Optical Trapping Applications (OTA)

April 4-6 2011, Hyatt Regency Monterey, Monterey, California, United States

The Optical Trapping Applications topical meeting will encompass technologies related to the trapping and manipulation of micro- and nanoscopic particles. The technology for micromanipulation continues apace and is increasingly being used for real applications, spanning biology, imaging and soft condensed matter and forms practical components in a wide range of emerging technologies, such as plasmonics and microfluidics. In addition optical trapping is now being proposed, and indeed being used, for probing the quantum limits of microscopic systems, and is being developed as a ultrasensitive test of aspects of Brownian motion and a means to measure extremely small forces. This conference aims to encompass all aspects of modern trapping techniques and their applications, and will extend beyond optical techniques to take in complementary technologies in the form of sonic and electrostatic trapping.

Papers are being considered in the following topic categories:

- The technology and basic science of trapping techniques: optical, sonic, electrostatic and optofluidic
- The applications of trapping technologies for the manipulation of microscopic and nanoscopic particles
- Plasmonic trapping
- Integration with microfluidic systems
- Integration with imaging systems
- New results in cell and molecular biology making use of trapping
- Fundamental applications: Brownian motion, quantum limited sensing, ultraprecision measurments

View the conference program and plan your itinerary for the conference

- Browse speakers and the agenda of sessions
- Browse sessions by type or day.
- Search by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference

General Chairs

Carlos Lopez-Mariscal, US Naval Res. Lab., USA
David McGloin, Univ. of Dundee, UK

A number of distinguished invited speakers have been invited to present at the meeting.

Proceedings from OSA conferences are archived in Optics InfoBase, OSA's online library for OSA flagship journals and partnered and co-published journals.

This event is part of the Optics in Life Sciences Congress, allowing attendees to access to all meetings within the Congress for the price of one and to collaborate on topics of mutual interest.

Optics in the Life Sciences: OSA Optics and Photonics Congress

- Optical Trapping Applications (OTA)
- Novel Techniques in Microscopy (NTM)
- NEW! Bio-Optics: Design and Application (BODA)
- NEW! Optical Molecular Probes, Imaging, and Drug Delivery (OMP)
Optics in the Life Sciences: OSA Optics and Photonics Congress

April 4-6 2011, Hyatt Regency Monterey, Monterey, CA, USA

Agenda of Session Now Available!

Significant advances in the development of optical techniques have led to an ever increasing role of optics in the study of and treatment of various problems in the life sciences ranging from molecular level investigations to clinical treatment of patients. In this Congress, the latest advances in molecular probe development, life science imaging, novel and more powerful optical instrumentation and its application to study fundamental biological processes and clinical investigations will be presented. This progress in instrumentation development and its rapid application represents important enablers that permit studies not possible a few years ago. The upcoming group of meetings is a forum designed to report on this progress and brings together leaders in the field whose contributions are significantly advancing the state of the art in biological and medical research through the use of optical technologies.

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The Optics in the Life Sciences congress features the following meetings:

- Optical Trapping Applications (OTA)
- Novel Techniques in Microscopy (NTM)
- NEW! Bio-Optics: Design and Application (BODA)
- NEW! Optical Molecular Probes, Imaging, and Drug Delivery (OMP)

Be sure to add this exhibit to your marketing calendar. This Congress provides you an audience of over 300 scientists focused on optics in the life sciences. For information about reserving exhibit space, please call +1 202.416.1474 or email exhibitsales@osa.org. Sign up early to maximize your location.

Sponsor:

[OSA Logo]
Optical Trapping Applications (OTA)

April 4-6 2011, Hyatt Regency Monterey, Monterey, California, United States

Optical Trapping Applications (OTA) Conference Program

The Optical Trapping Applications topical meeting will encompass technologies related to the trapping and manipulation of micro- and nanoscopic particles. The technology for micromanipulation continues apace and is increasingly being used for real applications, spanning biology, imaging and soft condensed matter and forms practical components in a wide range of emerging technologies, such as plasmonics and microfluidics. In addition optical trapping is now being proposed, and indeed being used, for probing the quantum limits of microscopic systems, and is being developed as a ultrasensitive test of aspects of Brownian motion and a means to measure extremely small forces. This conference aims to encompass all aspects of modern trapping techniques and their applications, and will extend beyond optical techniques to take in complementary technologies in the form of sonic and electrostatic trapping.

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- Plasmonic trapping
- Integration with microfluidic systems
- Integration with imaging systems
- New results in cell and molecular biology making use of trapping
- Fundamental applications: Brownian motion, quantum limited sensing, ultraprecision measurements

A number of distinguished invited speakers have been invited to present at the meeting. In addition, the organizers have planned a number of special events to make your meeting experience more enjoyable!

View the conference program and plan your itinerary for the conference

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Special Events

Welcome Reception
Poster Sessions
Post Deadline Sessions
Optics in the Life Sciences: OSA Optics and Photonics Congress

Exhibit: April 4-6, 2011 at The Hyatt Regency Monterey in Monterey, CA USA

The Optics in Life Sciences: OSA Optics and Photonics Congress provides a forum where speakers present the latest results in the life sciences arena ranging from design and fabrication of bio-optics to the coverage of optical trapping schemes. This Congress is composed of six complimentary co-located meetings dealing with the most recent, high impact advances in the area of optics in life sciences. Approximately 300 Attendees expected:

- Optical Trapping Applications
- Novel Techniques in Microscopy
- Bio-Optics Design and Application
- Optical Molecular Probes and Imaging

Monterey County highlights everything that's best about California. From seaside restaurants to the Salinas Valley's hillside vineyards, from Big Sur's redwood groves to Pebble Beach's perfectly groomed golf courses, from Salinas' old-fashioned rodeo to Carmel-by-the-Sea's elite music and art festivals, Monterey has a feast of fun just waiting to be sampled.

For More Information about Reserving Exhibit Space at OSA Meetings, please call +1 202.416.1474 or email exhibitsales@osa.org

If you are already an exhibitor and you have questions about shipping, ordering furnishings or services and/or have any other logistically related questions, please call +1 202-416-1972 or topicalexhibits@osa.org.
Optics in the Life Sciences:
OSA Optics & Photonics Congress 2011

Bio-Optics: Design and Application (BODA)
Novel Techniques in Microscopy (NTM)
Optical Molecular Probes, Imaging, and Drug Delivery (OMP)
Optical Trapping Applications (OTA)

4–6 April, 2011
Monterey, CA, USA

Conference Program
Welcome to the 2011 Optics in the Life Sciences: OSA Optics and Photonics Congress! This congress has two veteran topical meetings, Novel Techniques in Microscopy (NTM) and Optical Trapping Applications (OTA) and two new meetings, Bio-Optics: Design and Application (BODA) and Optical Molecular Probes, Imaging, and Drug Delivery (OMP) which promise to be exciting and informative first-ever meetings on these fascinating topics. We hope that bringing together leaders and experts among the different communities to share information and discuss topics across the disciplines of optical science and engineering will provide you with a rich experience in Monterey.

The focus of the BODA meeting is on design, fabrication, instrumentaton, and applications of optical technologies for the life sciences. Themes include but are not limited to visual optics, eye imaging and sensing, bio-inspired optics, optical biochip, optofluidics, biomedical and drug discovery imaging, biosensors, and other novel optical technologies for diagnosis and treatment. This meeting is intended to be a highly interdisciplinary forum of discussion for researchers and engineers from academia and industry to discuss the design and application of bio-optics in life science. This inaugural meeting’s program boasts 30 well-known invited speakers, 23 contributed speakers and 7 posters.

The NTM Meeting emphasizes new advances and strategies that push back the limits in microscopic imaging, leading to improvements in resolution, speed, depth penetration, versatility, etc., as well as novel modalities and contrast mechanisms. The primary focus is on techniques rather than applications, with the goal of providing a forum for the interaction of inventors in optical microscopy, researchers and students, and industrial participants. NTM’s exciting program consists of a total of more than 60 papers, with 13 invited speakers, 40 oral presenters and 8 poster presentations.

As one of the inaugural meetings in the congress, the OMP topical meeting focuses on the optical detection and localization of molecular processes that occur at low concentrations in vivo. Topics include experimental and computational approaches for generating adequate contrast between a target and the surrounding tissue, which is essential for accurate disease diagnosis, as well as monitoring drug delivery and treatment response. This meeting will highlight recent advances in this rapidly evolving area of research with a goal of stimulating new ideas toward clinical translation. OMP’s exciting program consists of a total of more than 40 papers, with 14 invited speakers, 22 oral presenters and 5 poster presentations.

The OTA topical meeting explores the applications of novel optical trapping and manipulation techniques, including the use of evanescent fields, plasmonics, microfluidics, integrated lab-on-a-chip technologies, parallel optical sorting, innovation in optical methods for cellular biology and the current state of the art in fundamental concepts of optical trapping. During the course of 2 days, we will present an exceptional program with 15 invited speakers, 24 oral presentations and 12 poster presentations demonstrating cutting-edge research and technology.
We all are pleased to have you join us and look forward to your continued participation in these topical meetings.

**BODA**
Guoqiang Li, *Univ. of Missouri at St Louis, USA*, **General Chair**
Ronguang Liang, *Carestream Health, USA*, **General Chair**

**NTM**
Jerome Mertz, *Boston Univ., USA*, **General Chair**
Eric Potma, *Univ. of California at Irvine, USA*, **General Chair**

**OMP**
Mary-Ann Mycek, *Univ. of Michigan, USA*, **General Chair**
Konstantin Sokolov, *UT M.D. Anderson Cancer Ctr., USA*, **General Chair**

**OTA**
Carlos Lopez-Mariscal, *US Naval Res. Lab., USA*, **General Chair**
David McGlone, *Univ. of Dundee, UK*, **General Chair**
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<tr>
<th>7.00</th>
<th>7.00–18.30 Registration Open, Regency Foyer South</th>
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<td>10.00–10.30 Coffee Break, Regency Main</td>
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<tr>
<td><strong>BMA</strong> • Adaptive Optics for the Eye</td>
<td><strong>NMA</strong> • Superresolution I (starts at 8.15)</td>
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<tr>
<td><strong>OMA</strong> • Advances in Instrumentation or Algorithms I</td>
<td><strong>OMA</strong> • Nanomanipulation and Microfluidics</td>
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<tr>
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<th>10.00</th>
<th>10.00–10.30 Coffee Break, Regency Main</th>
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<tr>
<td>10.30</td>
<td>10.00–16.00 Exhibits Open, Regency Main</td>
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<tr>
<td><strong>BMB</strong> • Multi-Modality Optical Imaging</td>
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<td><strong>NMB</strong> • Superresolution II</td>
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<td><strong>OMB</strong> • Novel Probes I (ends at 11.15)</td>
<td><strong>OTMB</strong> • Fundamental Systems</td>
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<tr>
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<tr>
<td>13.30</td>
<td>15.30–16.00 Coffee Break, Regency Main</td>
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<tr>
<td><strong>BMC</strong> • Optical Biosensors I</td>
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<td><strong>NMC</strong> • Nonlinear I</td>
<td><strong>OMC</strong> • Clinical / Pre-clinical Applications I</td>
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<th>15.30</th>
<th>15.30–16.00 Coffee Break, Regency Main</th>
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<tr>
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<td>15.00–18.00 Registration Open, Regency Foyer South</td>
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<tr>
<td><strong>BMD</strong> • Optical Biosensors II</td>
<td><strong>NMD</strong> • Nonlinear II (ends at 17.45)</td>
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<tr>
<td><strong>NMD</strong> • Nonlinear II (ends at 17.45)</td>
<td><strong>OMD</strong> • Novel Probes II (ends at 17.30)</td>
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<td><strong>OMD</strong> • Novel Probes II (ends at 17.30)</td>
<td><strong>OTMD</strong> • Trapping with Shaped Beams</td>
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<tr>
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<td>20.00</td>
<td>19.00–20.00 Conference Reception, Spyglass Promenade</td>
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<td>Time</td>
<td>Tuesday, 5 April, 2011</td>
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<td><strong>BODA</strong> • Bio-Inspired Optics <strong>NTM</strong> • Imaging Through Tissue <strong>OMP</strong> • Advances in Instrumentation or Algorithms II <strong>OTA</strong> • Trapping Techniques and Applications I</td>
</tr>
<tr>
<td>7.00–18.00</td>
<td>Registration Open, Regency Foyer South</td>
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<tr>
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<td><strong>BtUA</strong> • Bio-Inspired Optics <strong>NTuA</strong> • Imaging Through Tissue <strong>OtUA</strong> • Advances in Instrumentation or Algorithms II <strong>OtTuA</strong> • Trapping Techniques and Applications I</td>
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<tr>
<td>10.00–10.30</td>
<td>Coffee Break, Regency Main</td>
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<tr>
<td>10.00–16.00</td>
<td>Exhibits Open, Regency Main</td>
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<td></td>
<td><strong>BtUB</strong> • Visual Optics <strong>NTuB</strong> • Phase I <strong>OtUB</strong> • Clinical / Preclinical Applications II <strong>OtTuB</strong> • Trapping Techniques and Applications II</td>
</tr>
<tr>
<td>11.30–13.30</td>
<td>Lunch Break (on your own)</td>
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<tr>
<td>13.30–15.30</td>
<td><strong>JTUA</strong> • Joint Poster Session, Regency Main</td>
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<tr>
<td>15.30–16.00</td>
<td>Coffee Break, Regency Main</td>
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<td></td>
<td><strong>BtUC</strong> • Biomedical Optical Imaging <strong>NTuC</strong> • Phase II <strong>OtUC</strong> • Novel Probes III (ends at 17.15) <strong>OtTuC</strong> • Trapping Techniques and Applications III</td>
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**Key to Agenda**

- **BODA** • Bio-Optics Design and Application
- **NTM** • Novel Techniques in Microscopy
- **OMP** • Optical Molecular Probes, Imaging and Drug Delivery
- **OTA** • Optical Trapping Applications
- **Joint Sessions**
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<th>Regency 1 &amp; 2</th>
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<tr>
<td>Bio-Optics: Design and Application (BODA)</td>
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<td>Optical Molecular Probes, Imaging and Drug Delivery (OMP)</td>
<td>Optical Trapping Applications (OTA)</td>
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**BMA • Adaptive Optics for the Eye**

**Monday, 4 April**  
8.00–10.00  
Presider to Be Announced

**NMA • Superresolution I**

**Monday, 4 April**  
8.15-10.00  
Michael Thompson; Stanford Univ., USA, Presider

**NMA1 • 8.15 Invited**

Advances in Super-Resolution Biplane FPALM, STED and 3-D Particle Tracking Microscopy, Jörg Beversdorff; Yale Univ., USA. STED and FPALM microscopy generate super-resolution images at ~25 nm resolution through targeted and stochastic switching of fluorophores. I present recent advances in both techniques and introduce a novel ultra-fast 3D particle-tracking microscope.

