Novel Techniques in Microscopy (NTM)

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

NTM - The topical meeting on Novel Techniques in Microscopy will focus specifically on novel techniques rather than applications. The goal of this meeting is to provide a forum for the interaction of inventors in optical microscopy, researchers and students, and industrial participants.

Optical microscopy is one of the most important tools in biological research. Technical advances are continually pushing back the limits of microscopy performance and versatility. These advances are occurring on many fronts. Examples include new strategies for superresolution beyond the diffraction limit, including stimulated emission depletion microscopy (STED), techniques based on molecular photoactivation (PALM, STORM, etc), and structured illumination. New techniques aimed at increasing the depth penetration in tissue, based for example on adaptive optics or scattering matrix inversion, form another active area of developments. At the same time, miniaturized optics with GRIN lenses or fibers are opening new directions in intravital imaging. Examples include the development of fluorescence endomicroscopes and optical coherence tomography (OCT) fiberscopes. Other approaches have concentrated on phase imaging, such as interference microscopy, digital holography, and polarization imaging. In addition, technical advances continue to improve the image contrast based on nonlinear mechanisms, such as multi-photon excitation, multi-harmonic generation, coherent Raman scattering, and stimulated emission, with recent emphasis on coherent control. This meeting will provide a rich collection of recent highlights in these and other fronts of technical developments in optical microscopy.

View the conference program and plan your itinerary for the conference

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- Plan and print your personal itinerary before coming to the conference

General Chairs

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

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

The 2009 meeting featured speakers representing 16 countries. In addition, nearly 25% of the contributed presentations were submitted by students.

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)

For more information about Monterey, please visit the Housing and Travel page.

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

Novel Techniques in Microscopy (NTM)

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

Program

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Optical microscopy is one of the most important tools in biological research. Technical advances are continually pushing back the limits of microscopy performance and versatility. These advances are occurring on many fronts. Examples include new strategies for superresolution beyond the diffraction limit, including stimulated emission depletion microscopy (STED), techniques based on molecular photoactivation (PALM, STORM, etc), and structured illumination. New techniques aimed at increasing the depth penetration in tissue, based for example on adaptive optics or scattering matrix inversion, form another active area of developments. At the same time, miniaturized optics with GRIN lenses or fibers are opening new directions in intravital imaging. Examples include the development of fluorescence endomicroscopes and optical coherence tomography (OCT) fiberscopes. Other approaches have concentrated on phase imaging, such as interference microscopy, digital holography, and polarization imaging. In addition, technical advances continue to improve the image contrast based on nonlinear mechanisms, such as multi-photon excitation, multi-harmonic generation, coherent Raman scattering, and stimulated emission, with recent emphasis on coherent control. This meeting will provide a rich collection of recent highlights in these and other fronts of technical developments in optical microscopy.

Papers are being considered in the following topic categories:

- Nonlinear microscopy and coherent techniques
- Fiberscopes and Endoscopy techniques
- Imaging through scattering tissue
- OCT, holographic and phase microscopy
- Super-resolution
- New techniques

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- Browse sessions by type or day.
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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!

For more information about Monterey, please visit the Housing and Travel page.

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

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

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, instrumentation, 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 McGloin, *Univ. of Dundee, UK,* **General Chair**

Time	Sunday, 3 April, 2011	Monday, 4 April, 2011 BODA	NTM	OMP	OTA
7.00		7.00–18.30 **Registration Open**, *Regency Foyer South*			
8.00		BMA • Adaptive Optics for the Eye	NMA • Superresolution I (starts at 8.15)	OMA • Advances in Instrumentation or Algorithms I	OTMA • Nanomanipulation and Microfluidics
10.00		10.00–10.30 **Coffee Break**, *Regency Main*			
		10.00–16.00 **Exhibits Open**, *Regency Main*			
10.30		BMB • Multi-Modality Optical Imaging	NMB • Superresolution II	OMB • Novel Probes I (ends at 11.15)	OTMB • Fundamental Systems
11.30		11.30–13.30 **Lunch Break** (*on your own*)			
13.30		BMC • Optical Biosensors I	NMC • Nonlinear I	OMC • Clinical / Pre-clinical Applications I	OTMC • Analysis of Biological Systems
15.30	15.00–18.00 **Registration Open**, *Regency Foyer South*	15.30 –16.00 **Coffee Break**, *Regency Main*			
16.00		BMD • Optical Biosensors II	NMD • Nonlinear II (ends at 17.45)	OMD • Novel Probes II (ends at 17.30)	OTMD • Trapping with Shaped Beams
18.00					
19.00		**19.00–20.00 Conference Reception, Spyglass Promenade**			
20.00					

Tuesday, 5 April, 2011

BODA	NTM	OMP	OTA
7.00–18.00 Registration Open, *Regency Foyer South*			
BTuA • Bio-Inspired Optics	NTuA • Imaging Through Tissue	OTuA • Advances in Instrumentation or Algorithms II	OTTuA • Trapping Techniques and Applications I
10.00–10.30 Coffee Break, *Regency Main*			
10.00–16.00 Exhibits Open, *Regency Main*			
BTuB • Visual Optics	NTuB • Phase I	OTuB • Clinical / Pre-clinical Applications II	OTTuB • Trapping Techniques and Applications II
11.30–13.30 Lunch Break (*on your own*)			
13.30–15.30 JTuA • Joint Poster Session, *Regency Main*			
15.30 –16.00 Coffee Break, *Regency Main*			
BTuC • Biomedical Optical Imaging	NTuC • Phase II	OTuC • Novel Probes III (ends at 17.15)	OTTuC • Trapping Techniques and Applications III

Wednesday, 6 April, 2011

BODA	NTM
7.00–15.30 Registration Open, *Regency Foyer South*	
BWA • Design for Biomedical Optical Imaging	NWA •Endoscopy
10.00–10.30 Coffee Break, *Regency Main*	
BWB • Two-Photon Imaging	NWB • New Techniques
11.30–13.30 Lunch Break (*on your own*)	
BWC • Spectroscopic Imaging (ends at 3:45pm)	

Key to Agenda

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

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

Sunday, 3 April, 2011 — **15.00–18.00 Registration Open**, *Regency Foyer South*
Monday, 4 April, 2011 — **7.00–18.30 Registration Open**, *Regency Foyer South*

BMA • Adaptive Optics for the Eye

Monday, 4 April
8.00–10.00
Presider to Be Announced

BMA1 • 8.00 Invited
History and Future of Ophthalmic Adaptive Optics, *Pablo Artal; Univ. de Murcia, Spain.* Adaptive optics allows the simultaneous measurement and manipulation of the eye's aberrations. Some of the recent history, together with my personal views of the future will be covered in the presentation.

