanotechnology have been critical towards the rapid development of enhanced sensing platforms. Among the different nanomaterials, gold nanoparticles (AuNPs) exhibit new optical properties that can be exploited to build new biosensors. For instance, plasmonic NPs can produce heat upon excitation of their plasmonic band with light, which can be used to develop immunosensors. In order to improve the biosensor performance, herein we report a two-step methodology which involves an initial rapid ionic adsorption of the Ab followed by a much slower Ab covalent attachment, resulting in a covalently attachment of the Ab in an oriented fashion. The use of the proposed thermo sensor is being applied for the identification at point-of-care of the nature of binders from micro-samples of artworks. [ONS’15 _11]
### Optical Microscopy, Imaging & Characterization Methods

**17:40>18:00**  
**Optical memory effect in liquid crystals-carbon nanotubes dispersions**  
Teresa Cacace, Amanda García-García, Gianluigi Zito, Morten Andreas Geday, Giulia Rusciano, Volodymyr Tkachenko, Antonio Sasso, José Manuel Otón and Antigone Marino

Self-organizing properties of liquid crystals (LC) can be exploited to impose alignment on dispersed multiwall carbon nanotube (MWCNT). We show, by means of ellipsometry and Raman spectroscopy, how the interaction of these two materials with an electric field can lead to an optical memory effect. [OIS'S15 _22]

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**17:20>17:40**  
**Amorphous silicon photodiodes with integrated long-pass interferential filter**  
Domenico Caputo, Emanuele Parisi, Augusto Nascetti, Mario Tucci and Gianpietro de Cesare

In this work, we present an integrated structure, challenging the combination on the same glass substrate of the a-Si:H photosensors and a long-pass interferential filter, suitable for the detection of Ochratoxin A, a highly toxic mycotoxin present in widespread food commodities. The integration minimizes the distance between emission and detection sites allowing to achieve a very compact and efficient device. [OIS'S15 _23]

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**17:40>18:00**  
**High-frequency THz Ellipsometry on Oxide Interfaces**  
Andrea Rubano

A method to measure the dielectric function of optically dense materials and thin films in the THz range has been developed. THz Ellipsometry measures the polarization- and phase-sensitive THz reflected electrical transients. This method was first tested on a prototype perovskite, SrTiO3. Here we discuss the problems and technical challenges that must be faced by reproducing this procedure on 2-dimensional electron gases observed at oxides interfaces. The LAO/STO example is shown and discussed. [ONS'15 _24]

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### Optical Microsensors & Microsystems

**17:15>17:30**  
**LSHR nanosensors based on metamaterials for environmental analytes detection**  
Massimo Rippa, Eugenia Bobeico, Marianna Pannico, Pellegrino Musto and Lucia Petti

In recent years, there has been growing interest among researchers in plasmonic nanosensors for the detection of different analytes. In this work Localized Surface Plasmon Resonance (LSHR) nanosensors based on gold Thue-Morse nanopatterns with different shapes and sizes were fabricated by the use of the Electron Beam Lithography process. The sensitivity, the figure of merit of the nanosensor and the limit in detection of a pesticide (Thiram, C6H12N2S4) were evaluated and reported. [ONS'15 _12]

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**17:30>17:45**  
**An adaptive spectroellipsometric technology for monitoring aquatic systems**  
Ferdenant Mkrtchyan and Vladimir Krapivin

A compact measuring - information multi-channel spectroellipsometric system for monitoring the quality of aquatic environment, that is based on the combined use of spectroellipsometry and training, classification, and identification algorithms is described. [ONS'15 _13]

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**17:45>18:00**  
**Hybrid plasmonic modulators based on electro-optic polymers**  
Dimitrios C. Zografopoulos, Mohamed A. Swillam and Romeo Beccherelli

Novel hybrid plasmonic modulators are designed, based on the use of electro-optic polymer nanometric layers in hybrid silicon-gap-conductor waveguides. High modulation depths, small footprint, low insertion losses, and low power consumption are demonstrated. [ONS'15 _14]
POSTER SESSION

18:00 Poster Session and Welcome Cocktail at Garden of Hotel “La Residenza”

P1 Optically controlled release of biomolecules by porous silicon and microneedle based device: fabrication and characterization
Alessandro Calò, Principia Dardano, Jane Politi, Ilaria Rea and Luca De Stefano
In this work we report results on fabrication and characterization of a naked eye monitored device for release of biomolecules. It is constituted of a free-standing porous silicon membrane, that acts both as reservoir of biomolecules and monitoring system, and microneedles, used for release of drugs in the human body. The operation of the device is tested by means of the release of fluoresce in from it to the phosphate buffered saline.

P2 From Melanins to New Electroluminescent Materials for Bio-Inspired OLED Applications
Paola Manini, Valeria Criscuolo, Alessandro Pezzella, Orlando Crescenzi, Marco d’Ischia, Salvatore Aprano, Maria Grazia Maglione, Paolo Tassini and Carla Minarini
Reported herein is the synthesis of a series of melanin-inspired heterocyclic compounds and the investigation of their optoelectronic properties. The fabrication and characterization of the corresponding OLED devices highlighted the potentiality of these platforms as new bio-inspired electroluminescent materials.

P3 Photolithographic defined hydrogel-based microfluidic filter
Alessandro Calò, Jacques Leng, Jérémie Decock, Luca De Stefano and Jean-Baptiste Salmon
In this work, we report preliminary results on the fabrication and the characterization of a filter made with photoreactive hydrogel within a microfluidic circuit. We verified that fluorescent molecules are able to diffuse through the filter and that its kinetics doesn’t depend on the flow rate. The filter could be used for separation of cells from blood, microdialysis, etc.

P4 Pyroelectric emission analysis using microheaters from –Z surface of LiNbO3
Shomnath Bhowmick, Giuseppe Coppola, Mario Iodice, Mariano Gioffrè, Giovanni Breglio, Michele Riccio, Andrea Iraice and Gianpaolo Romano
The pyroelectric emission from the –Z surface of a single domain Lithium Niobate (LiNbO3) crystal was analyzed by integrating microheaters on the crystal. Thermal behavior of these microheaters were investigated theoretically and experimentally using COMSOL Multiphysics and FLIR SC7000 series thermo camera. The pyroelectric electron emission (PEE) from the –Z surface of LiNbO3 was measured using two-point probes method.