**NMA2 • 8.45 Invited**

Benchmarking Image Analysis Algorithms for Superresolution Fluorescence Microscopy, Forrest Hippensteel, Alexander R. Small, California State Polytechnic Univ., USA. We demonstrate a method of benchmarking to identify optimal rejection algorithms for superresolution fluorescence microscopy. Simulations show that a minimum photon count of ~3/4 the mean photon count per molecule yields acceptable performance.

**NMA1 • 8.00 Invited**

Photoacoustic Tomography: Ultrasonically Breaking through the Optical Diffusion Limit, LiHong Wang; Biomedical Engineering, Washington Univ. in St. Louis, USA. Photoacoustic tomography measures optical absorption through detection of photoacoustic waves. The optical diffusion limit, defined by the transport mean free path, on penetration for high-resolution optical imaging is broken.

**NMA3 • 10.45 Invited**

Simultaneous Morphological and Biochemical Imaging for Cancer Diagnosis and Atherosclerotic Plaque Discrimination, Brian E. Applegate; Texas A&M Univ., USA. We have developed a high-speed integrated OCT/FLIM imaging system to acquire morphological and biochemical images. System development and results from recent studies for cancer detection and atherosclerotic plaque discrimination will be discussed.

**NMA1 • 8.30 Invited**

Advanced Optical Techniques for Clinical and Basic Vision Science, Austin J. Roorda; Lawrence C. Sincich; Qiang Yang; David W. Arathorn; Pavan Tirawatdhula; William S. Tacket; 2School of Optometry, Univ. of California at Berkeley, USA; 1Dept of Ophthalmology, Univ. of California at San Francisco, USA; 1Montana State Univ., Bozeman, USA. A system that records microscopic retinal video while delivering ultra-sharp stimuli to targeted retinal locations is described. The precision of the stimulus presentation to living retina enables an unprecedented level of control for vision research.

**NMA1 • 8.30 Invited**

Simultaneous Morphological and Biochemical Imaging for Cancer Diagnosis and Atherosclerotic Plaque Discrimination, Brian E. Applegate; Texas A&M Univ., USA. We have developed a high-speed integrated OCT/FLIM imaging system to acquire morphological and biochemical images. System development and results from recent studies for cancer detection and atherosclerotic plaque discrimination will be discussed.

**NMA2 • 8.30 Invited**

Bbowie Nanoantennas for Plasmonic Optical Trapping, Brian J. Roxworthy; Kaypar D. Ko; Anil Kumar; Kin Hung Fung; Gang Logan Liu; Nicholas Fang; Kimani C. Trousaint; Lab. for the Photonics Res. of Bio/nano Environments, Univ. of Illinois at Urbana-Champaign USA; Mechanical and Aerospace Engineering, Univ. of Illinois at Urbana-Champaign, USA; Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA. Plasmonic optical trapping of polystyrene micron-sized spheres using Au bowtie nanoantenna arrays is demonstrated. Conventional trapping constraints are greatly reduced, allowing for the use of weak focusing and inexpensive sources (laser pointers).

**OMA1 • 8.00 Invited**

Nanomanipulation Using Near Field Photonics, David Erickson; 1Sibley School of Mechanical and Aerospace Engineering, Cornell Univ., USA. I will present our recent work on the optical trapping and manipulation of nanomaterials using the near-field of integrated photonic devices. I will discuss two application areas namely: single molecule trapping and nanoscopy.

**OMA1 • 8.00 Invited**

Heat in Optically Trapped Gold Nanoparticles Measured in Artificial Membranes, Poul M. Bendix; Anders Kyrsting; Nader Reihani; Lone Oldershede; Niels Bohr Inst., Univ. of Copenhagen, Denmark. We have developed lipid based assays which can measure the temperature of any nanoscale irradiated object. As a demonstration we apply this to gold nanoparticles irradiated by focused near infrared laser light.
BMA3 • 9.00 Invited
Three-Dimensional Cellular Resolution in vivo Retinal Imaging, Robert J. Zouedzki1, Saman Pili2, Du Yu Kim1, Sandra Balderas-Mata1, Arlie G. Capps1, John S. Werner1; *Optimetry & Vision Science, Univ. of California at Davis, USA. Current developments in cellular resolution in-vivo retinal imaging systems at the UC Davis will be presented. Instrumentation developments include the combination of adaptive optics with optical coherence tomography and scanning laser ophthalmoscopy.

NMA4 • 9.15 High-Resolution Total-Internal-Reflection Fluorescence Microscopy Using Periodically Nano-Structured Glass Slides, Emeric Mudry1, Jules Girard2, Kamal Belkebir1, Hugues Giovannini1, Patrick C. Chaumet1, Anne Sentenac1; Inst. Fresnel, Aix-Marseille Univ., France. Resolution of the optical fluorescence microscopy is improved up to fourfold thanks to a standing-wave structured-illumination, whose illumination field is created by a nano-structured glass slides.

BMA4 • 9.30 Invited
Title to be Announced, Jennifer Hunter Univ. of Rochester; USA. Abstract not available.

NMA5 • 9.30 Hyperspectral Nanoscale Imaging on Dielectric Substrates with Coaxial Optical Antenna Scan Probes, Alexander Weher-Bargioni1, Adam Schwartzberg1, Matteo Cornaglia1, Ariel Issach1, Jeffrey Urban1, Yuanyue Pang1, Reuven Gordon1, Jeffrey Bobo1, Miguel Salmeron1, Frank Ogievetsky1, Stefano Cabrini1, Peter Jim Schuck1; Molecular Foundry, Lawrence Berkeley Natl. Lab., USA; Dept. of Electrical and Computer Engineering, Univ. of Victoria, Canada. We have demonstrated hyperspectral tip-enhanced Raman imaging on dielectric substrates using reproducible nano-fabricated coaxial antenna tips, enabling Raman spectral imaging (chemical mapping) with high resolution (<20mm) shown on CNTs.

OMA4 • 9.30 Whole-Cell Analysis of Cardiomyocytes with Combined Quantitative Phase and Two-Channel Fluorescence Microscopy, Matthew T. Rinehart1, Natan T. Shaked1, Lisa Sattershite1, Adam Wax1; Biomedical Engineering, Duke Univ., USA. We have developed a novel microscope combining quantitative phase and fluorescence microscopy to perform quantitative analysis of dynamic cardiomyocyte contraction. Phase-based parameters are informed by molecular specificity of fluorescence images.
We propose a new type of scanning optical microscope which has a few tens nanometer spatial resolution laterally and is possible to observe dynamic behaviors of a specimen in various surroundings.

In vivo Estimation of Functional and Structural Characteristics in Epithelial Neoplasia, George Papoutsoglou1; Electronic & Computer Engineering, Technical Univ. of Crete, Greece. We have developed a method for estimating functional and structural characteristics in cervical neoplasia based on pharmacokinetic modeling of biomarker-tissue interaction and on the solution of the inverse problem through Global Optimization methods.

Microfluidic Systems Combined with Optical Micromanipulation and Spectroscopy for Live-cell Analysis and Sorting, Zdenek Pilat, Alexandr Jonas, Ota Samek, Jan Jezek, Mojmir Sery, Pavel Zemanek; Inst. of Scientific Instruments of the ASCR, Czech Republic. We have investigated a combination of optical trapping with microspectroscopic techniques and microfluidic chips for advanced biotechnological applications.
## Big Sur Room
Bio-Optics: Design and Application (BODA)

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<tr>
<td>BMB1 • 10.30</td>
<td>Invited</td>
<td>Title to be Announced, Joseph Izatt; Duke Univ., USA. Abstract not available.</td>
<td>Monday, 4 April</td>
<td>10.30–11.00</td>
</tr>
<tr>
<td>BMB2 • 11.00</td>
<td>Invited</td>
<td>Title to be Announced, Gultekin Gulsen; Univ. of California at Irvine, USA. Abstract not available.</td>
<td>Monday, 4 April</td>
<td>11.00–12.00</td>
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<tr>
<td>BMB3 • 11.15</td>
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<td>Double-Helix PSF Microscopy with a Phase Mask for Efficient Photon Collection, Sean Quinn, Gimi Geever, Callie Fiedler, Rafael Pieten; Electrical, Computer and Energy Engineering, Univ. of Colorado, USA. We present the first implementation of double-helix phase masks for 3-D microscopy with high photon collection efficiency. The mask is fabricated using gray-level mask-less lithography. The system demonstrates precise 3-D tracking of quantum dots.</td>
<td>Monday, 4 April</td>
<td>11.15–12.00</td>
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## Regency 1 & 2
Novel Techniques in Microscopy (NTM)

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<tr>
<td>NMB1 • 10.30</td>
<td>Invited</td>
<td>Optical Tracking Microscopy and Super-Resolution Imaging of Living Cells Beyond the Diffraction Limit, W. E. Moerner; Stanford Univ., USA. Abstract not available.</td>
<td>Monday, 4 April</td>
<td>10.30–11.00</td>
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<tr>
<td>NMB2 • 11.00</td>
<td></td>
<td>Three-Dimensional Super-Resolution Imaging with a Corkscrew Point Spread Function, Matthew D. Lee‡; Steven F. Lee©, W. E. Moerner‡; Electrical Engineering, Stanford Univ., USA; Chemistry, Stanford Univ., USA. We describe the design of a corkscrew point spread function for 3D super-resolution microscopy. To prove the principle, we image fluorescent beads on a patterned PDMS surface, achieving a localization precision of 3 nm in x, 2 nm in y, and 6 nm in z.</td>
<td>Monday, 4 April</td>
<td>11.00–12.00</td>
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## Regency 3
Optical Molecular Probes, Imaging and Drug Delivery (OMP)

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<tr>
<td>OMB1 • 10.30</td>
<td>Invited</td>
<td>Title to be Announced, Rebekah Drexel, Rice Univ., USA. Abstract not available.</td>
<td>Monday, 4 April</td>
<td>10.30–11.00</td>
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<tr>
<td>OMB2 • 11.00</td>
<td>Invited</td>
<td>Preliminary Intravital Microscopic Analysis Reveals Macrophage Uptake of Circulating Nanotubes and Peptide-Dependent Delivery into Tumor, Bryan R. Smith1, Harkristhu Rallapalli2, Jennifer Preischer1, Cristina Zavalea1, Jarrett Rosenberg1, Scott Tsuchman1, Hongjie Dai2, Sanijiv S. Gambhir1; Radiology/Bioengineering, Stanford Univ., USA; Chemistry, Stanford Univ., USA. Nanoparticle targeting efficiency to tumor is poor and not well-understood. We applied intravital microscopy in a dorsal window chamber model to interrogate vasculature-targeted carbon nanotubes. We found that nanotubes program circulating macrophages to enter tumor.</td>
<td>Monday, 4 April</td>
<td>11.00–11.45</td>
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## Cypress Room
Optical Trapping Applications (OTA)

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<thead>
<tr>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution</th>
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<tr>
<td>OTMB1 • 10.30</td>
<td>Invited</td>
<td>Optical Trapping and Cooling of Glass Microspheres, Mark G. Raizen1, Tongcang Li1, Simon Kheifets1, Carlos Medellin4; Ctr. for Nonlinear Dynamics and Dept. of Physics, Univ. of Texas at Austin, USA. We report optical trapping of glass microspheres in air and vacuum, and measurement of Brownian motion of single microspheres at different pressures. We have also cooled the center of mass in vacuum to 2 mK.</td>
<td>Monday, 4 April</td>
<td>10.30–11.30</td>
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<tr>
<td>OTMB2 • 11.00</td>
<td>Invited</td>
<td>Laser Cooling Optically Trapped Particles, Peter Barker; Univ. of College London, UK. In this talk I will report on the development of two methods to cool optically levitated objects. I will outline both cavity and Doppler cooling techniques and report on progress towards cooling particles in an optical fiber trap.</td>
<td>Monday, 4 April</td>
<td>11.00–11.45</td>
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Invited
Fluorescence Lifetime Techniques in Multimodal Tissue Diagnostic Platform, Laura Marcu; Biomedical Engineering, Univ. of California Davis, Davis, USA. We overview fluorescence lifetime techniques for tissue diagnostics and approaches to merging these techniques with ultrasound backscatter microscopy and photographic imaging. Such hybrid system allow for complex tissue characterization at biochemical, morphological, and functional levels.

NMB4 • 12.00
Combining Optical Coherence Tomography (OCT) and Fluorescence Imaging: Technology and Applications, Yu Chen; Bioengineering, Univ. of Maryland, USA. I will present our efforts on the development of combining optical coherence tomography (OCT) with fluorescence imaging (including depth-integrated imaging and depth-resolved tomography) for simultaneous morphological and molecular imaging.

NMB5 • 11.45
Polarimetry-Based Far-Field Method for High-Resolution Optical Microscopy, Oscar Rodriguez; David Lars; Chris Dainty; Applied Optics, School of Physics, Natl. Univ. of Ireland, Ireland; Imperial College London, UK. We present numerical and experimental results of a polarimetry-based far-field method for high-resolution optical microscopy. This method may be used to differentiate between a set of different sub-resolution objects with no need for active scanning.

Big Sur Room
Bio-Optics: Design and Application (BODA)

Regency 1 & 2
Novel Techniques in Microscopy (NTM)

Regency 3
Optical Molecular Probes, Imaging and Drug Delivery (OMP)

Cypress Room
Optical Trapping Applications (OTA)

NMB • Multi-Modality Optical Imaging—Continued

BMB3 • 11.30
Invited
Fluorescence Lifetime Techniques in Multimodal Tissue Diagnostic Platform, Laura Marcu; Biomedical Engineering, Univ. of California Davis, Davis, USA. We overview fluorescence lifetime techniques for tissue diagnostics and approaches to merging these techniques with ultrasound backscatter microscopy and photographic imaging. Such hybrid system allow for complex tissue characterization at biochemical, morphological, and functional levels.

NMB4 • 11.30
Nanometric Resolution using Far-Field Optical Tomographic Microscopy in the Multiple Scattering Regime, Emeric Mudry; Jules Girard; Guillaume Maitre; Kamal Belkhir; Patrick C. Chaumet; Hugues Giovanni; Anne Taillieu; Anne Sentenac; Inst. Fresnel, Aix-Marseille Univ., France; CNRS, Lab. Photon et Nanostructure, France. Optical Tomographic Microscopy is a technique allowing to reconstruct high-resolution 3-D maps of permittivity. We found an experiment case where multiple scattering leads to image resolution beyond diffraction limit.

NMB5 • 11.45
Polarimetry-Based Far-Field Method for High-Resolution Optical Microscopy, Oscar Rodriguez; David Lars; Chris Dainty; Applied Optics, School of Physics, Natl. Univ. of Ireland, Ireland; Imperial College London, UK. We present numerical and experimental results of a polarimetry-based far-field method for high-resolution optical microscopy. This method may be used to differentiate between a set of different sub-resolution objects with no need for active scanning.