BMA2 • 8.30 Invited
Advanced Optical Techniques for Clinical and Basic Vision Science, *Austin J. Roorda[1], Lawrence C. Sincich[2], QIang Yang[3], David W. Arathorn[3], Pavan Tiruveedhula[1], William S. Tuten[1]; [1]School of Optometry, Univ. of California at Berkeley, USA; [2]Dept of Ophthalmology, Univ. of California at San Francisco, USA; [3]Montana 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.

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, *Joerg Bewersdorf, 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
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.

OMB • Novel Probes I

Monday, 4 April
8.00–10.00
Mary-Ann Mycek; Univ. of Michigan, USA, Presider

OMA1 • 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.

OMA2 • 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.

OTMA • Nanomanipulation and Microfluidics

Monday, 4 April
8.00–10.00
David McGloin; Univ. of Dundee Presider

OTMA1 • 8.00 Invited
Nanomanipulation Using Near Field Photonics, *David Erickson[1]; [1]Sibley 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 nanoassembly.

OTMA2 • 8.30
Bowtie Nanoantennas for Plasmonic Optical Trapping, *Brian J. Roxworthy[1,2], Kaspar D. Ko[1,2], Anil Kumar[3], Kin Hung Fung[2], Gang Logan Liu[3], Nicholas Fang[2], Kimani C. Toussaint[1,2]; [1]Lab. for the Photonics Res. of Bio/nano Environments, Univ. of Illinois at Urbana-Champaign USA; [2]Mechanical Science and Engineering, Univ. of Illinois at Urbana-Champaign, USA; [3]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).

OTMA3 • 8.45
Heating in Optically Trapped Gold Nanoparticles Measured in Artificial Membranes, *Poul M. Bendix[1], Anders Kyrsting[1], Nader Reihani[1], Lene Oddershede[1]; [1]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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BMA • Adaptive Optics for the Eye–Continued

BMA3 • 9.00 **Invited**

Three-Dimensional Cellular Resolution *in vivo* Retinal Imaging, *Robert J. Zawadzki[1], Suman Pilli[1], Dae Yu Kim[1], Sandra Balderas-Mata[1], Arlie G. Capps[1], John S. Werner[1]; [1]Ophthalmolgy & 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.

BMA4 • 9.30 **Invited**

Title to be Announced, *Jennifer Hunter Univ. of Rochester; USA.* Abstract not available.

NMA • Superresolution I–Continued

NMA3 • 9.00

Grating-Enhanced Coherent Imaging, *Jeffrey P. Wilde[1], Joseph W. Goodman[1], Yonina C. Eldar[2], Yuzuru Takashima[1]; [1]Electrical Engineering, Stanford Univ., USA; [2]Electrical Engineering, Israel.* We describe a coherent imaging technique that utilizes a diffraction grating placed near the object to alias high spatial frequency information through the imaging system pupil. Linear signal processing is used to reconstruct high-resolution images.

NMA4 • 9.15

High-Resolution Total-Internal-Reflection Fluorescence Microscopy Using Periodically Nano-Structured Glass Slides, *Emeric Mudry[1], Jules Girard[1], Kamal Belkebir[1], Hugues Giovannini[1], Patrick C. Chaumet[1], Anne Sentenac[1]; [1]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.

NMA5 • 9.30

Hyperspectral Nanoscale Imaging on Dielectric Substrates with Coaxial Optical Antenna Scan Probes, Alexander *Weber-Bargioni[1], Adam Schwartzberg[1], Matteo Cornaglia[1], Ariel Ismach[1], Jeffrey Urban[1], YJuanJie Pang[2], Reuven Gordon[2], Jeffrey Bokor[1], Miquel Salmeron[1], Frank Ogletree[1], Stefano Cabrini[1], Peter Jim Schuck[1]; [1]Molecular Foundry, Lawrence Berkeley Nat'l. Lab., USA; [2]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 (<20nm) shown on CNTs.

OMB • Novel Probes I– Continued

OMA3 • 9.00 **Invited**

Simultaneous, Dual-Color STORM Imaging of Membrane Reorganization during Early Immune Response, *Jesse S. Aaron, Bryan D. Carson[1], Jerilyn Timlin; Bioenergy and Defense Technologies, Sandia Natl. Labs, USA.* TLR-4 receptor reorganization in cell membranes was investigated using a novel STORM microscope. The increased resolution permits observation of receptor cluster formation following challenge with chemotypes of lipopolysaccharide.

OMA4 • 9.30

Whole-Cell Analysis of Cardiomyocytes with Combined Quantitative Phase and Two-Channel Fluorescence Microscopy, *Matthew T. Rinehart[1], Natan T. Shaked[1], Lisa Satterwhite[1], Adam Wax[1]; [1]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.

OTMA • Nanomanipulation and Microfluidics–Continued

OTMA4 • 9.00

Temperature Measurements of Optically Trapped Gold Nanoshells, *Brooke C. Hester[1], Gretchen K. Campbell[2], Kristian Helmerson[3], Ryan Huschka[4], Naomi Halas[4]; [1]Physics and Astronomy, Appalachian State Univ., USA; [2]Atomic Physics Division, NIST, USA; [3]School of Physics, Monash Univ., Australia; [4]Depts. of Chemistry and of Electrical and Computer Engineering, Rice Univ., USA.* We measure the temperature of an optically trapped gold nanoshell by tracking its Brownian motion. Single nanoshells are found to heat significantly, and this heating varies with trap wavelength and particle number.

OTMA5 • 9.15 **Invited**

Title to be Announced, *Michal Lipson; Cornell, USA.* Abstract not available.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

NMA • Superresolution I–Continued

NMA6 • 9.45
Imaging Beyond the Diffraction Limit by Electron-Beam Excited Assisted (EXA) Scanning Optical Microscope, *Wataru Inami[1,3], Yasunori Nawa[1], Akito Chiba[3], Atsuo Miyakawa[1,3], Yoshimasa Kawata[1,3], Susumu Terakawa[2,3], Atsushi Ono[1,3]; [1]Shizuoka Univ., Japan; [2]Hamamatsu Univ. School of Medicine, Japan; [3]CREST, Japan.* 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.

OMB • Novel Probes I– Continued

OMA5 • 9.45
***In vivo* Estimation of Functional and Structural Characteristics in Epithelial Neoplasia,** *George Papoutsoglou[1]; [1]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.

OTMA • Nanomanipulation and Microfluidics–Continued

OTMA6 • 9.45
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.