P5 Numerical studies of plasmonic metasurfaces consisting in metal cylinders on dielectric substrates
Roxana Tomescu and Cristian Kusko
In this paper we present the phase behavior of the transmitted wave through a plasmonic metasurface as a function of the incident beam wavelength. We investigate the phase shift by varying different geometrical parameters of the structures that composed the metasurface, in this case gold nano-cylinders. The results obtain show that the beam shape can be control while the help of plasmonic metasurfaces which leads to the possibility of development of flat optical components.

P6 Fibonacci diffractive lenses for THz focusing and imaging
Walter Furlan
We present a new design of diffractive bifocal THz lens constructed using the Fibonacci sequence. The axial irradiance produced by this lens is computed simulating a simple experimental setup composed of a conventional THz source and detector. The result is compared with the one obtained with a classical binary Fresnel diffractive lens of the same dimensions and optical characteristics.

P7 Photoluminescent ZnO Nanowires as quantitative tool for biosensing applications
Jane Politi, Ilaria Rea, Principia Dardano, Luca De Stefano and Mariano Gioffrè
Zinc oxide nanowires (ZnO NWs) grown on crystalline silicon, by hydrothermal method evidence intense photoluminescence emission under laser irradiation. In this study, ZnO NWs were biomodified in order to bind a proper bioprobe on the surface for selective protein-protein biorecognition. A quantitative and label-free monitoring of protein-protein interaction was obtained by photoluminescence emission of ZnO NWs under laser irradiation.

P8 Label-free optical biosensor for medical applications: detection of lymphoma cells
Nicola Massimiliano Martucci, Ilaria Rea, Immacolata Ruggiero, Monica Terracciano, Nunzia Migliaccio, Principia Dardano, Luca De Stefano, Paolo Arcari, Ivo Rendina and Annalisa Lambert
A new strategy for highly selective direct detection of lymphoma cells by exploiting the interaction between a peptide and its B-cell receptor has been evaluated. In particular, an idioype peptide, able to specifically bind the B-cell receptor of A20 cells, has been used as molecular probe. The new detection technique has been demonstrated on a silicon chip. The recognition strategy promises to extend its application in studying the interaction between ligands and their cell-surface receptors.
POSTER SESSION

**P9** Fabrication and characterization of a blue OLED based on α-NPD as emitting-layer
Salvatore Aprano, Elena Santoro, Michele Tesoro, Carmela Tania Prontera, Claudia Diletto, Maria Fiorillo, Giuseppe Cuomo, Valeria Criscuolo, Paola Marini, Alessandro Pezzella, Giuliano Sico, Maria Grazia Maglione, Paolo Tassini, Alfredo Rubino and Carla Minarini

An OLED device structure for blue fluorescent emission based on α-NPD and intrinsic degradation phenomena have been studied through shelf-life experiments performed at different storage conditions.

**P10** Enhancement of Stimulates Anti-Stokes Raman Scattering in Whispering Gallery Mode silica microspheres resonators
Daniele Farnesi, Gualtiero Nunzi Conti, Silvia Soria, Giancarlo C. Righini, Franco Cosi, Cosimo Trono and Simone Berneschi

Whispering gallery mode resonators provide huge advantages for Stimulated Raman Scattering (SRS) generation. We present cavity resonant enhanced Stimulated Anti-Stokes Raman Scattering (SARS) generation by SRS together with four wave mixing. Efficient SARS has been observed in silica microspherical resonators at the normal dispersion regime. The lack of correlation between stimulated anti-stokes and stokes scattering spectra indicates that the signal has to be resonant with the cavity.

**P11** Amplification of supercritical angle fluorescence at a dielectric-dielectric interface
Randhir Kumar and Sushil Mujumdar

The modification of photonic mode density has consequences on emission/amplification properties of emitters. Here, we investigate self-amplification of super-critical angle fluorescence (SAF) in an ensemble of emitters overlaying a dielectric interface. A comparison between SAF and normal fluorescence (NF) reveals several differences, apart from stronger amplification in the SAF at any excitation energy. Disturbance of pristine interface leads to contrasting effects on SAF and NF amplification.

**P12** TiO2 nanotube arrays: fabrication, properties, and biosensing applications
Vardan Galstyan, Monica Terracciano, Ilaria Rea, Giorgio Sberveglieri and Luca De Stefano

TiO2 nanotubes have been considered as promising functional materials in fabrication of biosensors for biomedical applications, due to their good biocompatibility, corrosion resistance, high orientation and uniformity, as well as the large surface area. In this work, we report fabrication and investigation of TiO2 nanotubes as label free-biosensor for biomedical applications.

**P13** Thrombin Recognition by Self-assembled Thiolated-TBA: QCM and ellipsometric characterizations
Jane Politi, Ilaria Rea, Principia Dardano, Ivo Rendina, Fabrizia Nici, Giorgia Oliviero, Gennaro Piccialli and Luca De Stefano

We present the self-assembling of a thiolated-Thrombin Binding Aptamer (TBA-SH) and the biorecognition with thrombin molecules on quartz resonators. Variable-angle spectroscopic ellipsometry (VASE) was also used to investigate the optical response of interaction monitoring.

**P14** Optical and thermal simulations of PhC devices
Massimo Borrelli, Principia Dardano, Marilena Musto, Giuseppe Rotondo and Mario Iodice

In this work we present optical and thermal simulations of two kinds of thermally controlled silicon PhC devices: an air hole in silicon slab, that switches between two refractive behaviors and a T-shaped circuit of silicon rods in air, that have an on-off behavior. Both effects are controlled by increasing the device temperature.

**P15** Design and realization of a portable continuous wave fNIRS system
Diego Agrò, Riccardo Canicattì, Maurizio Pinto, Gabriele Adamo, Riccardo Pernice, Antonio Parisi, Salvatore Stivala, Costantino Giaconia and Alessandro Busacca

A design of a portable functional Near InfraRed Spectroscopy device is described. We present an embedded system hosting 64 LED sources and 128 Silicon Photomultiplier (SiPM) detectors. The elementary part of the structure is a flexible probe “leaf” consisting in 16 SiPMs, 4 couples of LEDs, each operating at two wavelengths, and a temperature sensor. The performed preliminary experimental tests achieved very promising results, thus demonstrating the effectiveness of our fNIRS device.