NMB6 • 12.00
Resolution Enhancement in Confocal Scanning Microscopy by a Radially Polarized Beam with Phase Modulation, Yutiki Kazano, Shunichi Sato; Inst. of Multidisciplinary Research for Advanced Materials, Tohoku Univ., Japan. We evaluate spatial resolution in fluorescence confocal scanning microscopy using a radially polarized beam with concentric phase modulation. The enhancement of lateral resolution is predicted with side-lobe suppression due to a confocal aperture.

BMB4 • 12.00
Invited
Combining Optical Coherence Tomography (OCT) and Fluorescence Imaging: Technology and Applications, Yu Chen; Bioengineering, Univ. of Maryland, USA. I will present our efforts on the development of combining optical coherence tomography (OCT) with fluorescence imaging (including depth-integrated imaging and depth-resolved tomography) for simultaneous morphological and molecular imaging.

NMB4 • 12.00
Two-Photon Fluorescence Imaging with a Tumor Penetrating Bioconjugate, Ciceron Yanez; Alma R. Morales; Takeo Urakami; Masanobu Komatsu; Kevin D. Belfield; Dept. of Chemistry, Univ. of Central Florida, USA; Sanford-Burnham Medical Res. Inst. at Lake Nona, USA.

NMB5 • 11.45
Two-Photon Fluorescence Imaging with a New Fluorene-RGD Peptide Conjugate, Alma K. Morales; Ciceron O. Yanez; Takeo Urakami; Masanobu Komatsu; Kevin D. Belfield; Chem, Univ. of Florida, USA; CCREOL, College of Optics and Photonics, Univ. of Central Florida, USA; Sanford-Burnham Medical Res. Inst. at Lake Nona, USA. Two-photon fluorescence microscopy is a powerful tool in the study of living cells, and tissue microvasculature. Herein, a 2PFM was conducted to evaluate the efficiency of a new 2PA conjugate designed to target avβ3 integrins.

OCTMB4 • 12.00
Momentum Transfer by the Emission of Raman and Fluorescence Photons Detected by an Optically Trapped Probe, Dmitri Petrov; ICFO - Inst. of Photonic Science, Spain; ICREA, Spain. The momentum transfer to a scatterer from Raman (fluorescence) photons was detected using an optical system that permits one to simultaneously measure the radiation forces exerted on, and the emission from the scatterer.
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<td>Bio-Optics: Design and Application (BODA)</td>
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<td>Optical Molecular Probes, Imaging and Drug Delivery (OMP)</td>
<td>Optical Trapping Applications (OTA)</td>
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**NMB • Superresolution II–Continued**

NMB7 • 12.15
Isotropic Diffraction-Limited Focusing Using a Single Lens, Emeric Mudry, Eric Le Maul, Patrick Ferrand, Anne Sentenac; Inst. Fresnel, France. Using the time reversal concept, we show that isotropic focusing can be realized by placing a mirror after the focal point and shaping the incident beam. This idea is applied to axial resolution improvement in confocal microscopy.

<p>| 12.30–13.30 Lunch Break (on your own) |</p>
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**BMC • Optical Biosensors I**

Monday, 4 April  
13.30–15.30  
**Presider to Be Announced**

**BMC1 • 13.30**  
**Invited**  
Optofluidic Nano-Plasmonics for Biosensing, Yeshaiahu Fainman; Univ. of California at San Diego, USA. We explore metal-dielectric nano-plasmonic structures for localization and resonant transmission of optical fields, investigate fabrication and integration of optofluidic nano-plasmonic systems and explore their applications for biochemical sensing.

**NMC • Nonlinear I**

Monday, 4 April  
13.30–15.30  
Eric Potma; Univ. of California at Irvine, USA, Presider

**NMC1 • 13.30**  
**Invited**  
Nonlinear Coherent Optical Imaging by Stimulated Radiation Microscopy, Wei Min; Columbia Univ., USA. The emerging stimulated radiation microscopy, including stimulated Raman scattering and stimulated emission, provides distinct and powerful image contrasts for non-fluorescent species. Here we present its principles and biomedical applications.

**OMC • Clinical/Pre-clinical Applications I**

Monday, 4 April  
13.30–15.30  
Lihong Wang; Washington Univ. in St. Louis, USA, Presider

**OMC1 • 13.30**  
Optical Redox Imaging of Endogenous Contrast for Tissue-Engineered Construct Viability, Leng-Chun Chen1, William Lloyd2, Malarika Chandrap1, Kenji Izumi1, Shihuang Kao1, Cynthia Marcello2, Stephen Feinberg1, Mary-Ann Mycek2; 1Dept. of Biomedical Engineering, Univ. of Michigan, USA; 2Dept. of Oral and Maxillofacial Surgery, Univ. of Michigan, USA. Endogenous fluorescence redox imaging was developed to noninvasively assess cell viability in 3-dimensional tissue-engineered constructs prior to implantation. A lower redox ratio was observed from samples with higher proliferation.

**OMC2 • 1:45 p.m.**  
**Multimodal Time-Resolved Measurement of Diffuse Reflectance for Brain Oxygenation Assessment during Hypoxic Challenge Test**, Anna Gergić, Wojciech Wężyk, Daniel Milewski, Piotr Savko2, Ewa Magner-Zanawiska1, Roman Maniewski1, Adam Lieder1; 1Inst. of Biocybernetics and Biomedical Engineering, Poland; 2Dept. of Anesthesiology and Intensive Care, Medical Univ. of Warsaw, Poland. Multi-wavelength measurement of time-resolved reflectance signal on the surface of the human head was carried out. The changes of oxy- and deoxyhemoglobin concentration were obtained at 14 wavelengths during controlled hypoxic challenge test.

**OTMC • Analysis of Biological Systems**

Monday, 4 April  
13.30–15.30  
Mike MacDonald; Univ. Dundee, UK, Presider

**OTMC1 • 13.30**  
**Invited**  
Title to Be Announced, Gijs Waite; Vrije Univ., Amsterdam. Abstract not available.
Champaign, 2Bioengineering, 1Mechanical
BMC2 • 14.00
Surface Plasmon Resonance Optical Fiber Biosensor for Label-Free Characterization of Biomolecular Interactions, Yanina Shevechenko, Tariq Francis, Maria DeRosa, Jacques Albert; Carleton Univ., Canada. A fiber sensor was applied to monitor the interaction of biomolecules. Results indicate that the biosensor can be successfully applied for a wide range of biomolecular characterizations including identification of the biomolecules’ binding constants.

BMC3 • 14.15
The Effect of Nano Grating Shapes on the Sensitivity of Guided Mode Resonance Protein Sensor Fabricated by Nano Injection Molding Process, Eikyoung Cho1, Youra Hee1, Miyungki Jung1, Jiseok Lim1, Seokmin Kim1, Shinil Kang1; 1Mechanical Engineering, Yonsei Univ., Republic of Korea; 3Mechanical Engineering, Chung-Ang Univ., Republic of Korea. We investigated the effect of nano grating shapes on the sensitivity of nano injection molded guided-mode-resonance protein sensor. To confirm the profile effects, we performed design, fabrication and performance evaluation.

BMC4 • 14.30
Photonic Crystal Enhanced Microscopy: Multimode Imaging for Photonic Crystal Biosensors, Vikram Chaudhry1, Erich Liddle2, Sherrine George2, Cheng-Sheng Huang2, Anja Kahl2, Patrick Mathias1, Brian Cunningham2; 1Electrical and Computer Engineering, Univ. of Illinois Urbana-Champaign, USA; 2Biointerfaces, Univ. of Illinois Urbana-Champaign, USA. Photonic Crystal Enhanced Microscopy (PCEM) utilizes the optical resonances of photonic crystal surfaces for label-free biosensor imaging and amplification of fluorescence. We describe the application of PCEM to biomolecular and cell-based assays.

BMC2 • 14.00
Picosecond CARS Spectral Imaging with Principal Component Analysis, Jeffrey L. Subahlin2, Ryan S. Lim3, Moshe Levis3, Bruce J. Tromberg2, Eric Potma1; 1Beckman Laser Inst. and Medical Clinic, Univ. of California at Irvine, USA; 2Department of Biomedical Engineering, Univ. of California at Irvine, USA; 3Department of Chemical Engineering, Univ. of California at Irvine, USA; 4Division of Renal Diseases and Hypertension, Univ. of Colorado, USA. We demonstrate the utility of picosecond spectral coherent anti-Stokes Raman scattering imaging with principal component analysis to rapidly map lipophilic components in cardiovascular tissues, facilitating the interrogation of atherosclerosis.

NMC2 • 14.00
Wavelength-Swept Coherent Anti-Stokes Raman Scattering Spectroscopy System for Hyperspectral Imaging, Steve Begin1,2, Bryan Burgoyne1, Alain Villeneuve1, Vincent Mercier3, Réal Villée1, Daniel Cote1,2; 1Centre de Recherche Univ. Laval Robert-Giffard (CRLRG), Univ. Laval, Canada; 2Centre d’Optique, Photonique et Laser (COPL), Univ. Laval, Canada; 3Genia Photonics Inc., Lasalle, Canada. We present hyper spectral imaging in the high wavenumber region of thick tissue samples made possible by a wavelength-swept CARS spectroscopy system where the Raman lines are excited sequentially at rates of up to 50,000 wavenumber per seconds.

NMC3 • 14.15
Time-Resolved Fluorescence Spectroscopy of the Bile Duct for Image-Guided Cancer Diagnosis, Javier A. Jø1, Javier A. Jø1, Matthew W. Miller2, Eric J. Seibel1; 1Biomedical Engineering, Texas A&M Univ., USA; 2Veterinary Medicine, Texas A&M Univ., USA; 3Mechanical Engineering, Univ. of Washington, USA. An ultra thin (1.2-1.6 mm diameter) scanning fiber endoscope, capable of video-rate high-resolution imaging of the bile duct, will be used as a “guidewire-with-eyes” to guide time-resolved fluorescence spectroscopy of the duct for cancer diagnosis.

OMC1 • 14.30
Title to be Announced, Stanislav Emeljanov; Univ. of Texas at Austin, USA. Abstract not available.

OMC4 • 14.30
Title to be Announced, Pietro Cicuta; Cambridge Univ., UK. Abstract not available.
Mode Splitting in Whispering-Gallery-Mode Microresonators in Aquatic Environment, Woosang Kim1, Sahin K. Ozdemir1, Jiangang Zhu2, Liya He1, Lan Yang3; 1Electrical Engineering, Washington Univ., St. Louis, USA. We demonstrate scatterer-induced mode splitting in Whispering-Gallery-Mode resonators as a new sensing scheme in water. It is used to achieve detecting polystyrene particles of radii 50nm with a similar size as influenza A virus.

Study of the Dynamics of Protein Aggregation with a Bloch Surface Wave Sensor, Vincent Paeder1, Valeria Musi1, Hans Peter Herzig2; 1EPFL, Switzerland. We present a study of the dynamics of protein aggregation using an interferometric Bloch surface wave sensing scheme. We demonstrate the ability to detect, during thermal incubation, the aggregation of proteins related to conformational diseases.

Remote Focusing Differential Multiphoton Microscopy: Application to Neuronal Imaging, Erich E. Hoover1, Michael D. Young1, Suzy M. Kim2, Eric V. Chandler1, Jeffrey J. Field2, Daun N. Vitkó2, Kraig E. Shetzle3, Jing W. Wang4, Jeff A. Squier5; 1Physics, Colorado School of Mines, USA; 2Biological Sciences, Univ. of California at San Diego, USA; 3Physics and Nuclear Engineering, United States Military Academy, USA. We apply remote focusing to multi-focus multiphoton microscopy by simultaneously imaging multiple focal planes of Drosophila melanogaster olfactory neurons. This technology permits imaging the entire volume of the antennal lobe in a single scan.

Screening Small Molecule Compounds for Protein Ligands with Label-Free, Optically Detected Microarrays, Xiangdong Zhu1; 1Physics, Univ. of California at Davis, USA. We developed an optical scanner for label-free screening small molecule compounds in microarray format for protein ligands. It has a detection throughput of 12,000 compounds per slide and thus promises screening 100,000 compounds daily.

Remote Detection of Differential Multiphoton Microscopy: Application to Neuronal Imaging, Erich E. Hoover1, Michael D. Young1, Suzy M. Kim2, Eric V. Chandler1, Jeffrey J. Field2, Daun N. Vitkó2, Kraig E. Shetzle3, Jing W. Wang4, Jeff A. Squier5; 1Physics, Colorado School of Mines, USA; 2Biological Sciences, Univ. of California at San Diego, USA; 3Physics and Nuclear Engineering, United States Military Academy, USA. We apply remote focusing to multi-focus multiphoton microscopy by simultaneously imaging multiple focal planes of Drosophila melanogaster olfactory neurons. This technology permits imaging the entire volume of the antennal lobe in a single scan.