10.00–10.30 Coffee Break, *Regency Main*

10.00–16.00 Exhibits Open, *Regency Main*

NOTES

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BMB • Multi-Modality Optical Imaging

Monday, 4 April
10.30–12.30
Presider to Be Announced

BMB1 • 10.30 **Invited**

Title to be Announced, *Joseph Izatt; Duke Univ., USA.* Abstract not available.

BMB2 • 11.00 **Invited**

Title to be Announced, *Gultekin Gulsen; Univ. of California at Irvine, USA.* Abstract not available.

NMB • Superresolution II

Monday, 4 April
10.30–12.30
Joerg Bewersdorf; Yale Univ., USA, Presider

NMB1 • 10.30 **Invited**

Optical Tracking Microscopy and Super-Resolution Imaging of Living Cells Beyond the Diffraction Limit, *W. E. Moerner; Stanford Univ., USA.* Abstract not available.

NMB2 • 11.00

Three-Dimensional Super-Resolution Imaging with a Corkscrew Point Spread Function, *Matthew D. Lew[1,2], Steven F. Lee[2], W. E. Moerner[2]; [1]Electrical Engineering, Stanford Univ., USA; [2]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.

NMB3 • 11.15

Double-Helix PSF Microscopy with a Phase Mask for Efficient Photon Collection, *Sean Quirin, Ginni Grover, Callie Fiedler, Rafael Piestun; 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.

OMB • Novel Probes I

Monday, 4 April
10.30–12.15
Konstantin Sokolov; MD Anderson Cancer Center, Univ. of Texas, USA, Presiders

OMB1 • 10.30 **Invited**

Title to be Announced, Rebekah Drezek, *Rice Univ., USA.* Abstract not available.

OMB2 • 11.00 **Invited**

Preliminary Intravital Microscopic Analysis Reveals Macrophage Uptake of Circulating Nanotubes and Peptide-Dependent Delivery into Tumor, *Bryan R. Smith[1], Harikrishna Rallapalli[1], Jennifer Prescher[1], Cristina Zavaleta[1], Jarrett Rosenberg[1], Scott Tabakman[2], Hongjie Dai[2], Sanjiv S. Gambhir[1]; [1]Radiology/Bioengineering, Stanford Univ., USA; [2]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.

OTMB • Fundamental Systems

Monday, 4 April
10.30–12.30
Carlos López-Mariscal; NRL, USA, Presider

OTMB1 • 10.30 **Invited**

Optical Trapping and Cooling of Glass Microspheres, *Mark G. Raizen[1], Tongcang Li[1], Simon Kheifets[1], David Medellin[1]; [1]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.

OTMB2 • 11.00 **Invited**

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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BMB • 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 photoacoustic imaging. Such hybrid system allow for complex tissue characterization at biochemical, morphological, and functional levels.

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.

NMB • Superresolution II–Continued

NMB4 • 11.30

Nanometric Resolution using Far-Field Optical Tomographic Microscopy in the Multiple Scattering Regime, *Emeric Mudry[1], Jules Girard[1], Guillaume Maire[1], Kamal Belkebir[1], Patrick C. Chaumet[1], Hugues Giovannini[1], Anne Talneau[2], Anne Sentenac[1]; [1]Inst. Fresnel, Aix-Marseille Univ., France; [2]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[1], David Lara[2], Chris Dainty[1]; [1]Applied Optics, School of Physics, Natl. Univ. of Ireland, Ireland; [2] Blackett Lab., 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, *Yuichi Kozawa, 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.

OMB • Novel Probes I–Continued

OMB3 • 11.30

Plasmonic Gold Nanorods for Depth-Resolved Viscosity in Polarization-Sensitive OCT, *Raghav Chhetri[1], Krystian Kozek[2], Aaron Johnston-Peck[2], Joseph Tracy[2], Amy Oldenburg[1]; [1]Physics and Astronomy, Univ. of North Carolina at Chapel Hill,USA; [2]Materials Science and Engineering, North Carolina State Univ. USA.* We demonstrate depth-resolved viscosity via polarized scattering from ensembles of tumbling plasmon-resonant gold nanorods (GNRs) monitored with polarization-sensitive OCT. This has potential for *in vivo* microrheology imaging of fluids such as mucus.

OMB4 • 11.45

Two-Photon Fluorescence Imaging with a Tumor Penetrating Bioconjugate, *Ciceron Yanez[1], Alma R. Morales[1], Takeo Urakami[2], Masanobu Komatsu[2], Kevin D. Belfield[1]; [1]Dept. of Chemistry, Univ. of Central Florida, USA; [2]Sanford-Burnham Medical Res. Inst. at Lake Nona, USA.*

OMB5 • 12.00

Two-Photon Fluorescence Vascular Imaging with a New Fluorene-RGD Peptide Conjugate, *Alma R. Morales[1], Ciceron O. Yanez[1], Takeo Urakami[3], Masanobu Komatsu[3], Kevin D. Belfield[1,2]; [1]Chemistry, Univ. of Florida, USA; [2]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA; [3]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 $\alpha v \beta 3$ integrins.

OTMB • Fundamental Systems–Continued

OTMB3 • 11.30 **Invited**

Sensitive Force-Detection with Optically-Levitated Microspheres in Vacuum, *Andrew A. Geraci[1,2], Scott B. Papp[1], John Kitching[1]; [1]NIST, USA; [2]Physics, Univ. of Nevada, USA.* Optically levitated and cooled dielectric microspheres in vacuum show great promise as resonant force detectors with an expected sub-attonewton sensitivity. Hence, they can be used to investigate Casimir forces or for testing non-Newtonian gravity.

OTMB4 • 12.00

Momentum Transfer by the Emission of Raman and Fluorescence Photons Detected by an Optically Trapped Probe, *Dmitri Petrov[1,2]; [1]ICFO - Inst. of Photonic Sciences, Spain; [2]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.

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 • Superresolution II–Continued

NMB7 • 12.15
Isotropic Diffraction-Limited Focusing Using a Single Lens, *Emeric Mudry, Eric Le Moal, 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.