**P16** Waveguide integrated amorphous silicon p-i-n temperature sensor for CMOS photonics
Sandro Rao, Giovanni Pangallo and Francesco Giuseppe Della Corte

A high-performance temperature sensor based on hydrogenated amorphous silicon p-i-n diode is presented. The linear dependence of the voltage drop across the forward-biased diode on temperature, in a range from room temperature up to 170°C, has been used for thermal sensing. A high sensitivity of 11.93 mV/°C in the biasing current range ≈34-40 nA has been measured.

**P17** An Integrated Electro-Optical Sensor for Electromagnetic Fields
Mario Medugno

We propose an integrated optical device enabling an affordable electromagnetic field sensing in the Fresnel region from the ELF band up to the GHz UHF band, suitable for near-field monitoring of critical communication structures.
P18 Volume Holographic Gratings as Optical Sensor for Detection of Heavy Metal in Water Solution

Gaetano Bianco, Maria Antonietta Ferrara, Fabio Borbone, Antonio Roviello, Valerio Striano and Giuseppe Coppola

In this work, we present a holographic sensor based on a volume holographic grating (VHG) recorded using a photopolymer functionalized to detect heavy metal in water. A change in the swelling state or cross-linking density of the polymer can be caused by the hologram interaction with an analyte, leading to a change in the recorded hologram. In particular, a variation of the VHG efficiency is observed when the sensor is exposed to heavy metal.

P19 Fiber optic sensors temperature and strain monitoring of the central beam pipe in the CMS experiment at CERN

Francesco Fienga, Giovanni Breglio, Noemi Beni, Salvatore Buontempo, Marco Consales, Andrea Cusano, Remi Favre-Felix, Andrea Gaddi, Michele Giordano, Andrea Irace, Zoltan Szillasi, Armando Laudati, Fabio Mennella and Luigi Petrazzuoli

The results of structural health monitoring of the central beam pipe in the CMS underground experiment at the CERN will be reported. The measurements are carried out by means of Fiber Bragg Grating (FBG) sensor arrays. This fiber optic monitoring system represents the ideal solution to realize a reliable and accurate sensing system to be used 24/7 in the harsh environment at CERN.

P20 Arc-induced Long Period Gratings in standard and hollow core optical fibers

Agostino Iadicicco, Rajeev Ranjan and Stefania Campopiano

In the last few years, Long Period fiber Gratings (LPGs) attracted the attention of scientific community as a basic enabling technology in sensing and communication applications. In this work, the fabrication of LPGs with electric arc discharge (EAD) process in both standard optical fibers and hollow core photonic bandgap fibers will be presented together with their characterization.

P21 From Melanins to New Electroluminescent Materials for Bio-Inspired OLED Applications

Paola Manini, Valeria Criscuolo, Alessandro Pezzella, Orlando Crescenzi, Marco d’Ischia, Salvatore Aprano, Maria Grazia Maglione, Paolo Tassini and Carla Minarini

Reported herein is the synthesis of a series of melanin-inspired heterocyclic compounds and the investigation of their optoelectronic properties. The fabrication and characterization of the corresponding OLED devices highlighted the potentiality of these platforms as new bio-inspired electroluminescent materials.

P22 Fishnets for optical coatings: Prototyping silica-silver-based structures

Anna Sytchkova, Daniele De Felicis, Guohang Hu, Edoardo Bemporad, Kui Yi and Angela Piegari

Fishnet metal-dielectric-metal structures suitable to application in optical filters of relatively large areas have been simulated for silver-oxide based structures. Experimental results are presented here for silica-silver-based structures fabricated for optical coating applications. Millimeter-size fishnets have been realized by combination of r.f. sputtering and lithographic techniques with focused-ion-beam writing.

P23 Nanostructured optical fiber probe for biochemical sensing based on Localized Surface Plasmon Resonance

Valentino Di Meo, Alessio Crescitelli, Ivo Rendina, Emanuela Esposito, Armando Ricciardi, Renato Severino, Giuseppe Quero, Benito Carotenuto, Marco Consales, Antonello Cutolo, Andrea Cusano, Menotti Ruvo, Annamaria Sandonenco, Anna Boriello, Lucia Sansone, Michele Giordano and Flavio Santorelli

Recently there is wide interest in the development of biochemical sensors based on localized surface plasmonic resonance. In this work, we report a LSPR-coupled fiber-optic nanoprobe (based on a gold nanostructure fabricated on the fiber tip by means of e-beam lithography and lift-off process) as a biosensor capable of label-free, real time detection of thyroid carcinomas biomarkers. Following a chemical and biological functionalization of the sensing area, human Thyroglobulin has been detected.

P24 Optimal Design of Plasmonic Chains for Second Harmonic Generation

Antonio Capretti, Carlo Forestiere and Giovanni Miano

Localized surface plasmon resonances can drastically enhance the nonlinear processes, including the second harmonic (SH) scattering. In this work, we perform the inverse design of a chain of gold nano-spheres maximizing its SH scattered power. This is obtained by coupling a genetic algorithm with the SH-Mie theory. Using this approach, we obtain general design criteria for optimal SH scattering, unveiling the importance of the in-phase photonic coupling in the SH generation process.

P25 Self-assembled hybrid organic-inorganic films for the optical sensing of zinc ions

Alfredo Franco, Sujatha Giacomazzo, Laura Brigo and Giovanna Brusatin

We present a fluorescent targeted zinc sensor based in a hybrid organic-inorganic sol-gel film. The sensor enhances its fluorescence under the presence of zinc ions in a selective way. The system is stable and reversible. It opens the doors to kinetic studies of zinc release from biological systems. AF is Marie Curie Fellow at University of Padova. Research leading to these results has received funding from the European Commission Seventh Framework Programme, under Grant Agreement n° 600376.
## Invited Talk

**Key Enabling Technologies in the new concept of Smart Living**

P. Siciliano, A. Leone and L. Franciosi

This work refers to the use of Key Enabling Technologies for the development of advanced technological solutions for the realization of products (sensors, devices, etc.) and services which, according to a pattern of "Ambient Assisted Living" and "Ambient Intelligence", enable to redesign the sense of "Smart Living" to ensure inclusion, safety, welfare, comfort, care, health care, environmental sustainability.