Screening Small Molecule Compounds for Protein Ligands with Label-Free, Optically Detected Microarrays, Xiangdong Zhu1; 1Physics, Univ. of California at Davis, USA. We developed an optical scanner for label-free screening small molecule compounds in microarray format for protein ligands. It has a detection throughput of 12,000 compounds per slide and thus promises screening 100,000 compounds daily.
**Big Sur Room**  
Bio-Optics: Design and Application (BODA)

**Regency 1 & 2**  
Novel Techniques in Microscopy (NTM)

**Regency 3**  
Optical Molecular Probes, Imaging and Drug Delivery (OMP)

**Cypress Room**  
Optical Trapping Applications (OTA)

| BMD • Optical Biosensors II | Monday, 4 April  
16.00–18.00  
Presider to Be Announced |
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<tr>
<td>BMD1 • 16.00</td>
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| Title to be Announced, Lan Yang; Washington Univ. in St. Louis, USA.  
Abstract not available. |

| NMD • Nonlinear II | Monday, 4 April  
16.00–17.45  
Wei Min; Columbia Univ., USA,  
Presider |
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<tr>
<td>NMD1 • 16.00</td>
<td>In situ Measurement of Sarcomere Length in Cardiac Myocytes Using a Two-Photon Microscope with Near-Isotropic Scan Rate, Alex D. Corbetti; Gil Bab; Tony Wilson; Engineering Science, Univ. of Oxford, UK; Anatomy and Genetics, Univ. of Oxford, UK. Images are presented showing sarcomere spacing within a living rodent heart. To uniquely identify the sarcomere spacing, two 2-D sections, angularly offset from each other, were sampled at high frame rate.</td>
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| NMD2 • 16.15      | Nonlinear Optical Imaging with Sub-8fs Laser Pulses, Dmitry Pestyov; Bingwei Xu, Haowen Li, Marcus Dantus; Biophotonic Solutions Inc, USA; Chemistry, Michigan State Univ., USA.  
Broadband Ti:Sapphire oscillator output, guided through a pulse shaper, is compressed down to sub-8fs at the focus of a high-NA microscope objective. The compression is verified in situ by interferometric autocorrelation, and images were obtained. |

| NMD3 • 16.30      | Continuous Oxygen Measurements in Bio-media Using Metal-Halide Cluster Phosphorescence, Ruby Gholizadeh, Reza Laloee; Physics, Michigan State Univ., USA. A dissolved oxygen sensor for biological media using the 3O: quenching of the phosphorescence from MoCl clusters is presented. Real-time measurements for four hours over a physiologically relevant PO2 range show no evidence of photobleaching. |

| OMD • Novel Probes II | Monday, 4 April  
16.00–17.30  
Rebekah Drecek; Rice Univ., USA,  
Presider |
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<td>OMD1 • 16.00</td>
<td>Invited</td>
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<tr>
<td>Luminescent Nanodiamonds for Intracellular Imaging, Andrei V. Zvyagin; Varun K. Sreenivasan; Timothy A. Keef; Sergey M. Deger; Physics and Astronomy, Macquarie Univ., Australia; Shemyakin and Ovchinnikov Inst. of Bio-organic Chemistry, Russian Federation. Advances in production of single-digit luminescent nanodiamonds are reported. We report a versatile bioconjugation protocol to dock biomolecules on the colloidal diamond leading to demonstration of non-specific and specific internalisations in cells.</td>
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| OMD2 • 16.30         | Ultrasound-Quenchable Fluorescent Contrast Agent: Experimental Demonstration, Michael J. Benchimol; Mark J. Hua; Carolyn E. Schuitt; Sadik C. Esener; Jacobs School of Engineering, Univ. of California at San Diego, USA; Zivica Corp., USA. We have developed a novel contrast agent for deep tissue imaging. Ultrasound control of fluorescence emission can overcome the resolution limitations of optical tissue scattering. Fluorescence modulation was detected in an acousto-fluorescence setup. |

| OMD3 • 16.30         | Engineered Point Spread Functions for 3-D Parallel Particle Tracking of Optically Trapped Particles, Donald B. Conkey; Rahul P. Trivedi; Prasanna Pavani; Ivan I. Smalyukh; Rafael Piestun; Electrical and Computer Engineering, Univ. of Colorado at Boulder, USA; Physics, Univ. of Colorado at Boulder, USA. We integrate a holographic optical tweezer system with a double-helix point spread function imaging for high precision three-dimensional (3-D) multi-particle tracking. We perform precise quantitative estimates of the 3-D forces in an optical trap. |

**Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011**
### Big Sur Room

Bio-Optics: Design and Application (BODA)

### Regency 1 & 2

Novel Techniques in Microscopy (NTM)

### Regency 3

Optical Molecular Probes, Imaging and Drug Delivery (OMP)

### Cypress Room

Optical Trapping Applications (OTA)

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<th>BMD • Optical Biosensors II–Contributed</th>
<th>NMD • Nonlinear II–Contributed</th>
<th>OMD • Novel Probes II–Contributed</th>
<th>OTMD • Trapping with Shaped Beams–Contributed</th>
</tr>
</thead>
</table>
| BMD3 • 16.45  
A Novel Monte Carlo Approach for Diagnostic Fiber Optic Probe Design, Adam R. Gardner¹,², Carole Hayakawa¹, Jerome Spanier², Vasan Venugopalan¹; ¹Chemical Engineering and Materials Science, Univ. of California at Irvine, USA; ²Laser Microbeam and Medical Program, Beckman Laser Inst., Univ. of California at Irvine, USA. A radiative transport method based on efficient coupled forward-adjoint Monte Carlo simulations is used for the analysis of diagnostic fiber optic probes. Results are shown for various probe geometries within a layered tissue model. | NMD4 • 16.45  
Beyond Pathology: Pump-Probe Imaging of Skin Slices Provides Additional Indicators of Melanoma, Mary Jane Simpson¹, Thomas Matthews¹, Angelica Selmi², Ivan Piletic², Warren S. Warren³; ¹Chemistry, Duke Univ., USA; ²Pathology, Duke Univ. Medical Center, USA. Principal component analysis of images taken with a pump-probe scanning microscope resolves eumelanin and pheomelanin. Utilizing intrinsic melanin contrast in skin slices has revealed significant differences between melanoma and other lesions. | OMD3 • 16.45  
Folate Receptor-targeted Aggregation-enhanced Emission Silica Nanoprobe for One-photon in vivo and Two-photon ex vivo Fluorescence Bioimaging, Xuhua Wang⁴, Alma R. Morales⁴, Takeo Urakami⁴, Masanobu Komatsu⁴, Kevin D. Belfield⁵; ⁴Dept. of Chemistry, Univ. of Central Florida, USA; ⁵Sanford-Burnham Inst. for Medical Res. at Lake Nona, USA. A two-photon absorbing, aggregation-enhanced near infrared emission and folic acid conjugated silica nanoprobe was investigated for FRs targeting one-photon in vivo imaging and two-photon ex vivo imaging by employing nude mice bearing HeLa tumors. | OTMD3 • 16.45  
Mapping of the Optical Field of a Focused Cylindrical Vector Beam by Trapped Rayleigh Particles, Liangcheng Zhou¹, Qwen Zhan¹, Daniel Ou-Yang¹; ¹Physics, Lehigh Univ., USA; ²Electro-Optics Graduate Program, Univ. of Dayton, USA. We propose a non-invasive method of mapping the optical field of a tightly focused laser beam by imaging transiently trapped nanoparticles. Optical field intensities are calculated from known trapping energy of the probe particles. |

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**BTuC4 • 17.00 Invited**

Cataract Surgery with OCT-guided Femtosecond Laser, Daniel Palanker¹, Georg Schuele¹, Neil Friedman¹, Dan Andersen², William Culbertson²; ¹Ophthalmology, Stanford Univ., USA; ²OptMedica Corp., USA. About a third of people in the developed world will undergo cataract surgery in their lifetime. Currently, cataract surgery is a manual procedure highly dependent on the surgical skills and complicating factors. We developed and tested an image-guided laser system to improve the precision and reproducibility of cataract surgery. A long-range Optical Coherence Tomography automatically discards the anterior and posterior surfaces of the lens and cornea, and a co-registered femtosecond laser then performs capsulotomy, lens segmentation and corneal incisions.

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**NMD5 • 17.00**

Development of Multi-Photon Coherence Domain Molecular Imaging, Brian E. Applegate¹, Qiujie Wan¹, Nilanthi Warnasooriya¹; ¹Biomedical Engineering, Texas A&M Univ., USA. We have recently developed a high-resolution molecular imaging technique by fusing pump-probe spectroscopy and optical coherence microscopy. Basic concepts and progress toward improving imaging speed and spectral resolution will be discussed.

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**NMD6 • 17.15**

Multiphoton Photothermal Imaging in Scattering Samples, Michael Durst¹, Jerome Mertz²; ¹Dept. of BME, Boston Univ., USA. We present multiphoton photothermal imaging of non-fluorescent, absorbing structures in scattering samples. Wide-field LED probe illumination is collected and de-scanned through a confocal pinhole. Nanoparticle and brain-slice imaging are presented.

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**OMD • 17.00**

Two-photon Absorbing Fluorene Derivatives with Efficient Stimulated Emission Depletion (STED) for Bioimaging, Kevin D. Belfield¹, Mykhailo V. Bondar²,³, Alma R. Morales³, Olga V. Przhonskaya⁴, Xuhua Wang⁴; ¹Inst. of Physics, Ukraine; ²Dept. of Chemistry, Univ. of Central Florida, USA. Stimulated emission depletion (STED) is emerging as an important photophysical process for superresolution microscopy. We report a new STED probe, its photophysical characterization, and potential use in bioimaging.

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**OMD • 17.15**

Near-Infrared Emitting Squaraine Dyes for Multiphoton Fluorescence Imaging with High 2PA Cross Sections, Hye-Yang Ahn¹, Sheng Yao¹, Xuhua Wang¹, Kevin D. Belfield;¹ ¹Chemistry, Univ. of Central Florida, USA. New near-infrared squaraine probe SQX (1), and squaraine dye, SQ440H (2), were investigated for their photochemical properties and cytotoxicity. *In vitro* one-photon and two-photon fluorescence microscopy imaging was demonstrated.

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**OTMD4 • 17.00 Invited**

Holographic Optical Traps and Spectroscopic Detection for Probing Cellular Releases, Daniel R. Burnham¹, Thomas Schneider¹, Daniel T. Chiu¹; ¹Dept. of Chemistry, Univ. of Washington, USA. We will discuss the implementation and considerations for combining holographic optical tweezers with spatially resolved spectroscopic detection in order to visualize chemical communication between cells.
Intrinsic Optical Signal Imaging of Stimulus-Evoked Neural Activities in the Retina, Xincheng Yao, Yangguo Li, Yichao Li, Qixiang Zhang. Unv. of Alabama at Birmingham, USA. Intrinsic optical signal (IOS) imaging and electrophysiological recording were used to detect retinal neural activities. IOS imaging allowed dynamic monitoring of visual signal propagation from the photoreceptor to inner retinal neurons.

Temperature Distribution in Red Blood Cells Using Photothermal Imaging Integrated with Digital Holography, George Cheri, Srivathsan Vasudevan, Beng Koon Ng. BC Photonic Technological Co, Canada; School of EEE, Nanyang Technological Univ., Singapore. Integration of digital holographic microscope with photothermal microscope is proposed. Besides obtaining 3-D images, temperature distribution of red blood cells can be obtained, aiding real-time monitoring of biological assays.

We make use of surface acoustic wave nebulization to introduce airborne particles into optical traps in a robust and repeatable manner. We demonstrate the facile loading of aerosols such as organic liquids and solid particles.

Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011
### BTuA • Bio-Inspired Optics

**Tuesday, 5 April**

**8.00–10.00**

**Presider to Be Announced**

**BTuA1 • 8.00** Invited

*Medical Imaging Systems Using Bio-Inspired Fluidic Lenses, Yuhua Lu,* Frank Tsai, Askhan Arianpour; ECE, Univ. of California at San Diego, USA. We discuss fluidic lens imaging systems for minimally invasive and image-guided cancer surgery. The system offers many unique capabilities such as optical zoom, macro and microscopic functions, high sensitivity, hyper spectral imaging, etc.

**BTuA2 • 8.30** Invited

*Title to be Announced, Tony Wilson; Univ. of Oxford; UK. Abstract not available.*

### NTuA • Imaging Through Tissue

**Tuesday, 5 April**

**8.00–10.00**

**Eric Potma; Univ. of California at Irvine, USA, Presider**

**NTuA1 • 8.00** Invited

*Optical Methods for Imaging of Cerebral Hemodynamics, Andrew Dunn; Univ. of Texas at Austin, USA. Abstract not available.*

**NTuA2 • 8.30** Invited

*Towards Deep Tissue Imaging By Time-Reversal Optical Phase Conjugation Techniques, Changhui Yang; California Inst. of Technology, USA. Towards deep tissue imaging by time-reversal optical phase conjugation techniques.*

### OTuA • Advances in Instrumentation or Algorithms II

**Tuesday, 5 April**

**8.00–10.00**

**Miltind Rajadhyaksha; Memorial Sloan Kettering Cancer Ctr., USA, Presider**

**OTuA1 • 8.00** Invited

*Title to be Announced, Vasilis Niziachristos; Germany. Abstract not available.*

**OTuA2 • 8.30** Invited

*Fluorescence Lifetime Imaging for Cell Biology, Drug Discovery and Label-Free Diagnosis, Paul French; 'Physics, Imperial College London, UK. I will present FLIM technology to read out biomolecular interactions across the scales from labeled proteins in solution and in cells through automated plate readers to imaging disease models and endoscopic diagnosis using autofluorescence.*

### OTTuA • Trapping Techniques and Applications I

**Tuesday, 5 April**

**8.00–10.00**

**Steve Neale, Univ. Glasgow, UK, Presider**

**OTTuA1 • 8.00** Invited

*Optical Sculpting: Trapping through Disorder, Kishan Dholakia; USA. Abstract not available.*

**OTTuA2 • 8.30**

*Improving Spot Uniformity in Holographic Optical Tweezers, Martin Persson1, David Engström1, Jürgen Bengtsson1, Mattias Goksör1; 'Physics, Univ. of Gothenburg, Sweden; 'Microtechnology and Nanoscience, Chalmers Univ. of Technology, Sweden. We have developed a method for compensating for crosstalk between adjacent pixels in liquid crystal based spatial light modulators. The method decreases the uniformity error of the trap intensities in holographic optical tweezers (HOT) systems.*

**OTTuA3 • 8.45**

*Integrated Instrument for Holographic Optical Trapping and Multicolor Holographic Video Microscopy, Bhaskar Joott Krishnamuty2, David G. Grier; 'Dept. of Physics and Ctr. for Soft Matter Res., New York Univ., USA. We designed and constructed an integrated holographic materials characterization and processing workstation that combines dynamical holographic optical trapping and multicolor holographic video microscopy with enhanced efficiency and adaptability.*
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<td>Bio-Optics: Design and Application (BODA)</td>
<td>Novel Techniques in Microscopy (NTM)</td>
<td>Optical Molecular Probes, Imaging and Drug Delivery (OMP)</td>
<td>Optical Trapping Applications (OTA)</td>
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**BTuA • Bio-Inspired Optics—Continued**

**BTuA3 • 9.00**

Design of a Parallel 3-D Confocal Imaging System with Adaptive Objective Lens, Guanqiong Li, Xiao Fang, Dongxue Zhu; Univ. of Missouri at St. Louis, USA. A nontranslational 3-D confocal imaging system using an adaptive objective lens for depth scanning over a 1mm range and a MEMS mirror array for parallel transverse sampling has been designed with a 2um transverse resolution.

**OTuA • Trapping Techniques and Applications I—Continued**

**OTuA4 • 9.00**

Transportation of a Micro Droplet by Light Irradiation: The Influence of an Advection and the Marangoni Effect, Takaflumi Iwaki; 1Fukui Inst. for Fundamental Chemistry, Kyoto Univ., Japan. Photophoresis of a micro droplet induced by a photo-thermal force is discussed. In particular, a feedback process between an internal flow and a surface temperature is considered in terms of advections and the Marangoni effect.

**NTuA • Imaging Through Tissue—Continued**

**NTuA3 • 9.00**

Invited Imaging Through an Opaque Material, Sylvain Gigan, Sébastien M. Popoff, Geoffrey Lerosey, Rémi Carminati, Mathias Fink, Albert C. Boccara; Inst. Langevin, ESPCI ParisTech, France. We introduce a method to measure the transmission matrix of a complex medium in optics, thanks to a spatial light modulator. Using this matrix, we demonstrated experimentally light focusing and imaging through an opaque medium.