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

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)

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 Chen[1], William Lloyd[1], Malavika Chandra[1], Kenji Izumi[2], Shiuhyang Kuo[2], Cynthia Marcelo[2], Stephen Feinberg[2], Mary-Ann Mycek[1]; [1]Dept. of Biomedical Engineering, Univ. of Michigan, USA; [2]Dept. 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.
Multiwavelength Time-Resolved Measurement of Diffuse Reflectance for Brain Oxygenation Assessment during Hypoxic Challenge Test, *Anna Gerega[1], Wojciech Weigl[2], Daniel Milej[1], Piotr Sawosz[1], Ewa Mayzner-Zawadzka[2], Roman Maniewski[1], Adam Liebert[1]; [1]Inst. of Biocybernetics and Biomedical Engineering, Poland; [2]Dept. 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 Wuite; Virje Univ., Amsterdam.* Abstract not available.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

Big Sur Room

BMC • Optical Biosensors I–Contributed

BMC2 • 14.00
Surface Plasmon Resonance Optical Fiber Biosensor for Label-Free Characterization of Biomolecular Interactions, *Yanina Shevchenko, 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, *Eikhyun Cho[1], Youra Heo[1], Myungki Jung[1], Jiseok Lim[1], Seokmin Kim[2], Shinill Kang[1]; [1]Mechanical Engineering, Yonsei Univ., Republic of Korea; [2]Mechanical 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 Chaudhery[1], Erich Lidstone[2], Sherine George[2], Cheng-Sheng Huang[1], Anja Kohl[2], Patrick Mathias[2], Brian Cunningham[1,2]; [1]Electrical and Computer Engineering, Univ. of Illinois Urbana-Champaign, USA; [2]Bioengineering, 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.

Regency 1 & 2

NMC • Nonlinear I–Continued

NMC2 • 14.00
Picosecond CARS Spectral Imaging with Principal Component Analysis, *Jeffrey L. Suhalim[1,2], Ryan S. Lim[1], Moshe Levi[4], Bruce J. Tromberg[1,2], Eric Potma[1,3]; [1]Beckman Laser Inst. and Medical Clinic, Univ. of California at Irvine, USA; [2]Department of Biomedical Engineering, Univ. of California at Irvine, USA; [3]Dept. of Chemistry, Univ. of California at Irvine, USA; [4]Division 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.

NMC3 • 14.15
Wavelength-Swept Coherent Anti-Stokes Raman Scattering Spectroscopy System for Hyperspectral Imaging, *Steve Begin[1,2], Bryan Burgoyne[3], Alain Villeneuve[3], Vincent Mercier[3], Réal Vallée[2], Daniel Cote[1,2]; [1]Centre de Recherche Univ. Laval Robert-Giffard (CRULRG), Univ. Laval, Canada; [2]Centre d'Optique, Photonique et Laser (COPL), Univ. Laval, Canada; [3]Genia 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.

NMC4 • 14.30 **Invited**
Enhancing Resolution and Contrast in Coherent Raman Microscopy: Towards Superresolution Chemical Imaging, *Stephan Stranick[1], Hyun Min Kim[1,2]; [1]NIST, USA; [2]Joint Qunatum Inst., Univ. of Maryland, USA.* We will detail our efforts to extend the contrast and resolution of coherent Raman scattering microscopy through the combination of spatial light modulator generated, annular-phase masks and the two color nature of Coherent Raman scattering.

Regency 3

OMC • Clinical/Pre-clinical Applications I–Continued

OMC3 • 14.00
Optical Monitoring of Tracers and Mitoxantrone in Rabbit Brain and the Variability in Blood-Brain Barrier Disruption, *Aysegul Ergin[1], Mei Wang[2], Shailendra Joshi[2], Irving J. Bigio[1]; [1]Department of Biomedical Engineering, Boston Univ., USA; [2]Dept. of Anesthesiology, College of Physicians and Surgeons of Columbia Univ., USA.* Intraarterial mannitol is the main method to disrupt blood-brain barrier. The data collected using optical pharmacokinetics revealed variation in disruption in rabbits. Optical monitoring could help better understand the drug pharmacokinetics.

OMC4 • 14.15
Time-Resolved Fluorescence Spectroscopy of the Bile Duct for Image-Guided Cancer Diagnosis, *Javier A. Jo[1], Javier A. Jo[1], Matthew W. Miller[2], Eric J. Seibel[3]; [1]Biomedical Engineering, Texas A&M Univ., USA; [2]Veterinary Medicine, Texas A&M Univ., USA; [3]Mechanical 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 **Invited**
Title to be Announced, *Stanislav Emelianov; Univ. of Texas at Austin, USA.* Abstract not available.

Cypress Room

OTMC • Analysis of Biological Systems–Contributed

OTMC2 • 14.00
Multi-trap Raman Tweezers Integrated with Phase Contrast and Fluorescence Microscopy for Monitoring Biological Dynamics of Individual Cells, *Pengfei Zhang[1], Lingbo Kong[1], Yong-qing Li[1]; [1]East Carolina Univ., USA.* We report the development of a multiple-trap Raman tweezers array integrated with phase contrast and fluorescence microscopy for simultaneously acquiring Raman spectra, refractility, and fluorescence images of multiple individual cells.

OTMC3 • 14.15
Surface Scanning with Optically Trapped Probes, *Lars Friedrich[1], Alexander Rohrbach[1]; [1]Microsystems Technology, Univ. of Freiburg, Germany.* Optically trapped beads with diameters below 500 nm are scanned across surface structures. The elongation of the probe from the trap center is measured interferometrically and the height profile of the sample is recovered.

OTMC4 • 14.30 **Invited**
Title to be Announced, *Pietro Cicuta; Cambridge Univ., UK.* Abstract not available.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

Big Sur Room

BMC • Optical Biosensors I–Contributed

BMC5 • 14.45
Mode Splitting in Whispering-Gallery-Mode Microresonators in Aquatic Environment, *Woosung Kim[1], Sahin K. Ozdemir[1], Jiangang Zhu[1], Lina He[1], Lan Yang[1]; [1]Electrical 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.

BMC6 • 15.00
Study of the Dynamics of Protein Aggregation with a Bloch Surface Wave Sensor, *Vincent Paeder[1], Valeria Musi[1], Hans Peter Herzig[1]; [1]EPFL, 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.

BMC7 • 15.15
Screening Small Molecule Compounds for Protein Ligands with Label-Free, Optically Detected Microarrays, Xiangdong Zhu[1]; *[1]Physics, 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.

Regency 1 & 2

NMC•Nonlinear I–Continued

NMC5 • 15.00
Remote Focusing Differential Multiphoton Microscopy: Application to Neuronal Imaging, *Erich E. Hoover[1], Michael D. Young[1], Susy M. Kim[2], Eric V. Chandler[1], Jeffrey J. Field[1], Dawn N. Vitek[1], Kraig E. Sheetz[3], Jing W. Wang[2], Jeff A. Squier[1]; [1]Physics, Colorado School of Mines, USA; [2]Biological Sciences, Univ. of California at San Diego, USA; [3]Physics and Nuclear Engineering, United States Military Academy, USA.* We apply remote focusing to multi-focal 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.