**Opto-fluidics: do we really need only "new" materials for getting smart and fully integrated devices?**

Cinzia Sada

Opto-Microfluidics holds great promise to develop a lab-on-chip system that integrates different functionalities with applications to the chemical synthesis, biological analysis and optical sensing. Most of the challenges rely on the exploitation of materials hosting fully integrated stages. New perspectives will be presented on the use of "old" materials, such as lithium niobate and glasses, in comparison to "new" ones, with a special focus on particle manipulation and optical sensing.

**Enhanced optical Transmission through slanted Annular Aperture Arrays**

Abdoulaye Ndao, Maria Maria - Pilar Bernal, Roland Salut, Tahseen Alaridhee, Anne Laure Fehrembach, Evgeni Popov and Fadi Issam Baida

We present here an overview of our recent results on enhanced transmission through arrays of annular apertures made in metallic film [1,2,3]. Both vertical and slanted apertures are numerically, theoretically and experimentally studied. Some interesting properties will be presented.

**High-field enhancement factor in photonic nanostructures**

Silvia Romano, Carlos Pina-Hernandez, Christophe Perez, Stefano Cabrini, Ivo Rendina and Vito Mocella

It has been demonstrated that perfect light confinement can be achieved because of a particular type of localized state, a Bound state in the continuum. These resonant states are characterized by practically zero width and may have a variety of potential applications. In this paper experimental details about the simulation and the characterization of photonic crystal membranes supporting bound states in continuum will be reported.

## MICROFLUIDICS & OPTOFLUIDICS

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<td>8:30–9:00</td>
<td>Key Enabling Technologies in the new concept of Smart Living</td>
<td>P. Siciliano, A. Leone and L. Franciosi</td>
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<td>9:00–9:30</td>
<td>Opto-fluidics: do we really need only &quot;new&quot; materials for getting smart and fully integrated devices?</td>
<td>Cinzia Sada</td>
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<td>9:30–9:50</td>
<td>Microfluidic Devices for Hydrodynamic Cell Rotation</td>
<td>Stefania Torino, Mario Iodice, Ivo Rendina, Giuseppe Coppola and Ethan Schorbrun</td>
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## AEROSPACE PHOTONICS

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<td>Mini-satellites: Small Missions?</td>
<td>Mario Cosmo</td>
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<td>9:30–10:00</td>
<td>Moving from photonics to microphotonics: The case in spacecraft engineering</td>
<td>Iain McKenzie</td>
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<td>Theoretical description of the interaction of light with resonant metal particle</td>
<td>Philippe Lalanne</td>
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<td>9:30–10:00</td>
<td>Enhanced optical Transmission through slanted Annular Aperture Arrays</td>
<td>Abdoulaye Ndao, Maria Maria - Pilar Bernal, Roland Salut, Tahseen Alaridhee, Anne Laure Fehrembach, Evgeni Popov and Fadi Issam Baida</td>
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<td>9:45–10:00</td>
<td>High-field enhancement factor in photonic nanostructures</td>
<td>Silvia Romano, Carlos Pina-Hernandez, Christophe Perez, Stefano Cabrini, Ivo Rendina and Vito Mocella</td>
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### MICROFLUIDICS & OPTOFULIDICS

#### 9:50>10:20
Towards a two-photon multimode fiber endoscope
Christophe Moser, Edgar Morales, Salma Farahi, Demetri Psaltis and Ioannis Papadopoulos

Mode control of a multimode fiber has been shown by manipulating cw light with a spatial light modulator. However, propagation of a light pulse suffers additionally from time broadening due to modal dispersion. We present a method to selectively excite specific modes that allows the transmission of a femtosecond pulse.

[OµS'15 _30]

### MICROOPTICS & OPTICAL DEVICES BASED ON NOVEL CONCEPTS

#### 11:20>11:50
Quantitative phase-digital holographic microscopy: a promising imaging technique to identify new cellular biomarkers of diseases
P. Marquet, K. Rothenfusser, P. J. Ourdain, C. Depeursinge and P. Magistretti

Quantitative phase microscopy has recently emerged as a powerful label-free technique in the field of cell imaging allowing to non-invasively monitor various cell parameters by measuring the phase retardation of a light wave when transmitted through the observed cells. Practically Quantitative phase-digital holographic microscopy, thanks to its numerical flexibility facilitating parallelization and automation processes, represents an appealing imaging modality to identify new cellular biomarkers.

[OµS'15 _31]

#### 11:20>11:50 Invited Talk
Q-plates and their applications: an overview
Lorenzo Marrucci

I will review the main applications of the q-plate demonstrated since its introduction. Q-plates are used for generating and manipulating vector-vortex beams, polarization singularities, and nodal optical areas. The generated photonic states can have tailored rotational properties, useful for applications ranging from quantum communication to angular metrology. Among the most striking recent results is the recent demonstration of Möbius strips of optical polarization.

[OµS'15 _33]

#### 11:20>11:50 Invited Talk
Plasmonic materials and metamaterials manufactured utilizing directional solidification
Dorota Pawlik, Katarzyna Sadecka, Pawel Osewski, Marcin Gajc, Andrzej Klos, Emilia Petronijevic, Alessandro Belardini, Grigori Leahu and Concita Sibilia

Two novel bottom-up manufacturing methods for nanoplasmonic materials and metamaterials will be presented: (i) method based on directionally-grown self-organized eutectic structures; and (ii) NanoParticles Direct Doping method (NPDD) based on directional solidification of dielectric matrices doped with various nanoparticles. In both of these methods we can easily use all available resonant phenomena to develop materials with unusual electromagnetic properties.