**OTuA3 • 9.00**

Invited Photothermal Optical Coherence Tomography for Molecular Imaging, Melissa Skale1, Matthew Cowie1, Adam Wex1, Joseph Latt1; 1Biomedical Engineering, Vanderbilt Univ., USA; 2Biomedical Engineering, Duke Univ., USA. Molecular imaging using Photothermal Optical Coherence Tomography (OCT) was demonstrated with antibody-conjugated gold nanoparticles in phantoms and tissue constructs. Specific imaging of the epidermal growth factor receptor (EGFR) was confirmed.

**BTuA • Bio-Inspired Optics—Continued**

**BTuA4 • 9.15**

Optomechanical Fluid-Filled Model of the Human Eye, Ashkan Ariamour, Eric Tremblay, Joseph Ford, Yuhua Lu; Univ. of California San Diego, USA. The following describes the design and performance of an optomechanical fluid-filled eye model and its use for testing flaws in an actual eye using optical components that can be modified to match an individual’s eye.

**NTuA • Imaging Through Tissue—Continued**

**NTuA4 • 9.30**

Invited Coherent Optical Imaging Through Opaque Layers, Elbert G. van Putten; Univ. of Twente, Netherlands. We demonstrate imaging of gold nanostructures through an opaque scattering layer. We obtained a very high resolution proving that scattering can significantly improve the image quality in microscopy.

**OTuA4 • 9.30**

An MR compatible Frequency Domain Fluorescence Molecular Imaging System: Design and Phantom Studies, Yuting Lin1, Michael Ghijonen1, Hao Gao1,2, Orhan Nalcioglu1, Gultekin Gulse1; 1Ctr. for Functional Onco Imaging, Univ. of California at Irvine, USA; 2Applied Mathematics, Univ. of California at Los Angeles, USA. In this study, a hybrid MR-frequency domain fluorescence tomography (FT) is developed. The phantom studies show that the anatomical images from MRI improve reconstruction of both fluorescence concentration and lifetime parameters significantly.

**OTuA5 • 9.30**

Sub-Micron Patterning of Rough Surfaces Using Optical Trap Assisted Nanopatterning, Romain Fardel1, Yu-Cheng Tsai1, Craig B. Arnold1; 1Mechanical and Aerospace Engineering, Princeton Univ., USA. Optical trap assisted nanopatterning is used to write sub-micron features on substrates with pre-existing topography. Uniform patterns are successfully written across a large-scale trench on a polyimide surface.

Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011
**Big Sur Room**  
Bio-Optics: Design and Application (BODA)

**Regency 1 & 2**  
Novel Techniques in Microscopy (NTM)

**Regency 3**  
Optical Molecular Probes, Imaging and Drug Delivery (OMP)

**Cypress Room**  
Optical Trapping Applications (OTA)

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<td>Coffee Break, Regency Main</td>
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<tr>
<td>10.00–16.00</td>
<td>Exhibits Open, Regency Main</td>
</tr>
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**NOTES**

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Genetic Algorithm Optimization of Phase Masks for Focusing Light through Turbid Media, Donald B. Conkey, Albert Brown, Antonius Caravaca, Rafael Piestun; Electrical and Computer Engineering, Univ. of Colorado at Boulder, USA. We introduce genetic algorithms for wave-front control to focus light through scattering media. Genetic algorithms are attractive, because of their parallelism and global optimization properties.

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Two-Dimensional Surface Plasmon Resonance (SPR) Biosensor based on Infrared Imaging, Chi Lok Wong1, George Choe2, Beng Koon Ng3; 1BC Photonics Technological Co., Canada; 2School of EEE, Nanyang Technological Univ., Singapore. A surface plasmon resonance imaging biosensor based on IR imaging is demonstrated. A sensor resolution of 9.4 x 10-6 RIU is achieved which is better than reported by conventional intensity based SPR imaging sensors.

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Optical Manipulation in the Evanescent Field of a Nanofiber via Spatial Light Modulation, Mary Frawley1,2, Alex Petca-Colan1,2, Sile Nic Chormaic1,2; 1Physics Dept., Univ. College Cork, Ireland; 2Photonics Ctr., Tyndall National Inst., Ireland. We propose to selectively generate higher order mode superposition in an optical nanofiber. By adiabatically coupling Gaussian and SLM-generated Laguerre-Gaussian beams into the fiber, trapping sites form in the evanescent field at the fiber waist.
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### BTuB • Visual Optics

**Tuesday, 5 April**

10.30–12.30

**Presider to Be Announced**

#### BTuB1 • 10.30 Invited

**Optical Engineering for Intra-Ocular Lens (IOL) Selection and Customization**

**Chris Dainty**, Alexander Gencharov, Diana Bogasevscher, Patrick Collins, Arthur Cummins, Huanqing Gao, Eugene Ng, Anton Sharapov, Matt Sheehan, Kevin Smith;

1 School of Physics, Natl. Univ. of Ireland Gauley, Ireland; 2 Natl. Digital Res. Ctr., Ireland; 3 ClearSight Ltd., Ireland.

We describe new methodologies for the selection of the most appropriate power of intra-ocular lens (IOL) in cataract surgery, and how one might develop customized solutions for IOLs.

---

### NTuB • Phase I

**Tuesday, 5 April**

10.30–12.30

**Randy Bartels, Colorado State Univ., USA, Presider**

#### NTuB1 • 10.30 Invited

**Random and Deterministic Transport in Live Cells Quantified by SLIM,**

Gabriel Popescu;

1 Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA.

We used quantitative phase imaging to measure the dispersion relation, i.e. decay rate vs. spatial mode, gamma(q), associated with mass transport in live cells.

---

### OTuB • Clinical/Pre-clinical Applications II

**Tuesday, 5 April**

10.30–12.30

**Paul French, Imperial College London, UK, Presider**

#### OTuB1 • 10.30 Invited

**Optical Techniques for Tracking Cells in vivo,**

Charles P. Lin; Wellman Ctr. for Photomed, Harvard Med School, Massachusetts General Hospital, USA.

I will focus on tracking cancer cells, immune cells, and stem cells in vivo using (i) intravitral microscopy for 3-D tissue imaging, and (ii) in vivo flow cytometry for detection and quantification of circulating cells.

---

### BTuB2 • 11.00 Invited

**Title to be Announced, Christian Sandstedt, Callioun Vision, Inc., USA.**

Abstract not available.

#### NTuB2 • 11.00

**Tomographic Reconstruction by Quantitative Phase Imaging with Broadband Fields,**

Zhuo Wang, Daniel Marks, Scott Carney, Mustafa Mir, Gabriel Popescu;

Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA.

We developed a theoretical and experimental approach that allows for solving the 3D scattering inverse problem via quantitative phase imaging with broadband fields.

---

### OTuB2 • 11.00 Invited

**FLIM in Ophthalmology: a Diagnostic Tool for Metabolic Mapping,**

Dietrich Schweitzer, Matthias Klenm, Stefan Schenke, Silvia Quick, Lydia Deutsch, Susanne Jeitsch, Martin Hammer;

1 Experimental Ophthalmology, Univ. of Jena, Germany; 2 Biomedical Technique and Informatics, Technical Univ. Ilmenau, Germany.

A laser scanner ophthalmoscope for measurement of time-resolved fluorescence of endogenous fluorophores was developed for detection of metabolic alteration in age-related macular degeneration, retinal vessel occlusion, and diabetic retinopathy.

---

### BTuB3 • 11.15 Invited

**Real-Time Quantitative Phase and Dual-Channel Fluorescence Microscopy for Studying Cellular and Biomolecular Dynamics,**

Matthew T. Rinehart, Nathan T. Shaked, Lisa Satterwhite, Adam Wax;

Biomedical Engineering, Duke Univ., USA.

We have developed a microscope that simultaneously captures quantitative phase measurements and two distinct fluorescence images on a single camera. This microscope is an effective tool for investigating cellular dynamics with molecular specificity.

---

### OTuB3 • 11.15

**Microfluidic Particle Manipulation on Electro-Optic Surfaces,**

Michael Esseling, Stefan Glaesener, Cornelia Denz;

Inst. of Applied Physics, Germany.

We present an all-optical method for the creation of large-scale particle arrays on the surface of electro-optic crystals. Manipulation of matter is achieved by dielectrophoretic forces exhibited by the strong internal fields of these materials.

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**Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011**
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<td><strong>Bio-Optics: Design and Application (BODA)</strong></td>
<td><strong>BTuB • Visual Optics—Continued</strong></td>
<td><strong>Title to be Announced</strong>, Qiuqiu Ren; Peking Univ., China. Abstract not available.</td>
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<td><strong>Regency 1 &amp; 2</strong></td>
<td><strong>NTuB • Phase I—Continued</strong></td>
<td><strong>Spectral-domain Differential Interference Contrast Microscopy</strong>, Yizheng Zhu, Natan T. Shaked, Lisa Satterwhite, Adam Wax; Dept. of Biomedical Engineering, Duke Univ., USA. We present a novel imaging technique, termed spectral-domain DIC microscopy, for high-resolution quantitative measurement of optical pathlength gradients. Imaging of resolution target and live cardiomycocytes were demonstrated with 36pm resolution.</td>
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<tr>
<td><strong>Regency 3</strong></td>
<td><strong>OTuB • Clinical/Pre-clinical Applications II—Continued</strong></td>
<td><strong>Fluorescence Diffuse Optical Tomography with Multiple View Structured Illumination</strong>, Nicolas Ducros¹, Andrea Bassi¹, Gianluca Valentini², Martin Schweiger², Simon Arridge², Cosimo D’Andrea²; ¹Physics, IFN-CNR, IIT, Dept. di Fisica, Italy; ²Dept. of Computer Science, Univ. College London, Italy. Fluorescence Diffuse Optical Tomography with structured light is demonstrated using multiple views. Reconstructions from simulated and experimental data sets is carried out. Multiple view approach improves the spatial resolution of reconstruction.</td>
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<tr>
<td><strong>Cypress Room</strong></td>
<td><strong>OTuB • Trapping Techniques and Applications II—Continued</strong></td>
<td><strong>Sonotweezers: Complementing the Size and Force Spectra of Optical Trapping</strong>, Michael P. MacDonald; ¹Electronic Engineering and Physics, Univ. of Dundee, UK. Optical trapping is suited to applications with small forces, high spatial control and for nanometre-to micron-sized particles. We present Sonotweezers, manipulating particles up to millimetres in scale with forces in excess of nanometres.</td>
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<td><strong>NTuB4 • 11.30</strong></td>
<td><strong>Spectral-domain Differential Interference Contrast Microscopy</strong>, Yizheng Zhu, Natan T. Shaked, Lisa Satterwhite, Adam Wax; Dept. of Biomedical Engineering, Duke Univ., USA. We present a novel imaging technique, termed spectral-domain DIC microscopy, for high-resolution quantitative measurement of optical pathlength gradients. Imaging of resolution target and live cardiomycocytes were demonstrated with 36pm resolution.</td>
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<td><strong>NTuB5 • 11.45</strong></td>
<td><strong>GPU-based Real-time Phase Microscopy</strong>, Johannes Frank, Sebastian Wette, Jan Benke, Stefan Allmeyer; Inst. of Applied Optics and Electronics, Cologne Univ. of Applied Sciences, Germany. A quantitative multi-camera phase microscope, based on a Green’s function solution of the transport-of-intensity equation (TIE), is presented. Solving the TIE on a graphic processing unit offers the possibility of phase measurements in real-time.</td>
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<td><strong>OTuB4 • 11.45</strong></td>
<td><strong>Spectroscopic Optical Coherence Tomography for Quantitative Molecular Imaging</strong>, Francisco Robles, Adam Wax; Biomedical Engineering, Duke Univ., USA. Advances in spectroscopic OCT have allowed for quantitative analysis of endogenous contrast agents. Here, we will use SOCT to achieve quantitative molecular imaging using various exogenous contrast agents spanning the visible region of the spectrum.</td>
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<td><strong>OTTuB • Trapping Techniques and Applications II—Continued</strong></td>
<td><strong>Sonotweezers: Complementing the Size and Force Spectra of Optical Trapping</strong>, Michael P. MacDonald; ¹Electronic Engineering and Physics, Univ. of Dundee, UK. Optical trapping is suited to applications with small forces, high spatial control and for nanometre-to micron-sized particles. We present Sonotweezers, manipulating particles up to millimetres in scale with forces in excess of nanometres.</td>
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<td><strong>NTuB6 • 12.00</strong></td>
<td><strong>4-Dimensional Microscope System for Dynamic Phase Imaging</strong>, Katherine Creadth; 4-D Technology Corp. and Univ. of Arizona, USA. New, novel interference microscope system utilizing a pixeled phase sensor capturing dynamic phase images in vitro, enabling volumetric, motion and morphological studies, including examples of monitoring different biological processes and motions.</td>
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<tr>
<td><strong>OTuB5 • 12.00</strong></td>
<td><strong>Multimodal Optical Detection of Intravaginal Microbicide Gel Coating Thickness Distribution</strong>, Tyler K. Drake, Jennifer Peters, Marcus Henderson, Michael DeSoto, David Katz; Adam Wax; Biomedical Engineering, Duke Univ., USA. A clinical optical probe incorporating simultaneous fluorescence and low coherence interferometry imaging was developed. A clinical study was performed to compare fluorimetry and LCI in measuring intravaginal microbicide gel thickness distribution.</td>
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<td><strong>OTTuB • Trapping Techniques and Applications II—Continued</strong></td>
<td><strong>Sonotweezers: Complementing the Size and Force Spectra of Optical Trapping</strong>, Michael P. MacDonald; ¹Electronic Engineering and Physics, Univ. of Dundee, UK. Optical trapping is suited to applications with small forces, high spatial control and for nanometre-to micron-sized particles. We present Sonotweezers, manipulating particles up to millimetres in scale with forces in excess of nanometres.</td>
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Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011
X-ray Photon Sieves for Phase-contrast Microscopy, Guanxiao Cheng1,2, Chao Hu12, Max Q.-H. Meng2; 1Shenzhen Inst. of Advanced Technology, Chinese Academy of Sciences, China; 2Chinese Univ. of Hong Kong, China. A diffractive compound objective integrated the Zernike phase shift in an apodized photon sieve (ZAPS) is presented for high-resolution X-ray phase-contrast microscopy. The focusing properties of the ZAPS can be easily adjusted by pupil apodization.

Rapid Confocal Imaging of Large Area Excised Tissue with Strip Mosaicing, Sanjee Abeytunge1, Yongbiao Li1, Bjorg A. Larson1, Ricardo Toledo-Crow1, Milind Rajadhyaksha1; 1Res. Engineering Lab., Memorial Sloan Kettering Cancer Ctr., USA; 2Dermatology Services, Memorial Sloan Kettering Cancer Ctr., USA. Strip mosaicing in a confocal microscope allows imaging of cellular morphology over large-area tissue for rapid pathology at the bedside. We scan 10 mm long strips and stitch to display 100 mm2 in five minutes.