NMC6 • 15.15
Laser Microsurgery for Two-Photon Imaging in Fruit Flies, *Supriyo Sinha[1], Liang Liang[1], Eric Ho[1], Liqun Luo[1,2], Tom Baer[1], Mark Schnitzer[1,2]; [1]Stanford Univ., USA; [2]Howard Hughes Medical Inst., USA.* We demonstrate precise, minimally invasive, laser microsurgery of the fruit fly cuticle for in vivo brain imaging. Following surgery, flies behave normally, as determined by their phototaxis. We recorded odor-evoked calcium transients with 60.

Regency 3

OMC • Clinical/Pre-clinical Applications I–Continued

OMC2 • 15.00 Invited
Translational Advances in Reflectance Confocal Microscopy of Skin Cancer: Machine Learning-Based Image Classification, and Tumor Mapping in Shave Biopsy Wounds, *Milind Rajadhyaksha; Dermatology Service, Memorial Sloan-Kettering Cancer Ctr., USA.* Translational advances in reflectance confocal microscopy of skin cancers include automated methods to localize the dermo-epidermal junction, and imaging of residual tumor with a contrast agent in shave biopsy wounds toward intra-operative mapping.

Cypress Room

OTMC • Analysis of Biological Systems–Contributed

OTMC5 • 15.00
The Electrostatic Corral: Trapping Single DNA Molecules in Solution, *Jorg C. Woehl, Christine A. Carlson; Chemistry and Biochemistry, Univ. of Wisconsin-Milwaukee, USA.* In this contribution, we will discuss a novel and elegant approach for the trapping and manipulation of single biomolecules and other particles over extended periods of time free in solution: the electrostatic corral.

OTMC6 • 15.15
Concentration-Independent Modulation of Local Micromechanics in a Fibrin Clot, *Elliot L. Botvinick[1,2]; [1]Beckman Laser Inst., Univ. California Irvine, USA; [2]Dept. of Biomedical Engineering, Univ. of California at Irvine, USA.* Optical tweezers active microrheology (AMR) probes microdomain mechanical properties in 3-D engineered tissues. The application of a nonuniform strain field setups up distributed stiffness, measured by AMR, which yields differential cell phenotypes.

15.30 –16.00 Coffee Break, ***Regency Main***

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BMD • Optical Biosensors II

Monday, 4 April
16.00–18.00
Presider to Be Announced

BMD1 • 16.00 Invited

Title to be Announced, *Lan Yang; Washington Univ. in St. Louis, USA.* Abstract not available.

BMD2 • 16.30

Continuous Oxygen Measurements in Bio-media Using Metal-Halide Cluster Phosphorescence, *Ruby Ghosh, Reza Loloee; Physics, Michigan State Univ., USA.* A dissolved oxygen sensor for biological media using the $3O_2$ quenching of the phosphorescence from MoCl clusters is presented. Real-time measurements for four hours over a physiologically relevant PO_2 range show no evidence of photobleaching.

NMD • Nonlinear II

Monday, 4 April
16.00–17.45
Wei Min; Columbia Univ., USA, Presider

NMD1 • 16.00

***In situ* Measurement of Sarcomere Length in Cardiac Myocytes Using a Two-Photon Microscope with Near-Isotropic Scan Rate,** *Alex D. Corbett[1], Gil Bub[2], Tony Wilson[1]; [1]Engineering Science, Univ. of Oxford, UK; [2]Physiology, 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.

NMD2 • 16.15

Nonlinear Optical Imaging with Sub-8fs Laser Pulses, *Dmitry Pestov[1], Bingwei Xu[1], Haowen Li[1], Marcos Dantus[2,1]; [1]Biophotonic Solutions Inc, USA; [2]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

Nonlinear Phase Contrast Imaging in Neuronal Tissue, *Prathyush Samineni[1], Martin Fischer[1], Henry C. Liu[1], Ryohei Yasuda[2], Warren S. Warren[3]; [1]Chemistry, Duke Univ., Durham, USA; [2]Neurobiology, Duke Univ., USA; [3]Chemistry, Radiology and Biomedical Engineering, Duke Univ., USA.* We demonstrate nonlinear phase contrast imaging in highly scattering media using rapid femtosecond pulse shaping of mode-locked laser pulses. We will also discuss potential applications of this technique for intrinsic functional neuronal imaging.

OMD • Novel Probes II

Monday, 4 April
16.00–17.30
Rebekah Drezek; Rice Univ., USA, Presider

OMD1 • 16.00 **Invited**

Luminescent Nanodiamonds for Intracellular Imaging, *Andrei V. Zvyagin[1], Varun K. Sreenivasan[1], Timothy A. Kelf[1], Sergey M. Deyev[2]; [1]Physics and Astronomy, Macquarie Univ., Australia; [2]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.

OMD2 • 16.30

Ultrasound-Quenchable Fluorescent Contrast Agent: Experimental Demonstration, *Michael J. Benchimol[1], Mark J. Hsu[2], Carolyn E. Schutt[1], Sadik C. Esener[1]; [1]Jacobs School of Engineering, Univ. of California at San Diego, USA; [2]Ziva 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.

OTMD • Trapping with Shaped Beams

Monday, 4 April
16.00–18.00
Presider to Be Announced

OTMD1 • 16.00 **Invited**

Micro- and Nanoparticle Optical Trapping Using Cylindrical Vector Beams, *Phil Jones[1], Susan Skelton[1], Marios Sergides[1], Agata Pawlikowska[1,2], Onofrio Marago[3]; [1]Physics and Astronomy, Univ. of College London,UK; [2]Natl. Physical Lab., UK; [3]CNR-Inst. per i Processi Chimico-Fisici, Italy.* We report on the optical trapping of a number of micro- and nanoparticles using beams with a non-uniform state of polarization and show how geometry of the trap can be shaped by the polarization state.

OTMD2 • 16.30

Engineered Point Spread Functions for 3-D Parallel Particle Tracking of Optically Trapped Particles, *Donald B. Conkey[1], Rahul P. Trivedi[2], Prassanna Pavani[1], Ivan I. Smalyukh[2], Rafael Piestun[1,2]; [1]Electrical and Computer Engineering, Univ. of Colorado at Boulder, USA; [2]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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

Big Sur Room — BMD • Optical Biosensors II–Contributed

BMD3 • 16.45

A Novel Monte Carlo Approach for Diagnostic Fiber Optic Probe Design, *Adam R. Gardner[1,2], Carole Hayakawa[1,2], Jerome Spanier[2], Vasan Venugopalan[1,2]; [1]Chemical Engineering and Materials Science, Univ. of California at Irvine, USA; [2]Laser 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.