[ONS'15 _19]
The new detection technique has been demonstrated on a silicon chip. The B-cell receptor has been evaluated. In this work, we have described the structure and the electro-optical measurements carried out on our Dye Sensitized Solar Cells based on Ruthenium complex N719. The measurements have been performed at different irradiance levels, incident wavelengths, temperatures and hours of light soaking. The obtained results show a maximum conversion efficiency around 11-12% around 550 nm. In addition, the main electrical parameters increase with the hours of light soaking and decrease with the temperature. [OμS’15 _36]

12:10-12:30
Coupled-resonator sensors. Beyond the standard cavity enhancement
Pietro Malara, Antonio Giorgini, Saverio Avino, Gianluca Gagliardi and Paolo De Natale
A large sensitivity enhancement of optical fiber sensors can be obtained with coupled-resonator configurations (CRS). In the presentation, supported by a theoretical model and experimental results, it is shown that CRSs can largely overperform traditional resonant sensors based on fiber loops or Fabry-Perot cavities, at no additional cost and without altering the sensor robustness. They thus represent an excellent candidate for a new class of ultrasensitive optical fiber sensors. [OμS’15 _37]

12:20-12:35
Scrutinizing the light absorption in plasmon-enhanced thin film solar cells with combined spectroscopy
Isodiana Crupi, Seweryn Morawiec, Jakub Holovsky, Manuel J Dong Mendes, Martin Mullerm, Martin Ledinsky, Antonin Fejfar and Francesco Priolo
The light scattering properties of metal nanoparticles (NPs) sustaining surface plasmons are attractive for light trapping in thin film solar cells. By employing a combination of opto-electronic spectroscopic techniques, we present a novel characterization procedure to discriminate between the useful (that generates photocurrent) and parasitic (that lost as heat) light absorption in thin mc-Si:H films incorporating plasmonic NPs. [ONS’15 _22]
### OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

**12:30>12:50**

**Easy detection of very diluted biomolecules by direct laser-induced accumulation**

Oriella Gennari, Simonetta Grilli, Pierangelo Orlando, Veronica Vespini, Luigi Battista, Lisa Miccio, Sara Coppola and Pietro Ferraro  
A pyro-concentrator, able to accumulate biomolecules onto a conventional binding surface, is described. The reliability of the technique is demonstrated for labelled oligonucleotides diluted serially. Good results are shown also for sample of clinical interest, like gliadin, where a 60-fold improved LOD is reached, compared with standard ELISA. This method could open the way to a mass-based technology for sensing molecules at very low concentrations, in biomedicine, safety and eco-pollution.  

**12:30>12:50**

**Fast ELEDs for Quantum Teleportation over 1km**

Joanna Skiba, Mark R. Stevenson, Christiana Varnava, Jonas Nilsson, Bronislav Dzurnak, Marco Lucamarini, Richard V. Penty, Ian Farrer, David Ritchie and Andrew Shields  
Quantum teleportation promises guaranteed information security to multiple clients of quantum communication networks. We report photon quantum teleportation using a practical semiconductor source of entangled light, based on a quantum dot within a light-emitting-diode.  

### MICROOPTICS & OPTICAL DEVICES BASED ON NOVEL CONCEPTS

**12:30>12:50**

**Invited talk**

**Fast ELEDs for Quantum Teleportation over 1km**

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### BIOPHOTONICS, BIOSENSORS & BIOCHIPS

**13:10>14:30**

**LUNCH BREAK**

### MICROFLUIDICS & OPTOFLOWDICS

**14:30>15:00**

**Invited talk**

**A relation between Second Harmonic Generation (SHG) and superchiral light in chiral plasmonic nanostructures**

Ventsislav Valev  
Due to the favorable power-law scaling of nearfield enhancements, the nonlinear optical properties of chiral plasmonic nano- and metamaterials are of prime fundamental and practical interest. The chiroptical effects in SHG are typically three orders of magnitude larger than their linear optical counterparts. We report that nonlinear chiroptical effects are also sensitive to superchiral light enhancements.
OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

15:20>15:40

The reflection image visualization of the micro eyeballs of the dragonfly
Hocheol Lee, Wooseok Lee and Kang-Soo Lee

The compound eye of the dragonfly has been attracted due to its special figure. And several manufacturing techniques have tried to demonstrate it as the optical device. In this study, we visualized the reflection images of the thousands of the eyeball of the dragonfly by the photorealistic ray-traced rendering. Each micro eyeball has the redundant reflection image, which is different from the reference image by the human eye. It needs a special image processing for the biomimetic device. [OµS'15_43]

15:40>16:10

Biological Cells Tomography by Digital Holography: A short review
Christian Depeursinge

In this presentation we present a short review of our works and other works as well regarding tomographic imaging of dielectric object, biological cells in particular. The complex electromagnetic wavefield scattered by the specimen, can be obtained by reconstruction of digital holograms or by other methods described as Quantitative Phase Imaging. This approach leads to a growing modality in microscopy, which will find its own path in addition to intensity based imaging methods like fluorescence. [OµS'15_44]

ONs

15:00>15:15
Nonlinear Optical Properties of Self Assembled Gold Structures
A. Belardini, M. Centini, G. Leahu, E. Fazio, C. Sibilia, J. Haus, A. Sarangan

The second harmonic generation (SHG) from a self-assembled matrix of tilted gold nanowires (NWs) on a silicon substrate has been investigated. The break of symmetry has been put into evidence by means of polarization dependent measurements. [ONS'15_25]

15:15>15:30
Time-resolved carriers and lattice dynamics in the topological insulator Bi2Te3
Davide Boschetto, Nicolas Moisan and Marino Marsi

We report on the investigation of carrier dynamics and coherent lattice vibrations in the topological insulator Bi$_2$Te$_3$ by two color optical pump-probe measurements at femtosecond timescale. The results, compared to our recent measurements by femtosecond time-resolved ARPES experiment, allow to depict the whole scenario of the interplay between electrons and phonons dynamics. In particular, we will highlight the different dynamics at the surface and in the bulk states due to the topological properties of this material. [ONS'15_26]

15:30>15:45
MoO3-doped V2O5 thin film electrodes for rechargeable Li-ion batteries
Manuel Costa

Vanadium pentoxide (V2O5) thin films is being extensively explored as electrochromic device. In the work herein reported we researched the use of vanadium pentoxide thin films as electrodes on rechargeable Li-ion batteries and in particular the effect of molybdenum doping. It was studied the MoO3 doping of V2O5 thin films that proved to exhibit enhanced electrochemical performances than pure V2O5. [ONS'15_27]
### OμS I
- Pagano, Hotel La Palma