Message In a Bottle the Statistical Behavior of Nanoparticles in Optical Confinement, Liangcheng Zhou1, Daniel Ou-Yang1, Joseph Junio1, Jack Ng1, Joel Cohen1, Zhifang Lin4; 1Physics, Lehigh Univ., USA; 2Physics, Hong Kong Univ. of Science and Technology, Hong Kong; 3Physiology, Univ. of the Pacific, USA; 4Physics, Fudan Univ., China. A focused laser produced optical bottle transiently traps nanoparticles while 3-D fluorescence imaging maps the nanoparticle distribution.
**JTuA1**
Customized Eye Modeling Using Clinical Pentacam and Wavescan Data, Ying-Ling A. Chen1, Lei Shi1, Jim Lewis1, Ming Wang2, Ryan Vida1; 1Cir. for Laser Applications, Univ. of Tennessee, USA; 2Wang Vision Inst., USA; 3E-Vision Technologies Inc., USA. We incorporated anterior chamber compartments, axial length, and wavefront measurements to construct pilot customized eye models for extensive applications. 3D normal and diseased eyes were successfully constructed with RMS 0.01 wave accuracy.

**JTuA2**
Determination of Resorption in Bone Using Phase Shifting Interferometry, George Cher1, Joachim Lov1; 1BC Photonics Technological Co, Canada; 2School of Materials Science and Engineering, Nanyang Technological Univ., Singapore. Phase Shifting Interferometer using the Carre and Hariharan algorithms is proposed for quantifying resorption in bone sample. Advantages of the system include being non-contact, 3-D profile, less time consuming, and relatively inexpensive.

**JTuA3**
Biophotonic Studies of Intracellular Responses to Nanosecond, Megavolt-per-meter, Pulsed Electric Field, Yu-Hsuan Wu1, Stefania Romeo1, Martin A. Gundersen1, P. Thomas Vernier1; 1Chemical Engineering and Materials Science, Univ. of Southern California at Los Angeles, USA; 2Information Engineering, Second Univ. of Naples, Italy; 3Electrical Engineering, Univ. of Southern California at Los Angeles, USA; 4MOSIS/Information Sciences Inst., Univ. of Southern California at Marina Del Rey, USA. The effects of nanoelectropulses on intracellular structures are reported in this work. The real-time investigation is performed by means of a system consisting of a fluorescence microscope, an EMCCD camera and a photomultiplier tube.

**JTuA4**
Enhanced Bio-Sensing by Mechanically Stretching Active Plasmonic PDMS Device, Yanhui Zhai1, Ahmad A. Naez1, Tony J. Huang1; 1Engineering Science and Mechanics, Penn State Univ., USA. We demonstrated a bio-sensing tool involving deposition of gold coated PS nanospheres over a PDMS substrate. Sensing spectrum can be tuned by stretching PDMS substrate, providing large sensing range within a single structure.

**JTuA5**
Quantifying Kinetics and Dynamics of DNA Repair Proteins Using Raster-Scan Image Correlation Spectroscopy and Fluorescence Recovery after Photobleaching, Salim Abdissaalam1; 1Bioengineering, Univ. of Texas at Arlington, USA. DNA double-strand breaks (DSBs) are one of the most lethal DNA damage occurs in mammalian cells. In this work, RICS and FRAP techniques are used to study kinetics of double stand break repair protein before and after γ-irradiation in vivo.

**JTuA6**
Time-Gated Raman Spectra of Living Samples, Zachary Smith1, Florian Knorr1, Sebastian Wachsmann-Hogiu1; 1Cir. for Biophotonics, Univ. of California at Davis, USA. We have developed an 800 fs all-optical gate capable of providing approximately 1.

**JTuA7**
Statistical Analysis of Biotissues Mueller Matrix Images in Cancer Diagnostics, Roman M. Tsytalki1; 1Correlation Optics, Chernivtsi Natl. Univ., Ukraine. Application of lasers in biomedical optics caused the development of other research areas - biospeckles. This research was aimed at the potentialities of laser polarimetry in diagnostics of optically thick, multilayer tissues of human prostate.

**JTuA8**
Long Gradient Index Lens Multiphoton Endoscopic Systems, David Hulan1, Scott Howard1, Watt W. Webb1, Chris Xie1; 1Biomedical Engineering, Cornell Univ., USA; 2Applied and Engineering Physics, Cornell Univ., USA. We characterize long (up to 285 mm) GRIN lens endoscope systems for multiphoton imaging use. Axial and lateral point spread functions are presented.

**JTuA9**
Label-Free Detection of Calcifications in the Breast, Zhuo Wang1, Kristinranao Tangello1; 1Biophotonics, Univ. of California at Davis, USA. We have developed an 800 fs all-optical gate capable of providing approximately 1.

**JTuA10**
Live 3-D Imaging of HIV-1 Transfer through the Virological Synapse, Deanna L. Thompson1, Gregory McNerney1, Benjamin M. Dale1, Benjamin K. Chen1, Thomas Hust1; 1NSF Center for Biophotonics Science and Technology, Univ. of California at Davis, USA; 2Mount Sinai School of Medicine, USA. Live, 3-D, multicolor imaging of cell-to-cell HIV-1 transmission using spinning disk confocal microscopy and a replication-competent fluorescent clone of the virus reveals clues to HIV’s evasion of the human immune system.

**JTuA11**
Fast, Approximate Gaussian Mask Algorithm, Alexander R. Small1, Nahom Yirga1; 1Physics, California State Polytechnic Univ., USA. Gaussian Mask is an algorithm for localizing fluorophores in microscopy. Using simulated images, substantial speed improvements are shown to be possible if good initial position estimates are available and the fitting function is Taylor-expanded.

**JTuA12**
Tunable, Low Repetition Rate, Femtosecond Pulse Ti:Sapphire Laser for in vivo Imaging by Nonlinear Microscopy, Robert Szczepanski1, Peter Gyula Antal1, Attila Szilagyi1, Attila Kolonics1; 1Laser Applications, Res. Inst. for Solid State Physics and Optics of the Hungarian Academy of Sciences, Hungary; 2R&D Ultrafast Lasers Ltd., Hungary. We report on a broadly tunable, long-cavity, low-pump-threshold, pulsed Ti:Sapphire laser. The laser delivers nearly transform limited ~300 fs, ~10 nJ pulses at 22 MHz repetition rate being ideal for nonlinear microscopy.
JTuA13

Early Glutamate-mediated Cell Death Detection with Digital Holographic Microscopy, Nicolas Pavillon1, Jonas Kühn2, Pascal Jourdain3, Christian D. Depeursinge1, Pierre J. Magistretti2, Pierre Marquet2,3; 1Microvision and Microdiagnostics Group, STI, Ecole Polytechnique Fédérale de Lausanne, Switzerland; 2Dépt. de Psychiatrie, CHUV, Prilly, Switzerland; 3Brain Mind Inst., Ecole Polytechnique Fédérale de Lausanne, Switzerland. We demonstrate the capability of digital holography to dynamically detect non-invasively cell death through the measurement of cellular volume regulation, considered as an early indicator of cellular deregulation, leading to cell death triggering.

JTuA14

In vivo Real Time FF-OCT of the Rat Brain, Jonas Binding1,2, Juliette Benarous3, Sylvain Giguère, Claude Boccara4, Jean-François Léger4, Laurent Boudreau3; 1IBENS, EnS, Paris, France; 2Inst. Langevin, ESPCI ParisTech, Paris, France; 3Max Planck Inst. for Medical Res., Heidelberg, Germany. We demonstrate the ability of full-field OCT to image the cortex of living rats. The main feature that appears is individual myelin fibers. A precise measurement of the brain refractive index has also been obtained.

JTuA15

Extended Field of View Confocal Microscopy, Kristen C. Maiiland1, Megan Sodaiva1, Cory Olovsky2; 1Biomedical Engineering, Texas A&M Univ., USA. We exploit a fast motorized translation stage to replace the frame scan mirror in a raster scanning confocal microscope to extend field of view in one axis. 5cm x 1mm image is captured in ~10 seconds.

JTuA16

Tip Enhanced Raman Spectroscopy (TERS) Instrumentation for Probing Linearized DNA for Cancer-Specific Lesions: Challenges and Outcomes, Noah Kolodziejski, Rajan Gurjar, David Wolf; 1Radiation Monitoring Devices, USA. We have adapted Tip-Enhanced Raman Spectroscopy (TERS) technology to a DNA sequencing modality simultaneously sensitive to a broad spectrum of cancer-relevant lesions. Obstacles encountered while approaching single-base resolution will be discussed.

JTuA17

Two-photon Absorbing Probes and Their Use in Two-Photon Fluorescence Microscopy of Cells and ex vivo Imaging of Tumors, Ciceron Yanez1, Carolina D. Anracte2, Alma R. Morales2, Takei Urakami2, Masanobu Komatsu2, Kevin D. Belfield2,3; 1Chemistry, Univ. of Central Florida, USA; 2CREOL, Uniu of Central Florida, USA; 3Sanford-Burham Medical Research Inst., USA. Efficient two-photon (2PA) absorbing dyes and biocjugates were used in two-photon fluorescence microscopy (2PFM) of cells, tissue sections, and excised tumors. Results show the utility of these dyes in studying biological processes.

JTuA18

Non-Invasive Staining of the Whole Astrocytic Network in the Rodent Brain through Systemic Administration of Sulfonoforhadmine Dyes: Intravital and in vivo Applications, Florence Appaux1, Johannes Koeumer1, Boudewijn van der Sanden2, Sabine Giraf2, Sylvie Boisseau3, Mireille Albreux1, Harmut Weig3, Isabelle Guillemain4, Antoine Depaulis4, Jean-Claude A. Vial2,3; 1Lab. de Spectrométrie Physique, CNRS, Saint Martin d’Hères, France; 2Inst. des Neurosciences de Grenoble, INSEED, France. As compared to local injections of sulfonoforhadmine-B and sulfonoforhadamine-101, i.v. administration of these dyes was shown to be more efficient and less invasive for astrocyte staining in the whole rodent brain.

JTuA19

High-Speed Imaging of Microbubble Formation in a Novel Flow Focusing Microfluidics Chip, Paul Campbell; 1Physics, Univ. of Dundee, UK. This work aimed to produce monodisperse microbubbles for use as theranostic agents in medical ultrasound. We describe our design for a glass microfluidic chip with a distinctive flow focussing junction that ensure monodispersity.

JTuA20

Turbidity Measurements on Suspended Lipid Microbubble Populations Subjected to Ultrasound, Paul Campbell; 1Physics, Univ. of Dundee, UK. The turbidity of solutions containing 2 ultrasound contrast agents (SonoVue®Bracco Diagnostics, Inc. and Sonazoid™, GE HealthCare) was measured as a function of ultrasound exposure, and correlations developed with their bioeffects in vitro.

JTuA21

Novel Two-Photon Fluorescence Probes for Zinc Ion Sensing, Andrew Frazer1, Xiaohua Wang1, Doo M. Nguyen1, Alma R. Morales1, Kevin D. Belfield2; 1Chemistry, Univ. of Central Florida, USA. We report the synthesis, photophysical characteristics of two photon fluorescent (2PF) probes which shows superior specificity for zinc coupled with two photon microscopy imaging utilized to evaluate detection of Zn²⁺ in vivo.

JTuA22

Forward Problem Solution in Photoacoustic Tomography by Discontinuous Galerkin Method, Srijeta Bagchi1, Debasis Roy2, Ram Mohan Vasu1; 1Dept. of Instrumentation and Applied Physics, Indian Inst. of Science, India; 2Dept. of Civil Engineering, Indian Inst. of Science, India. This paper attempts to model the forward problem in photoacoustic tomography (PAT) using discontinuous Galerkin (DG) method. Numerical experiments show that DG solutions are comparable with those obtained by finite element method (FEM).

JTuA23

Please see OTTuC3

JTuA24

Evanescence Wave Optical Trapping Using Tapered Optical Fibers, Marius Sergules1, Susan E. Skelton1, Radhika Patel1, Agata Pavelkowska1,2, Phil Jones1; 1Physics and Astronomy, Univ. College London, UK; 2Nat. Physical Lab., UK. We investigate experimentally and theoretically the trapping of micro- and nanoparticles in the evanescent field surrounding a tapered optical fiber and show how combinations of modes may be used to control trapped particle dynamics.
**JTuA25**
Plasmon-Enhanced Optical Trapping of Metal Nanoparticles, Ondřej Marago, Phil Jones, Rosalba Saija, Ferdinando Borghese, Paolo Denti, Maria A. Iatò, Pietro Gucchiardi, CNR-Inst. per i Processi Chimico-Fisici, Italy; †Physics and Astronomy, Univ. of London, UK.

We investigate plasmon-enhanced optical trapping of metallic nanoparticles. We calculate the optical forces on gold, silver and aluminium nanospheres through a procedure based on the Maxwell stress tensor in the transition T-matrix formalism.

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**JTuA26**
Radially Polarized Optical Tweezers, Susan E. Skelton, Marios Sergides, Radhika Patel, Agata Pawelkowska, Onofrio Marago, Phil Jones, Dept. of Physics and Astronomy, Univ. of London, UK; †Natl. Physical Lab, Teddington, Middlesex, UK; †CNR-Inst. per i Processi Chimico-Fisici, Italy.

We present experimental measurements of the spring constants of a radially polarized optical tweezer for a wide range of micro- and nano-particles and compare the results to those obtained using linearly- and circularly-polarized trapping beams.

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**JTuA27**
Ultrafast Imaging of Microbubble Cavitation Using Integrated Optical Trapping for Spatial Control: Progress and Prospects, Paul Campbell, Physics, Univ. of Dundee, UK.

Cavitation science has experienced heightened interest within medical contexts due to the emerging theranostic capabilities of ultrasound driven microbubbles. We review the state of the art for optically controlled observations at MHz framing rates.

---

**JTuA28**
NanoTracker Force-Sensing Optical Tweezers for Quantitative Single-Molecule Nanomanipulation, Joost van Mameren, Helge Eggert, Gerd Behne, Claudia Böttcher, JPK Instruments AG, Berlin, Germany. JPK has developed an optical tweezers platform the NanoTracker This allows controlled trapping and accurate tracking of nanoparticles suspended either in a microfluidic multichannel flow chamber or even in temperature-controlled open Petri dish.

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**JTuA29**

We experimentally demonstrated an optical trapping of opaque particles, which were captured in a dark spot created by tightly focusing of a double-ring-shaped, radially polarized beam (TM02 mode beam).