BTuC4 • 17.00 Invited

Cataract Surgery with OCT-guided Femtosecond Laser, *Daniel Palanker[1], Georg Schuele[2], Neil Friedman[1], Dan Andersen[2], William Culbertson[3]; [1]Ophthalmology, Stanford Univ., USA; [2]OptiMedica Corp., USA; [3]Bascom Palmer Eye Inst., 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 discerns the anterior and posterior surfaces of the lens and cornea, and a co-registered femtosecond laser then performs capsulotomy, lens segmentation and corneal incisions.

Regency 1 & 2 — NMD • Nonlinear II–Contributed

NMD4 • 16.45

Beyond Pathology: Pump-Probe Imaging of Skin Slices Provides Additional Indicators of Melanoma, *Mary Jane Simpson[1], Thomas Matthews[1], Angelica Selim[2], Ivan Piletic[1], Warren S. Warren[1]; [1]Chemistry, Duke Univ., USA; [2]Pathology, 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.

NMD5 • 17.00

Development of Multi-Photon Coherence Domain Molecular Imaging, *Brian E. Applegate[1], Qiujie Wan[1], Nilanthi Warnasooriya[1]; [1]Biomedical 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.

NMD6 • 17.15

Multiphoton Photothermal Imaging in Scattering Samples, *Michael Durst[1], Jerome Mertz[1]; [1]Dept. 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.

Regency 3 — OMD • Novel Probes II–Contributed

OMD3 • 16.45

Folate Receptor-targeted Aggregation-enhanced Emission Silica Nanoprobe for One-photon *in vivo* and Two-photon *ex vivo* Fluorescence Bioimaging, *Xuhua Wang[1], Alma R. Morales[1], Takeo Urakami[2], Masanobu Komatsu[2], Kevin D. Belfield[1]; [1]Dept. of Chemistry, Univ. of Central Florida, USA; [2]Sanford-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.

OMD4 • 17.00

Two-photon Absorbing Fluorene Derivatives with Efficient Stimulated Emission Depletion (STED) for Bioimaging, *Kevin D. Belfield[2], Mykhailo V. Bondar[1,2], Alma R. Morales[2], Olga V. Przhonska[1], Xuhua Wang[2]; [1]Inst. of Physics, Ukraine; [2]Dept. 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.

OMD5 • 17.15

Near-Infrared Emitting Squaraine Dyes for Multiphoton Fluorescence Imaging with High 2PA Cross Sections, *Hyo-Yang Ahn[1], Sheng Yao[1], Xuhua Wang[1], Kevin D. Belfield[1]; [1]Chemistry, Univ. of Central Florida, USA.* New near-infrared squaraine probe SQ-X (1), and squaraine dye, SQ44OH (2), were investigated for their photochemical properties and cytotoxicity. *In vitro* one-photon and two-photon fluorescence microscopy imaging was demonstrated.

Cypress Room — OTMD • Trapping with Shaped Beams–Contributed

OTMD3 • 16.45

Mapping of the Optical Field of a Focused Cylindrical Vector Beam by Trapped Rayleigh Particles, *Liangcheng Zhou[1], Qiwen Zhan[2], Daniel Ou-Yang[1]; [1]Physics, Lehigh Univ., USA; [2]Electro-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.

OTMD4 • 17.00 Invited

Holographic Optical Traps and Spectroscopic Detection for Probing Cellular Releasates, *Daniel R. Burnham[1], Thomas Schneider[1], Daniel T. Chiu[1]; [1]Dept. 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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BMD • Optical Biosensors II–Contributed

BTuC5 • 17.30 **Invited**

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.

NMD • Nonlinear II–Contributed

NMD7 • 17.30

Temperature Distribution in Red Blood Cells Using Photothermal Imaging Integrated with Digital Holography, *George Chen[1], Srivathsan Vasudevan[2], Beng Koon Ng[2]; [1]BC Photonics Technological Co, Canada; [2]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.

OMD • Novel Probes II–Contributed

OTMD • Trapping with Shaped Beams–Contributed

OTMD5 • 17.30

Polarization Dependent Forces in Optical Vortex Pipeline, *Niko Eckerskorn[1], Wieslaw Krolikowski[1], Vladlen Shvedov[1], Andrei Rode[1]; [1]Australian Natl. Univ., Australia.* We study both, theoretically and in experiments, the dependence of optical forces acting on a spherical particle guided in air with an optical vortex beam, on the light polarization state, and discuss potential applications.

OTMD6 • 17.45

Loading Aerosol Optical Traps using Surface Acoustic Wave Devices, *David McGloin[1], Suman Anand[1], Jonathan Nylk[1], Calvin Dodds[1], Steve L. Neale[2], Jonathan Cooper[2]; [1]Electronic Engineering and Physics, Univ. of Dundee, UK; [2]Dept. of Electronics, Univ. of Glasgow, UK.* 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.

19.00–Welcome Reception, ***Spyglass Promenade***

NOTES

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

Tuesday, 5 April, 2011 **7.30–18.00 Registration Open**, *Regency Foyer South*

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, *Yuhwa Lo, Frank Tsai, Ashkan 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, *Changhuei 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
Milind Rajadhyaksha; Memorial Sloan Kettering Cancer Ctr., USA, Presider

OTuA1 • 8.00 Invited
Title to Be Announced, *Vasilis Ntziachristos; Germany.* Abstract not available.

OTuA2 • 8.30 Invited
Fluorescence Lifetime Imaging for Cell Biology, Drug Discovery and Label-Free Diagnosis, *Paul French[1]; [1]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 Persson[1], David Engström[1], Jörgen Bengtsson[2], Mattias Goksör[1]; [1]Physics, Univ. of Gothenburg, Sweden; [2]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 Jyoti Krishnatreya[1], David G. Grier[1]; [1]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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BTuA • Bio-Inspired Optics–Continued

BTuA3 • 9.00

Design of a Parallel 3-D Confocal Imaging System with Adaptive Objective Lens, *Guoqiang Li, Xiao Fang, Dongxue Zhao; 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

BTuA4 • 9.15

Optomechanical Fluid-Filled Model of the Human Eye, *Ashkan Arianpour, Eric Tremblay, Joseph Ford, Yuhwa Lo; 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.