### OμS II
- Relais, Hotel La Palma

### ONS
- Hotel La Residenza

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>15:45-16:00</td>
<td>Engineering triggered single photon source with a negatively charged single silicon vacancy color center in diamond</td>
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<tr>
<td>Yan Liu, Youying Rong, E Wu, Heping Zeng, Botao Wu and Chengjie Ding</td>
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<tr>
<td>A stable triggered single photon source with narrow linewidth, good polarization and short emission duration were achieved by exciting a negatively charged single silicon vacancy color center with a picosecond laser. It can be used in quantum cryptography, and quantum information processing. [ONS'15 _28]</td>
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**16:10-16:20 COFFEE BREAK**

**16:20-17:00 PLENARY TALK**

*On-demand optical properties at any given point in space and at any moment of time*

Nikolay I. Zheludev
### Friday, 18 September 2015

#### O@S I

**Pagano, Hotel La Palma**

**OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS**

<table>
<thead>
<tr>
<th>17:10&gt;17:40</th>
<th>Invited Talk</th>
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<tbody>
<tr>
<td>Learning from examples in optical imaging systems</td>
<td>Demetri Psaltis</td>
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<tr>
<td>We show that we can learn the shape of an object from examples formed by reconfiguring the optical system. We demonstrate this modality by constructing a neural network that models the optical system and training the network to match the experimentally measured data. The variables of the trained network yield the image of the unknown object at the end of training phase. [O@S’15 _48]</td>
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<tr>
<th>17:40&gt;18:00</th>
<th>Overcoming the Rayleigh Criterion in Video-Confocal Microscopy</th>
<th>Pier Alberto Benedetti</th>
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<tbody>
<tr>
<td>Interest persists in designing improved, more widely usable and affordable optical microscopes for “diffractive superresolution”. It will be illustrated how a recent generation of VCM methods harness non-linear, statistical analysis of signals collected as functions of illumination and detection patterns, exploiting the peaks more than the belly of signal amplitude distribution and superresolving 3D structures down to 50 nm, in compact and sparse specimens. [O@S’15 _49]</td>
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<tr>
<th>18:00&gt;18:20</th>
<th>Imaging by structured light and single pixel detection: encoding phase with colors</th>
<th>Edoardo De Tommasi, Luigi Lavanga, Stuart Watson, Kishan Dholakia and Michael Madou</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this paper the imaging of extended targets by means of structured light and single-pixel detection is examined. In particular, different kinds of illumination patterns (discrete Hadamard; continuous sinusoidal; complex Laguerre-Gauss) are compared both numerically and experimentally in terms of obtainable resolution. Finally, a new approach for encoding the phase of a complex pattern is presented, allowing to reduce the number of required illuminations for a given resolution. [O@S’15 _50]</td>
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#### O@S II

**Relais, Hotel La Palma**

**NON-LINEAR & QUANTUM OPTICAL DEVICES AND TECHNOLOGIES**

<table>
<thead>
<tr>
<th>17:10&gt;17:30</th>
<th>Optical Frequency Transfer Employing Bi-Directional Distributed Raman Amplification</th>
<th>Gabriele Bolognini, Cecilia Clivati, Stefano Faralli, Filippo Levi, Alberto Mura and Davide Calonico</th>
</tr>
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<tr>
<td>In this work we report on the use of distributed Raman amplification (DRA) for optical frequency transfer over long-haul fiber links. Bi-directional Raman amplification techniques have been assessed with optimized input parameters allowing for coherent optical frequency transfer over a 305 km fiber. We also describe the successful use of DRA for frequency transfer over a real 94 km metro fiber link in presence of data channels with attained fractional frequency instability of $3 \times 10^{-19}$ at 1000 s. [O@S’15 _51]</td>
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<table>
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<tr>
<th>17:30&gt;17:50</th>
<th>Novel liquid crystal cells using LiNbO3 crystals: properties and perspectives</th>
<th>Liana Luccetti, Katerina Kushnir, Anna Maria Zaltron and Francesco Simoni</th>
</tr>
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<tbody>
<tr>
<td>In this work we report on our preliminary results about the realization and optical behavior of novel LC cells using z-cut LiNbO3 crystals as substrates. An optical switch based on these kind of cells is also demonstrated as an example of possible application. [O@S’15 _52]</td>
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<td>In this work we present a simple multiscale process for the fabrication of micro-optical elements using high viscous polymer materials. In particular the pyro-electric effect activated onto a Lithium Niobate crystal is exploited for the fabrication on demand of micro lens array. [O@S’15 _54]</td>
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#### ONS

**Hotel La Residenza**

**OPTICAL FREQUENCY TRANSFER**

<table>
<thead>
<tr>
<th>17:10&gt;17:40</th>
<th>Teleportation Scheme Based on Classical Entanglement</th>
<th>Fabio Bovino</th>
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<tr>
<td>Entanglement has always been a key issue in the foundation and interpretation of Quantum Mechanics. Classical Entanglement denotes the occurrence of some mathematical and physical aspects of quantum entanglement in classical beams of light. Here we extend the concept of classical entanglement to propose a novel architecture to implement a quantum processor that provides deterministic universal logic gate and more complex scheme as entanglement generator and teleportation. [ONS’15 _29]</td>
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<tr>
<th>17:40&gt;17:55</th>
<th>Position-Dependent Local Detection Efficiency in a Nanowire Superconducting Single-Photon Detector</th>
<th>J elmer Renema, Qiang Wang, Rosalinda Gaudio, Andreas Engel, Martin van Exter, Andrea Fiore and Michel de Dood</th>
</tr>
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<tr>
<td>We use quantum detector tomography to determine and separate the polarization dependent absorption and internal detection efficiency (IDE) of a photon counting NbN superconducting nanowire. The observed linear exchange between photon energy and detector bias current for excitation energies in the 0.8-10 eV range points to a diffused cloud of quasiparticles in the detection model. The measured polarization dependent IDE implies a spatially non-uniform response that we resolve with ~10 nm (~50) resolution using far-field illumination only. [ONS’15 _30]</td>
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<tr>
<th>17:55&gt;18:10</th>
<th>Ultracold Quantum Gases InterFaces</th>
<th>Maurizio Artoni</th>
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<tr>
<td>We present the development of a novel interface based on a phase-resonant excitation mechanism to control the phase of a weak light pulse as well as frequency-bin entanglement. [ONS’15 _31]</td>
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### OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