---

**JTuA30**
Generation of Trapping Sites in the Evanescent Field of a Fiber Taper Coupler, Mary Frawley, Galvin Khara, Sile Nic Chormaic, Physics Dept., Univ. College Cork, Ireland; †Photonics Centre, Tyndall Nat'l. Inst., Ireland.

We propose to create optical trapping minima in the evanescent field of a fiber taper coupler by selectively exciting combinations of the HE11, TE01 and HE21 higher order modes in the waist region.

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**JTuA31**
Please see OTTuC2

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**JTuA32**

We study both experimentally and theoretically optical interactions called as optical binding between micro- and nanoscopic particles. We observed new and unexpected manifestations for particles asymmetrically placed in incident optical fields.

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**JTuA33**
An Approach to Selective Optical Isolation and Cloning of Cyanobacteria of Atacama Desert, Gabriel Araneda, Natally Cisternas San Martin, Juan Pablo Stafoillli, Dept. de Fisica, Univ. de Concepcion, Chile; †Ctr. for Optics and Photonics, Chile.

We propose a low-cost, highly precise and robust protocol for individual isolation of Cyanobacteria selected from a mixtures of species, combining optical tweezers techniques and flow control by gravity force.

---

**JTuA34**
Vortical Optical Traps Based on Spiral Beams, Kirill Afanasiev, Alexander Korobtsov, Svetlana Kozova, Nikolay Losevsky, Vsevolod Patlan, Eugenia Razueva, Vladimir Volostnikov, Evgeny Vorontsov, LPI Samara Branch, Russian Federation.

The possibility is shown to form vortical light fields with the desired intensity distribution by means of phase-only DOE's based on spiral beams optics. Experiments on fields generation with SLM and laser manipulation are presented.

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Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011

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### Big Sur Room
**Bio-Optics: Design and Application (BODA)**

#### BtuC • Biomedical Optical Imaging

**Tuesday, 5 April**

16.00-18.00  
Presenter to Be Announced

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<th>BtuC1 • 16.00</th>
<th>Invited</th>
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<tbody>
<tr>
<td>Title to Be Announced, Ruibang Wang; Univ. of Washington, USA. Abstract not available.</td>
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</tbody>
</table>

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#### NTuC • Phase II

**Tuesday, 5 April**

16.00-18.00  
Presenter to Be Announced

<table>
<thead>
<tr>
<th>NTuC1 • 16.00</th>
<th>Invited</th>
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<tbody>
<tr>
<td>High-Speed Nonlinear Harmonic Generation Holographic Microscopy, Randy Bartels¹,², Philip Schlip¹, Jesse Wilson¹; ¹Electrical and Computer Engineering, Colorado State Univ., USA; ²School of Biomedical Engineering, Colorado State Univ., USA. We present three-dimensional images of biological samples using nonlinear optical, holographic microscopy. The oscillator operates at a wavelength with low scattering in the sample and its low average power prevents damage to the samples.</td>
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</tbody>
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#### OTuC • Novel Probes III

**Tuesday, 5 April**

16.00-17.15  
Dietrich Schweitzer; Univ. of Jena, Germany, Presenter

<table>
<thead>
<tr>
<th>OTuC1 • 16.00</th>
<th>Invited</th>
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</thead>
<tbody>
<tr>
<td>Fluorescence Lifetime in Optical Molecular Imaging, Walter J. Akers¹,², Mikhail Berezin¹, Hyeran Lee¹, Samuel Achilefu¹,²; ¹Dept. of Radiology, Washington Univ. School of Medicine, USA; ²Dept. of Biochemistry and Biophysics, Washington Univ. School of Medicine, USA. Recent applications of fluorescence lifetime in optical molecular imaging are presented. These in vivo applications include fluorescent signal separation, monitoring of controlled release and improved detection of quenched probe activation.</td>
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</tr>
</tbody>
</table>

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#### OTTuC • Trapping Techniques and Applications III

**Tuesday, 5 April**

16.00-18.00  
Optoelectronic Tweezers as A Tool for Medical Diagnostics, Steve L. Neale¹, Clemens Kummer¹, Michael Barrett¹; Biomedical Engineering Res. Division, Univ. of Glasgow, UK; Welbeck Trust Centre for Molecular Parasitology, Univ. of Glasgow, UK. Optoelectronic Tweezers (OET) allows pattering of electric fields by the selected illumination of a photoconductive device. This has many applications for medical diagnostics, here we show work towards diagnosing Human African Trypanosomiasis.

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#### BTuC2 • 16.30

**Real-Time 4-D Full-Range Complex Fourier-Domain OCT with Non-Uniform Fast Fourier Transform Based on Dual Graphics Processing Units Architecture, Kang Zhang, Jin U. Kang; Electrical and Computer Engineering, Johns Hopkins Univ., USA.** We implemented real-time 4-D full-range complex FD-OCT with non-uniform fast Fourier transform processed in dual graphics processing units architecture. With a 128,000 A-scan/second line scan spectrometer, we obtained 5.0 volume/second C-scan speed.

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#### NTuC2 • 16.30

**Holographic Second Harmonic Generation Microscopy, Etienne Shaffer¹, Pierre Marquet¹, Christian D. Depeursinge¹; ¹Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; ²Dept. de Psychiatrie-CHUV, Site de Cery, Switzerland. Holographic second harmonic generation (SHG) microscopy is a non-scanning imaging technique that retrieves both the amplitude and the phase of SHG. Here, we present an overview of the technique and its applications.**

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#### OTuC2 • 16.30

**A New Optical Nano-Construct Composed of a Genome-Depleted Plant Virus Doped with a Near Infrared Organic Chromophore, Bong-sun Jung¹, Ayala L. Rao¹, Bahman Ansari²; ¹Bioengineering, Univ. of California at Riverside, USA; ²Plant Pathology and Microbiology, Univ. of California at Riverside, USA. We have engineered an optical construct composed of the brome mosaic virus doped with indocyanine green, an FDA-approved chromophore. These constructs may offer a non-toxic platform for site-specific and deep tissue optical imaging, and phototherapy.**

---

#### OTTuC2 • 16.30

**Resolving Interparticle Position and Optical Forces along the Axial Direction Using Optical Coherence Gating, Woei Ming Lee¹, Tzu Hao Chiu²; Beng Koon Ng³; Wellman Photomedicine, Harvard Medical School and Massachusetts General Hospital, USA; School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore; Singapore-MIT Alliance, Natl. Univ. of Singapore, Singapore. We demonstrate the use of coherence gating to resolve particle positions and forces in the axial direction. High depth resolution (micrometers) and weak optical force (femtonewtons) measurements in an optical trapping system is achieved.**

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**Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011**
Currently, eye cataract surgery is developed using femtosecond laser, automated using digital holographic interferometry. This method utilizes a photonic crystal slab between two crossed polarization filters as the microscope slide.

Cataract surgery differs from the surgical skills and complicating factors. We developed and tested an image-guided laser system to improve the precision and reproducibility of cataract surgery.
Intrinsic Optical Signal Imaging of Stimulus-Evoked Neural Activities in the Retina

Xincheng Yao, Yangguo Li, Yichao Li, Qiuxiang Zhang; Univ. of Alabama at Birmingham, USA. Intrinsic optical signal (IOS) imaging and electrophysiological recording were used to detect retinal neural activities. IOS imaging allowed dynamic monitoring of visual signal propagation from the photoreceptor to inner retinal neurons.

Quantitative Phase from Defocus

Shan Kou1, Colin J. R. Sheppard1, Nicolas Pavillon1, Pierre Marquet1, Christian D. Depeursinge1; 1STI, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland; 2Bioengineering, Natl. Univ. of Singapore (NUS), Singapore; 3Dept. of Psychiatry DP-CHU, Univ. de Lausanne, Switzerland. We present a non-iterative technique that unlike solving the transport of intensity equation (TIE) obtains the quantitative phase of a weak object using only the inversion of an optical transfer function in defocused situation.

Complex Field imaging for Diffraction Tomography

Isabelle Bergond, Cristian Arfe, Yann Cotte, Christian D. Depeursinge; 1Microvision and Microdiagnostics Group, EPFL, Switzerland. We present a technique to recover 3-D refractive index distribution of cells using Digital Holographic Microscopy. Diffraction tomography is performed by two-axes rotation of the sample and aberrations corrected imaging with high numerical aperture.

Dynamic Biomolecule Sensing Bead Array Held by Optical Tweezers

Manuel Alpacios1,2, Aaron F. Phillips3, David R. Walt1; 1Chemistry Dept., Tufts Univ., USA; 2Chemistry Dept., Bard College, USA. We have developed a platform using optical tweezers to create dynamic arrays of functionalized microbeads in microfluidic channels. The array is then exposed to analyte signaling molecules and washes, and interrogated using fluorescence microscopy.

Optically Tweezing the Colloidal Alphabet

Thomas Mason; Physics and Astronomy, UCLA, USA. Many intricate dielectric shapes having holes and arms, as sampled using lithographic letters that have a thickness and width comparable to the wavelength, can be optically trapped in more than one stable position and orientation.
**BWA • Design for Biomedical Optical Imaging**

Wednesday, 6 April 8.00–10.00

**BWA1 • 8.00 Invited**
Toward Low Cost Imaging: A Laser Scanning Digital Camera, Ann E. Elsner1, Matthew S. Muller2, Benno L. Petrig7, Joel A. Papay4, Christopher A. Clark5, Jovin Alavanja6, Bryan P. Haggerty7; 1Indiana Imaging, USA. The laser scanning digital camera is a hybrid confocal imager, designed with simplified optics and electronics to reduce the costs of diagnostic imaging, presentation of visual stimuli, and measurement of refractive error.

**BWA2 • 8.30 Invited**
Better Medicine Through Proper Lighting, Amber Czajkowski1; Coating, Edmund Optics, USA. Adverse lighting conditions can seriously hinder medical diagnoses. Through the use of properly filtered light, medical professionals may dramatically improve viewing conditions for timely and more accurate diagnoses.

**BWA3 • 9.00**
Microscopy and Spectroscopy on a Cell Phone, Kaiqin Chu2, Zachary J. Smith3, Denis Duguay4, Dennis Matthews5, Stephen Lane1, Sebastian Wachsmann-Hogiu6; 1Center for Biophotonics, Univ. of California at Davis, USA; 2Dept. of Pathology, Univ. of California at Davis, USA. We have developed two attachments that transform a cell phone’s integrated camera into either a microscope with 1.5 micron resolution or a spectrometer with a 5nm spectral resolution. We show applications to medically relevant problems.

**NWA • Endoscopy**

Wednesday, 6 April 8.00–10.00

**NWA1 • 8.00 Invited**
Scanning Fiber-Optic Nonlinear Endomicroscopy, Kartikeya Murari1, Jiefeng Xi2, Ming-Jan Li3, Xingde Li2, Yuying Zhang2; 1Biomedical Engineering, Johns Hopkins Univ., USA; 2Science and Technology Division, Corning Inc., USA. We present a fully integrated fiber-optic scanning endomicroscope of a probe head weight less than 1.2g. Significant improvements on nonlinear signal collection efficiency (by 30 fold) and resolution (by 2 fold) have been recently achieved.

**NWA2 • 8.30**
3 mm O.D. Raster Scanning Multiphoton Endoscope, David R. Rivera, Christopher M. Brown, Chris Xu, Watt W. Webb; Cornell Univ., USA. We present a 3mm outer diameter multiphoton endoscope that utilizes a hybrid resonant/non-resonant miniaturized piezo raster scanner. A field of view of 80um by 70um is achieved at a frame rate of 4.4 frames/s.

**NWA3 • 8.45 Invited**
Title to Be Announced, Zhongping Chen; Univ. of California Irvine, USA. Abstract not available.
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<th>Regency 3</th>
<th>Cypress Room</th>
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<td>Bio-Optics: Design and Application (BODA)</td>
<td>Novel Techniques in Microscopy (NTM)</td>
<td>Optical Molecular Probes, Imaging and Drug Delivery (OMP)</td>
<td>Optical Trapping Applications (OTA)</td>
</tr>
</tbody>
</table>

**BWA4 • 9.15**
Miniaturized Microscope for Multi-spectral Laser Imaging, Janaka Senaratne1, Biomedical Engineering, Johns Hopkins Univ., USA. Imaging setups require stereotaxically affixed animals restricting observable behavior. We present a rodent head-mountable microscope for multi-spectral laser imaging. Architecture and preliminary results are described.

**BWA5 • 9.30**
Invited
OCT Endomicroscopy and Functional Integration with Two-Photon Fluorescence Imaging, Jiefeng Xi1, Kartikeya Murari1, Yuqing Zhang2, Yongping Chen1, Jiasong Li1, Xingde Li1; Biomedical Engineering, Johns Hopkins Univ., USA. We report on our recent developments of optical coherence tomography endoscopy technologies that enable aberration correction, high-speed uniform data acquisition in Fourier domain, and functional integration with multiphoton fluorescence imaging.

**NWA4 • 9.15**
A Microendoscope with Focal Modulation, Guangjun Gao, Nanguang Chen; Division of Bioengineering, Natl. Univ. of Singapore, Singapore. An endoscope-version focal modulation microscopy (FMM) for in vivo imaging is proposed. Electric optical modulator (EOM)-crystal modulator is used to modulate the beam and a deformable mirror is used for axial scanning.

**NWA5 • 9.30**
Invited
Title to be Announced, S.H. Andy Yun; Massachusetts General Hospital, USA. Abstract not available.