BTuA5 • 9.30 **Invited**

Revisiting the Stiles-Crawford Effect in Retinal Imaging, *Brian Vohnsen; School of Physics, Univ. College Dublin, Ireland.* Efficient photoreceptor light coupling benefits both vision and high-resolution retinal imaging. Here, the related Stiles-Crawford effect is analyzed in relation to scanning retinal imaging and the situation of a coherent fiber-bundle retina model.

NTuA • Imaging Through Tissue–Continued

NTuA3 • 9.00 **Invited**

Imaging Through an Opaque Material, *Sylvain Gigan, Sébastien M. Popoff, Geoffroy 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 demonstrate experimentally light focusing and imaging through an opaque medium.

NTuA4 • 9.30

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.

OTuA • Advances in Instrumentation or Algorithms II–Continued

OTuA3 • 9.00 **Invited**

Photothermal Optical Coherence Tomography for Molecular Imaging, *Melissa Skala[1,2], Matthew Crow[2], Adam Wax[2], Joseph Izatt[2]; [1]Biomedical Engineering, Vanderbilt Univ., USA; [2]Biomedical 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.

OTuA4 • 9.30

An MR compatible Frequency Domain Fluorescence Molecular Imaging System: Design and Phantom Studies, *Yuting Lin[1], Michael Ghijsen[1], Hao Gao[2,1], Orhan Nalcioglu[1], Gultekin Gulsen[1]; [1]Ctr. for Functional Onco Imaging, Univ. of California at Irvine, USA; [2]Applied 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.

OTTuA • Trapping Techniques and Applications I–Continued

OTTuA4 • 9.00 **Invited**

Transportation of a Micro Droplet by Light Irradiation: The Influence of an Advection and the Marangoni Effect, *Takafumi Iwaki[1]; [1]Fukui 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.

OTTuA5 • 9.30

Sub-Micron Patterning of Rough Surfaces Using Optical Trap Assisted Nanopatterning, *Romain Fardel[1], Yu-Cheng Tsai[1], Craig B. Arnold[1]; [1]Mechanical 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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

NTuA • Imaging Through Tissue–Continued

NTuA5 • 9.45
Genetic Algorithm Optimization of Phase Masks for Focusing Light through Turbid Media, *Donald B. Conkey, Albert Brown, Antonio 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.

OTuA • Advances in Instrumentation or Algorithms II–Continued

OTuA5 • 9.45
Two-Dimensional Surface Plasmon Resonance (SPR) Biosensor based on Infrared Imaging, *Chi Lok Wong[2], George Chen[1], Beng Koon Ng[2]; [1]BC Photonics Technological Co., Canada; [2]School 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.

OTTuA • Trapping Techniques and Applications I–Continued

OTTuA6 • 9.45
Optical Manipulation in the Evanescent Field of a Nanofiber *via* Spatial Light Modulation, *Mary Frawley[1,2], Alex Petcu-Colan[1,2], Sile Nic Chormaic[1,2]; [1]Physics Dept., Univ. College Cork, Ireland; [2]Photonics 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.

10.00–10.30 Coffee Break, *Regency Main*
10.00–16.00 Exhibits Open, *Regency Main*

NOTES

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

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[1], Alexander Goncharov[1], Diana Bogusevschi[2], Patrick Collins[1], Arthur Cummings[3], Huanqing Guo[1], Eugene Ng[3], Anton Sharapov[1], Matt Sheehan[1], Kevin Smith[2]; [1]School of Physics, Nat'l. Univ. of Ireland Galway, Ireland; [2]Nat'l. 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.

BTuB2 • 11.00 **Invited**

Title to be Announced, *Christian Sandstedt; Calhoun Vision, Inc., USA.* Abstract not available.

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]; [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.

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.

NTuB3 • 11.15

Real-Time Quantitative Phase and Dual-Channel Fluorescence Microscopy for Studying Cellular and Biomolecular Dynamics, *Matthew T. Rinehart, Natan 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.

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) intravital microscopy for 3-D tissue imaging, and (ii) *in vivo* flow cytometry for detection and quantification of circulating cells.

OTuB2 • 11.00 **Invited**

FLIM in Ophthalmology - a Diagnostic Tool for Metabolic Mapping, *Dietrich Schweitzer[1], Matthias Klemm[2], Stefan Schenke[1], Silvio Quick[1], Lydia Deutsch[1], Susanne Jentsch[1], Martin Hammer[1]; [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.

OTTuB • Trapping Techniques and Applications II

Tuesday, 5 April
10.30–12.30
Daniel Burnham, Univ. of Washington, USA, Presider

OTTuB1 • 10.30 **Invited**

Title to be Announced, *Tony J. Huang; Penn State, USA.* Abstract not available.

OTTuB2 • 11.00

Fiber-Based Dual-Beam Optical Trapping System for Studying Lipid Vesicle Mechanics, *Tessa M. Pinon[1], Linda S. Hirst[2], Jay E. Sharping[2]; [1]School of Engineering, Univ. of California at Merced, USA; [2]School of Natural Sciences, Univ. of California at Merced, USA.* We describe the mechanics of giant unilamellar vesicles (GUVs) which are manipulated using a fiber-based dual-beam optical trap. We prepare GUVs encapsulating various concentrations and molecular weights of poly(ethylene glycol) (PEG) polymer.

OTTuB3 • 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 dielelectrophoretic forces exhibited by the strong internal fields of these materials.

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)

BTuB • Visual Optics–Continued

BTuB3 • 11.30 **Invited**
Title to be Announced, *Qiushi Ren; Peking Univ., China.* Abstact not available.

BTuB4 • 12.00 **Invited**
Bio-Inspired Structural Olor Waveplates and Polarizers and their Applications, *Stanley Pau, Graham Myhre, Arshad Sayyad; College of Optical Sciences, Univ. of Arizona, USA.* By studying the polarization property of jeweled beetles, we develop novel optical coatings that can be patterned at high spatial resolution and have precise optical retardance and polarization dependent absorption.

NTuB • Phase I–Continued

NTuB4 • 11.30
Spectral-domain Differential Interference Contrast Microscopy, *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 cardiomyocytes were demonstrated with 36pm resolution.

NTuB5 • 11.45
GPU-based Real-time Phase Microscopy, *Johannes Frank, Sebastian Wette, Jan Beneke, Stefan Altmeyer; 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.

NTuB6 • 12.00
4-Dimensional Microscope System for Dynamic Phase Imaging, *Katherine Creath; 4-D Technology Corp. and Univ. of Arizona, USA.* New, novel interference microscope system utilizing a pixelated phase sensor capturing dynamic phase images *in vitro*, enabling volumetric, motion and morphological studies, including examples of monitoring different biological processes and motions.