**18:20>18:40**

**Combined Holographic/ Raman microscopy approach for sperm cell characterization**

Annalisa De Angelis, Maria Antonietta Ferrara, Giuseppe Di Caprio, Stefano Managò, Luigi Sirleto, Giuseppe Coppola and Anna Chiara De Luca

A complete, label-free and non-destructive analysis of semen quality is required before artificial insemination. In this work, a combined optical approach based on Digital Holography and Raman Spectroscopy is proposed and applied to characterize single selected sperm cells. Indeed, the presented approach provides fast high-resolution cell images allowing morphological identification of cell defects and high-specific biochemical maps providing information on their nature.

[ONS'15 _55]

### NON-LINEAR & QUANTUM OPTICAL DEVICES AND TECHNOLOGIES

**18:10>18:30**

**Graphene and carbon black nanocomposite polymer absorbers for pyro-electric high resolution printing and energy harvesting**

Sara Coppola, Laura Mecozzi, Veronica Vespini, Luigi Battista, Simonetta Grilli and Pietro Ferraro

The pyro-electrohydrodynamic (EHD) manipulation of liquids has been discovered and demonstrated recently as a high resolution printing technique. Here we show a new modality for triggering the pyro-EHD process through a light-absorbing polymer nanocomposite layer deposited on the ferroelectric substrate.

[ONS'15 _56]

### 20:30 SOCIAL DINNER

at “da Paolino Lemon Trees” Restaurant
<table>
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<tr>
<th>09:00&gt;09:30</th>
<th>Invited talk</th>
<th>09:00&gt;09:30</th>
<th>Invited talk</th>
<th>09:00&gt;09:30</th>
<th>Invited talk</th>
</tr>
</thead>
</table>
| Multi-dimensional Displacement Measurement based on signal separation using Holographic Interferometry  
Pranod Rastogi  
This talk will encompass the latest trends and developments in multi-dimensional displacement measurement techniques in holographic interferometry using high resolution methods in signal processing. Experimental results and the statistical performance of the algorithms will be presented when applied to a multi-wave holographic interferometry setup for the simultaneous measurement of in-plane and out-of-plane displacements on a deformed object submitted to load.  
[OµS’15 _57] | New developments in lithium niobate nanophotonics  
Maria-Filar Bernal, Abdoulaye Ndao, Wentao Qiu, Nadège Courjal, Gwenn Ulliac, Roland Salut, Fadi I. Baida and Venancio Calero  
The optics community has used since decades lithium niobate (LN) material. Due to its multiphysical nature it is straightforward to imagine a LN chip in which thousands of optical functions are integrated. We will present our work in order to achieve this goal. Different active LN nanophotonic functions will be presented. The possibility of using LN thin films has allowed us to improve the performances. Tunable Fano LN photonic crystals attached to a fiber for sensing will be demonstrated.  
[OµS’15 _59] | Photonic thermotronics  
Philippe Ben-Abdallah and Svend-Age Biehs  
The control of electric currents in solids is at the origin of the modern computer technology which has revolutionized our daily life. Until the 2000s no thermal counterpart had been developed to control the flow of heat. In this talk we introduce basic building blocks [1-3] for a contactless technology dedicated to the thermal management.  
[ONS’15 _34] |
| Simultaneous 3-D visualization and position tracking of optically trapped particles using optical diffraction tomography  
Yongkeun Park  
We present a combined system employing optical diffraction tomography and holographic optical tweezers capable of simultaneous 3-D visualization of the shapes and tracking positions of trapped microscopic samples. We demonstrated the manipulation of a silica bead toward a white blood cell having complicated internal structures, and the tomographic measurements of 3-D dynamics of the white blood cell as it responded to an approaching glass bead in the high acquisition rate.  
[OµS’15 _58] | Integrated Resonator Platforms for Silicon Photonics  
Mher Gulyan  
We will present an overview of novel technological platforms for the realization of fully integrated microresonator structures for silicon photonics. As a particular example, we will describe thin (80nm) Si3N4 ultra-high quality factor (3.7 x 10⁶ at 784 nm) ring resonators monolithically integrated on a silicon chip. The devices are based on a strip-loaded configuration in which the absence of physically etched lateral boundaries leads to significantly reduced scattering losses.  
[OµS’15 _60] | PhoXonic crystals as phonon sources  
Daniel Navarro-Urrios, Jordi Gomis-Bresco, Francesc Alzina, Alejandro Martínez, Nestor E. Capuj, Said EJ allal, Mourad Oudich, Alejandro Girol, Yan Pennec, Bahram Djafari-Rouhani, Emigdio Chavez Angel and Clivia M. Sotomayor Torres  
Simultaneous confinement of light and sound in the same cavity enhances the phonon-phonon interaction resulting in the optomechanical (OM) effect. A particular case are phoXonic crystals based on the concepts of photonic and phononic crystals, targeting high frequency phonons. We report OM transduction modes inside the complete bandgap, a novel spontaneous synchronization process and phonon generation in a Si 1D phoXonic crystal cavity at 300K.  
[ONS’15 _35] |
| 10:00>10:20 | Net gain dynamics in small-mode volume planar organic microresonators  
Christian Tzscharach, Markas Sudzis, Andreas Mischok, Robert Brueckner, Hartmut Froeb and Karl Leo  
We report a room temperature study of net gain measurements in planar organic microlasers with a limited amount of gain material. We show that the evolution of population inversion can be very complex primarily due to a saturation of the gain medium and photobleaching of optically active organic molecules.  
[OµS’15 _61] | Near-Field Radiative Heat Transfer between Metallic Metasurfaces  
J in Dai, Sergey Dyakov and Min Yan  
We numerically demonstrate the possibility to enhance radiative heat transfer between two metallic plates over a wide range of frequencies in the near-field regime by decorating the surfaces with a periodic array of grooves. We show the properties of transmission factor spectrum for TM polarisation between two such metasurfaces with singly periodic and a super-cell structure separated by a vacuum gap of g=1μm. At T1=310K and T2=290K, the overall heat transfer between two metasurfaces with four different groove depths is 1.96 times... |
### Saturday, 19 September 2015