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**10.00–10.30 Coffee Break, Regency Main**

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<tr>
<td><strong>BWB • Two-Photon Imaging</strong></td>
<td>Wednesday, 6 April</td>
<td>10.30–12.30</td>
<td>Presider to Be Announced</td>
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<td><strong>BWB1 • 10.30</strong> Invited</td>
<td>Technology Development for Multiphoton Imaging, Chris Xu¹;</td>
<td>Applied and Engineering Physics, Cornell Univ., USA. We present our research effort in improving the penetration depth of multiphoton microscopy and the development of a multiphoton endoscope for imaging intrinsic tissue fluorescence and harmonic generation in vivo.</td>
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<td><strong>BWB2 • 11.00</strong> Invited</td>
<td>Title to Be Announced, James V. Jester;</td>
<td>Univ. of California Irvine, USA. Abstract not available.</td>
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<td><strong>BWB3 • 11.30</strong> Invited</td>
<td>Nonlinear Optical Probes of Ovarian Cancer, Paul J. Campagnola¹, Molly Breuer¹, Ronald LaCombr², Oleg Nadiarnykh³, Xiyi Chen¹, Reni-Yu He³; Dept. of Biomedical Engineering, Univ. of Wisconsin, USA; Univ. of Connecticut Health Ctr., USA. Nonlinear optics are used to study human ovarian cancer. SHG imaging elucidates structural differences in normal and malignant tissues. Cell adhesion/migration dynamics are examined with ECM models fabricated by multiphoton excited photochemistry.</td>
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<td><strong>NWB • New Techniques</strong></td>
<td>Wednesday, 6 April</td>
<td>10.30–12.30</td>
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<td><strong>NWB1 • 10.30</strong> Invited</td>
<td>Invasive Micro-optics for in vivo Imaging in Mouse Brain, Michael J. Levene; Biomedical Engineering, Yale Univ., USA. Invasive micro-optics, including both gradient index lenses and micro-prisms, enable multiphoton microscopy of deep brain structures in vivo that would otherwise be impossible to observe. We present the latest developments in use of micro-optics.</td>
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<td><strong>NWB2 • 11.00</strong> Invited</td>
<td>Lensfree Microscopy On a Chip, Aydogan Ozcan; Electrical Engineering Dept., UCLA, USA. We review the recent progress on lensfree on-chip microscopy techniques that are aimed at telemedicine as well as high-throughput biomedical imaging and screening applications.</td>
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<td><strong>NWB3 • 11.30</strong> Invited</td>
<td>Optically Sectioned Fluorescence Imaging with HiLo, Tim N. Ford¹, Daryl Lim¹, Kengyeh K. Chu¹, Eladio Rodriguez-Diaz¹, Satish K. Singh¹, Jerome Mertz¹; Biomedical Engineering, Boston Univ., USA; Gastroenterology, Boston Univ. School of Medicine, USA. HiLo is a wide-field fluorescence imaging technique that provides optical sectioning by processing two images acquired sequentially using illumination with and without high contrast structure. We present the latest implementations of the technique.</td>
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<td><strong>NWB4 • 11.45</strong></td>
<td>4-D Image Mapping Spectrometer (IMS) with Structured Illumination, Liang Gao¹, Noah Bedard¹, Robert Kester¹, Nathan Hagen¹, Tomasz Thaczynski²; Bioengineering, Rice Univ., USA; Electrical and Computer Engineering, Rice Univ., USA; Rice Quantum Inst., Rice Univ., USA. We present a 4-D (x, y, z, λ) Image Mapping Spectrometer with structured illumination. Depth resolved fluorescence spectral channel images of thick biological tissues were acquired with axial resolution of ~ 1 μm.</td>
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Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011
**BWB4 • 12.00**
Effects of Ultrashort Femtosecond Laser Pulses Upon Embryogenesis of Eukaryotic Organisms, Sergey Arkhipov, 1Chemistry, Michigan State Univ., USA. Using scoring of survival of irradiated Drosophila embryos the moderate effects of fs-laser irradiation on embryogenesis and indirect evidence of possible induction of DNA repair mechanisms are demonstrated.

**BWB5 • 12.15**
Particle pushing via Liquid Gradient Refractive Index (L-GRIN) Lens, Ahmad A. Nawaz1, Xiaole Ma1, Yanhui Zhao1, Sz-Chin Steven Lin1, Tony J. Huang2, Pennsylvania State Univ., USA. We report an onchip particle manipulator that utilizes a tunable Liquid gradient Refractive Index optofluidic microlens to optically control the pushing the particles. Utilizing the argon laser, particle velocity is controlled via laser input power.

**NWB5 • 12.00**
Practical Implementation of Log-Scale Active Illumination Microscopy, Kenyeh K. Chu1, Daryl Lim1, Jerome Mertz2; 1Biomedical Engineering, Boston Univ., USA. Active illumination microscopy is a method of redistributing dynamic range in scanning microscopes using feedback for real-time control of illumination power. Images are reconstructed on a logarithmic scale to preserve dynamic range benefits.

**NWB6 • 12.15**
Direct Aberrations Correction in Two Photon Microscopy by a Single On-Axis Measurement, Rodrigo Aviles-Espinosa1, Jordi Andilla2, Rafael Porcar-Guezene2, Omar Olarte3, Xavier Lozacq3, David Artigas4, Pablo Lesa-Alvarez5; 1Biophotonics, ICFO – Inst.de Ciències Fotòniques, Spain; 2Imagine Optic, France; 3Dept. of Signal Theory and Communications, Univ. Politécnica de Catalunya, Spain. The use of the nonlinear guide-star concept is proposed. This principle is used to directly measure sample aberrations employing a wave front sensor and correcting them in a single step by shaping a deformable mirror.

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**12.30 –13.30 Lunch Break (on your own)**

**BWC • Spectroscopic Imaging**
Wednesday, 6 April
13.30–15:45 p.m.
Presider to Be Announced

**BWC1 • 13.30 Invited**
Title to be Announced, Jonas Korlach
Pacific Biosciences, USA. Abstract not available.

**BWC2 • 14.00 Invited**
Title to be Announced, Jereong Hwang;
Biophysics Group, NIST, USA. Abstract not available.

**BWC3 • 14.30 Invited**
Multiplexed Fluorescence Lifetime Image with Fourier Excitation-Emission Spectroscopy, Ming Zhao, Leilei Peng; College of Optical Sciences, Univ. of Arizona, USA. We report a Fourier lifetime microscopic method that measures fluorescence lifetime and intensity excitation-emission matrices in 23 microseconds. The technique will allow fast multiplexed imaging study of Förster resonance energy transfer.

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Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011
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(Bold denotes Presider or Presenting Author)

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Optics in the Life Sciences Congress and Exhibition • 4–6 April, 2011
Locations

Location Updates
Please note the following meeting room updates:

BODA Technical Session Room: Regency 4 - 6, 2nd Floor
NTM Technical Session Room: Regency 1 - 3, 2nd Floor
OMP Technical Session Room: Spyglass 1 – 2, 1st Floor
OTA Technical Session Room: Big Sur 1 - 3, 1st Floor
Welcome Reception: Beach Grove
Exhibits/Coffee Break: Regency Main

Program Corrections
The first OMP session OMA: Advances in Instrumentation or Algorithms I will run Monday, 4 April, 08:00-10.00 in Spyglass 1 – 2.

Please note the corrected title and author block of JTuA18, Intravital, Non-Invasive Staining of the Mouse Astrocytic Network Through IV Administration of Sulforhodamine Dyes, Jean-Claude Vial1,
Clément Ricard3, Boudeijn von der Sanden2, Raphael Serduc2, Pascale Vérant1, 1 CNRS UMR 5588 LIPHY 38402 Saint Martin d’Hères, France;
2 INSERM, UMR-S 836, GIN, Grenoble 38043, France; 3 Univ. Joseph Fourier, Grenoble, France

Congratulations to Lihong Wang, the 2011 Mees Medal Recipient. The medal will be presented during the Welcome Reception.

EXHIBIT GUIDE

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Presenter Changes
- Yann Cotte; EPFL, Switzerland will present NTuC2, Holographic Second Harmonic Generation Microscopy.
- V. Karasek; Inst. of Scientific Instruments of the ASCR, Czech Republic will present OTTuC3, Optical Forces near Surface: Full 3-D Finite Element Method Based Calculations.
- S. Koa; EPFL, Switzerland will present JTuA13, Early Glutamate-mediated Cell Death Detection with Digital Holographic Microscopy

Presider Updates
- Mary-Anne Mycek; Univ. of Michigan, USA will preside over OMA: Advances in Instrumentation or Algorithms I.

Withdrawn Presentations
OMA5
OTMA4
OTMB4
OTMD4
OTTuA2
OTTuC2
OTTuC5
JTuA33

POSTDEADLINE PRESENTATIONS: Please see the postdeadline papers book for times and locations of postdeadline paper presentations.
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POSTDEADLINE PAPERS

Optics in the Life Sciences

Bio-Optics: Design and Application (BODA)

Optical Molecular Probes, Imaging and Drug Delivery (OMP)

Optical Trapping Applications (OTA)

ISBN 978-1-55752-925-1

4–6 April 2011
Hyatt Regency Monterey
Monterey, California, USA

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Optics in the Life Sciences Postdeadline Abstracts

• Monday, April 4, 2011 •

OTMD • Trapping with Shaped Beams
Big Sur I-3 (Hyatt)
16:00—18:00
Presider to Be Announced

OTMD4p • 17:00
Enhancement of Optical Gradient Force Employed in Optical Tweezers Using a Pulsed Laser Diode, Takamasa Suzuki1, Takatsugu Maeda2, Osami Sasaki1, Samuel Choi2; 1Niigata Univ., Japan. The optical gradient force employed in optical tweezers is enhanced using a pulsed laser diode. A time-sharing approach can be applied for performing multiple optical manipulations to obtain gentle and stiff tweezers for delicate samples.

OTMD5p • 17:15
Optical Micromanipulation of Red Blood Cells Using a Microfabricated Optical Fiber into Optical Tweezers, Yogeshwar N. Mishra1,2, Nelson Cardenas3, Samarendra K. Mohanty1; 1Physics, Univ. of Texas at Arlington, USA; 2CELOS, Cochin Univ. of Science And Technology, India. We demonstrate the micromanipulation of RBC’s into a tapered fiber-optic trap for the transport into and out of the optical tweezers trap in an orthogonal geometry. We are pursuing high-throughput transport analysis of the RBC’s using this system.

• Tuesday, April 5, 2011 •

OTTuC • Trapping Techniques and Applications III
Big Sur I-3 (Hyatt)
16:00—18:00
Presider to Be Announced

OTTuC2p • 16:30
Free-form optical trapping systems, Andreas Oeder1,2, Sebastian Stoebenau1,2, Stefan Sinzinger1,2; 1Technische Optik, Technische Univ. Ilmenau, Germany; 2IMN MacroNano, Ilmenau, Germany. We report a breakthrough in designing and fabricating free-form trapping systems which opens up a new class of systems for optical micromanipulation. We show 3-D-trapping with a specialized optics (WD=650 μm), which is made of a single piece of PMMA.

OTuD • OMP Postdeadline Session
Big Sur I-3 (Hyatt Regency)
17:15—18:15
Mary-Ann Mycek; Univ. of Michigan, USA, Presider

OTuD1 • 17:15
Sound Light: Model-free Inherently Quantitative Photoacoustic Imaging of Chromophore Concentrations, Wiendelt Steenbergen1, Khalid Daoudi2; 1MIRA Inst. for Biomedical Technology and Technical Medicine, Univ. of Twente, Netherlands. Photoacoustic imaging is made quantitative by adding acousto-optic tagging, following rules for illumination and detection. The theory will be described and computational and experimental validations will be presented, showing virtues and challenges.

OTuD2 • 17:30
Synthesis of Au2S/Au Core/Shell Nanostructures, Joseph Young1, Rebekah Drezek1,2; 1Electrical and Computer Engineering, Rice Univ., USA; 2Bioengineering, Rice Univ., USA. We present a description of the synthesis process that produces pure Au2S cores, with no Au byproducts, followed by the growth of a pure Au shell. NIR Au2S/Au nanoparticles, ~30nm in diameter, have been realized.

OTuD3 • 17:45
Two-photon Imaging of Intracellular Hydrogen Peroxide with a Chemoselective Fluorescence Probe, Hengchang Guo1, Hossein Aleyasin1, Scott Howard4, Bryan C. Dickinson1, Renee Haskew-Layton1, Demirhan Kobat1, Vivian Lin2, David R. Rivera3, Christopher J. Chang1,4, Rajiv R. Ratani1, Chris Xu2; 1Burke Medical Research Inst., Weill Medical College of Cornell Univ., USA; 2School of Applied Physics & Engineering, Cornell Univ., USA; 3Dept. of Chemistry, Univ. of California, USA; 4Howard Hughes Medical Inst., Univ. of California, USA. We present two-photon molecular imaging of hydrogen peroxide production in mouse hippocampal neuronal cells using Peroxyfluor-6 acetoxyethyl ester, a highly sensitive, small-molecule probe for selective imaging of H2O2 within the living cells.
Optics in the Life Sciences Postdeadline Abstracts

• Tuesday, April 5, 2011 •

OTuD4 • 18:00
Characterization of Orthopoxvirus Protein Affinity to Chondroitin Sulfate Using TIRF Microscopy, Jesse Aaron1, Jerilyn Timlin2, Masood Hadi2; 1Dept. Bioenergy and Defense Technologies, Sandia Natl. Labs., USA; 2Biomass Science and Conversion Technology, Sandia Natl. Labs., USA. We investigated the properties of FBL and D8L viral proteins, which mediate viral entry into cells via chondroitin sulfate (CS). We have developed a novel TIRF-based assay to reveal information on binding and nanoscale motility on a CS substrate.

BTuD • BODA Postdeadline Session
Regency 4–6 (Hyatt Regency)
18:15—19:30
Guoqiang Li, Univ. of Missouri at St Louis, USA, Presider

BTuD3 • 18:45
Endogenous Fluorescence Imaging for the Management of Oral and Cervical Cancers, Pierre Lane1, Catherine Poh2, Scott Durham3, Lewei Zhang4, Sylvia F. Lam5, Miriam Rosin2, Calum MacAulay1; 1Integrative Oncology, BC Cancer Research Center, Canada; 2Faculty of Dentistry, Univ. of British Columbia, Canada; 3Cancer Control Res., BC Cancer Res. Ctr., Canada; 4Dept. of Pathology, Vancouver General Hospital, Canada; 5Dept. of Otalaryngology, Vancouver General Hospital, Canada; 6Biomedical Physiology and Kinesiology, Simon Fraser Univ., Canada; 7Dept. of Obstetrics and Gynecology, Drexel University, USA. Imaging of endogenous tissue fluorescence is an effective tool for the early detection of oral and cervical cancers. Recent data show that fluorescence-guided surgical resection of oral lesions dramatically reduce the rate of cancer recurrence.

BTuD4 • 19:00
A Portable System for Imaging and Diffractometry, Khalid M. Arif1,2, Cagri A. Savran1,2, Stefan Sinzinger1,2; 1Mechanical Engineering, Purdue Univ., USA; 2Birk Nanotechnology Center, Purdue Univ., USA. We present the design and development of an all-in-one portable system with embedded computing and data analysis for both imaging and diffractometry. We demonstrate the application of the system to bead-based grating patterns.

BTuD5 • 19:15 p.m.
Cytometry via Optical Wavefront Sensing, James Jacob1, William Sullivan2; John Hoffnagle1,3,4; CytoRay Inc., USA; 1Univ. of California, Santa Cruz, USA; 3Picarro Inc., USA. We describe a new technique to non-invasively analyze cells. A wavefront sensor measures the aberrations imparted onto a laser that illuminates single cells. The Zernike coefficients of the deformed wavefront comprise a unique cellular signature.

• Wednesday, April 6, 2011 •

Visual Prosthesis: Recent Development and Future Challenges, Qiushi Ren1; 1College of Engineering, China. Electrical stimulating different parts of visual pathway for visual recovery has been proposed by many groups. The latest progress and future challenges were presented.
Key to Authors and Presiders
(Bold denotes Presider or Presenting Author)

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