#### EOS Capri 2015 | www.myeos.org/events/capri2015

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<tr>
<th>OμS I</th>
<th>OμS II</th>
<th>ONS</th>
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<td>Pagano, Hotel La Palma</td>
<td>Relais, Hotel La Palma</td>
<td>Hotel La Residenza</td>
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#### OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

**10:00>10:20**

**Holographic imaging of cell necrosis induced by laser stimulation**
Martina Mugnano, Alejandro Calabuig, Lisa Miccio, Simonetta Grilli and Pietro Ferraro

We are using the label free technique of holographic microscopy to analyze cellular parameters including morphological changes, volume variations and cell photodamage caused by intense laser stimulation directly in the cell culture environment. Furthermore, a preliminary study on cell apoptosis induced by exposure to cadmium chloride was carried out.
[OμS'15 _62]

**10:20>10:40**

**OnTime Response of Single Nanowires**
Marc Currie, Anna Persano, Antonietta Taurino, Fabio Quaranta, Paolo Prete, Nico Lovergine and Bahram Nabat

We report on electrooptically sampled time response of nanowires with core of GaAs and shell of AlGaAs (CSNW). The responsivity of these CSNWs is much larger than similar GaAs bulk devices, and Full-Width Half Max (FWHM) of ~13 ps is much faster than transit time of carriers in the nearly 3.5 um length of this wire. We discuss possible mechanisms responsible for these remarkable characteristics.
[OμS'15 _63]

**10:40>11:00**

**Interplay between biological samples and photorefractive fields**
Lisa Miccio, Martina Mugnano, Valentina Marchesan, Simonetta Grilli and Pietro Ferraro

Photorefractive fields in ferroelectric crystals are used to manipulate cells, maintaining them alive. The interaction of Escherichia coli with the field generated on the surface of iron-doped lithium niobate crystals is investigated. Bacteria trapping and orientation are demonstrated.
[OμS'15 _65]

### OPTICAL MATERIALS FOR HYBRID & MONOLITHIC INTEGRATION

**10:20>10:40**

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[OμS'15 _65]

**10:40>11:00**

**Novel light-driven micro-robotics**
Jesper Gluckstad

Modern micro- and nanoscopy demands functionalities, not only for observing micro-biologic phenomena, but also for reaching into and manipulating mesoscopic constituents. This post-deadline contribution describes our latest generation of light-crafted micro-tools for enabling all-optical light-activated robotics on microscopic scales.
[OμS'15 _64]

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[OμS'15 _63]
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<tr>
<td>10:45-11:00</td>
<td>Liquid-crystal tunable terahertz metamaterials and absorbers</td>
</tr>
<tr>
<td></td>
<td>Dimitrios C. Zografopoulos, Antonio Ferraro, Goran Isic, Borislav Vasic, Rados Gajic and Romeo Beccherelli</td>
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<td>We propose novel liquid-crystal tunable metamaterial devices for terahertz wave reconfiguration. Thin nematic material layers are introduced in metamaterial cavities, thus yielding extensive tunability in their electromagnetic response with fast response times. [ONS’15 _39]</td>
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<tr>
<td>10:40-11:20</td>
<td>COFFEE BREAK</td>
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<td>11:00-11:20</td>
<td>COFFEE BREAK</td>
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<tr>
<td>11:20-13:00</td>
<td>YEAR OF LIGHT SESSION</td>
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<td>END OF EOS TOPICAL MEETINGS</td>
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ABOUT EOS

History
The European Optical Society (EOS) was founded in 1991. The purpose of the society is to contribute to progress in optics and related sciences, and to promote their applications at the European and international levels, by bringing together individuals and legal entities involved in these disciplines and their applications. EOS is a not for profit organisation and serves as the joint forum for all individuals, companies, organisations, educational institutions, and learned and professional societies, who recognise the opportunity and challenge that a common European base provides for the development of optics in its broadest sense. EOS organises recognized topical meetings, conferences, workshops and other events, publishes journals and is an important player on the European level. 22 national optical societies and a great number of individuals and companies are currently members of EOS (www.myeos.org).

EOS membership - Join us and...
• Be a part of the umbrella organisation of the national optical societies in Europe
• Connect with colleagues from all over Europe and beyond
• Contribute to strengthening Europe’s future in optics and photonics
• Stay up-to-date about European Research Funding
• Benefit from discounts on EOS events and publications in the EOS online journal J EOS:RP
• Receive the Annual EOS Member Directory - your guide to the European optics and photonics community

Activities
• Organisation of topical meetings, workshops and conferences, and endorsement of other scientific events
• Operation of a virtual platform for the European optics and photonics community at www.myeos.org
• Focus Groups and Student Clubs (as of 2011)
• Publication of J EOS:RP, the electronic Journal of the European Optical Society - Rapid Publications (www.jeos.org)
• Bi-monthly electronic member newsletter
• Representation of the optics and photonics community on the European level (Photonics21 Technology Platform)
• Annual award of the EOS Prize

Membership modes and fees

Individual membership
Annual fee: 50 €

Individual membership through an EOS Branch
Every member of an EOS Branch is automatically an individual member of the EOS, too, with all benefits.
Annual fee: included in the Branch membership fee

Student membership
Annual fee: 10 €

Associate membership through an EOS Affiliated Society
Every member of an EOS Affiliated Society is automatically an associate member of the EOS, too, but with limited benefits.
Annual fee: included in the Affiliated Society membership fee

Upgrade for associate members
Upgrade to an individual EOS membership with full benefits.
Annual fee: 12.50 €

Corporate membership through an EOS Branch or Affiliated Society
Annual fee: 200 €

Direct corporate membership
Annual fee: 300 €

How to join?
To join the EOS as an individual, student or corporate member, please see our website at www.myeos.org/members.

Questions?
Please contact the EOS office at info@myeos.org.