OTuB • Clinical/Pre-clinical Applications II–Continued

OTuB3 • 11.30
Fluorescence Diffuse Optical Tomography with Multiple View Structured Illumination, *Nicolas Ducros[1], Andrea Bassi[1], Gianluca Valentini[1], Martin Schweiger[2], Simon Arridge[2], Cosimo D'Andrea[1]; [1]Physics, IFN-CNR, IIT, Dipt. di Fisica, Italy; [2]Dept. 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.

OTuB4 • 11.45
Spectroscopic Optical Coherence Tomography for Quantitative Molecular Imaging, *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.

OTuB5 • 12.00
Multimodal Optical Detection of Intravaginal Microbicide Gel Coating Thickness Distribution, *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.

OTTuB •Trapping Techniques and Applications II–Continued

OTTuB4 • 11.30 **Invited**
Sonotweezers: Complementing the Size and Force Spectra of Optical Trapping, *Michael P. MacDonald[1]; [1]Electronic 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.

OTTuB5 • 12.00
Combined Optical and Acoustic Trapping, *Gregor Thalhammer; Division for Biomedical Physics, Innsbruck Medical Univ., Austria.* We present the combination of optical and acoustic trapping in a microfluidic device. This setup combines the advantages of a large trapping volume of acoustic trapping with the high precision and flexibility of optical micro-manipulation.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

NTuB • Phase I–Continued

NTuB7 • 12.15
X-ray Photon Sieves for Phase-contrast Microscopy, *Guanxiao Cheng[1,2], Chao Hu[1,2], Max Q.-H. Meng[2,1]; [1]Shenzhen Inst. of Advanced Technology, Chinese Academy of Sciences, China; [2]Chinese 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.

OTuB • Clinical/Pre-clinical Applications II–Continued

OTuB6 • 12.15
Rapid Confocal Imaging of Large Area Excised Tissue with Strip Mosaicing, *Sanjee Abeytunge[1], Yongbiao Li[1], Bjorg A. Larson[2], Ricardo Toledo-Crow[1], Milind Rajadhyaksha[2]; [1]Res. Engineering Lab., Memorial Sloan Kettering Cancer Ctr., USA; [2]Dermatology 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.

OTTuB •Trapping Techniques and Applications II–Continued

OTTuB6 • 12.15
Message In a Bottle the Statistical Behavior of Nanoparticles in Optical Confinement, *Liangcheng Zhou[1], Daniel Ou-Yang[1], Joseph Junio[1], Jack Ng[2], Joel Cohen[3], Zhifang Lin[4]; [1]Physics, Lehigh Univ., USA; [2]Physics, Hong Kong Univ. of Science and Technology, Hong Kong; [3]Physiology, Univ. of the Pacific, USA; [4]Physics, Fudan Univ., China.* A focused laser produced optical bottle transiently traps nanoparticles while 3-D fluorescence imaging maps the nanoparticle distribution.

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

NOTES

JTuA1
Customized Eye Modeling Using Clinical Pentacam and Wavescan Data, *Ying-Ling A. Chen[1], Lei Shi[1], Jim Lewis[3], Ming Wang[2], Ryan Vida[2]; [1]Ctr. for Laser Applications, Univ. of Tennessee, USA; [2]Wang Vision Inst., USA; [3]E-Vision Technologies Inc., USA.* We incorporated anterior chamber components, axial length, and wavefront measurements to construct pilot customized eye models for extensive applications. 21 normal and diseased eyes were successfully constructed with RMS 0.01 wave accuracy.

JTuA2
Determination of Resorption in Bone Using Phase Shifting Interferometry, *George Chen[1], Joachim Loo[2]; [1]BC Photonics Technological Co, Canada; [2]School 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 Wu[1], Stefania Romeo[2], Martin A. Gundersen[3], P. Thomas Vernier[3,4]; [1]Chemical Engineering and Materials Science, Univ. of Southern California at Los Angeles, USA; [2]Information Engineering, Second Univ. of Naples, Italy; [3]Electrical Engineering, Univ. of Southern California at Los Angeles, USA; [4]MOSIS/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 Zhao[1], Ahmad A. Nawaz[1], Tony J. Huang[1]; [1]Engineering 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 Abdisalaam[1]; *[1]Bioengineering, 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 proteins before and after γ-irradiation *in vivo*.

JTuA6
Time-Gated Raman Spectra of Living Samples, *Zachary Smith[1], Florian Knorr[1], Sebastian Wachsmann-Hogiu[1]; [1]Ctr. 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. Tsykaliak[1]; [1]Correlation 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 Huland[1], Scott Howard[2], Watt W. Webb[2], Chris Xu[2]; [1]Biomedical Engineering, Cornell Univ., USA; [2]Applied 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 Wang[1], Krishnarao Tangella[2,3], Gabriel Popescu[1]; [1]Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA; [2]Pathology, Univ. of Illinois at Urbana-Champaign, USA; [3]Christie Clinic, USA.* We demonstrated that phase shifts and refractive index changes measured *via* quantitative phase imaging can be an indicator for calcifications in breast tissue biopsies.

JTuA10
Live 3-D Imaging of HIV-1 Transfer through the Virological Synapse, *Deanna L. Thompson[1], Gregory McNerney[1], Benjamin M. Dale[2], Benjamin K. Chen[2], Thomas Huser[1]; [1]NSF Center for Biophotonics Science and Technology, Univ. of California at Davis, USA; [2]Mount 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. Small[1], Nahom Yirga[1]; [1]Physics, 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 Szipocs[1,2], Peter Gyula Antal[1], Attila Szigligeti[1], Attila Kolonics[1,2]; [1]Laser Applications, Res. Inst. for Solid State Physics and Optics of the Hungarian Academy of Sciences, Hungary; [2]R&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 Pavillon[1], Jonas Kühn[1,2], Pascal Jourdain[3], Christian D. Depeursinge[1], Pierre J. Magistretti[2,3], Pierre Marquet[2,3]; [1]Microvision and Microdiagnostics Group, STI, Ecole Polytechnique Fédérale de Lausanne, Switzerland; [2]Dépt. de Psychiatrie, CHUV, Prilly, Switzerland; [3]Brain 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 Binding[3,2], Juliette Benarous[1], Sylvain Gigan[2], Claude Boccara[2], Jean-François Léger[1], Laurent Bourdieu[1]; [1]IBENS, ENS, Paris, France; [2]Inst. Langevin, ESPCI ParisTech, Paris, France; [3]Max 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. Maitland[1], Meagan Saldua[1], Cory Olsovsky[1]; [1]Biomedical 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[1], Rajan Gurjar[1], David Wolf[1]; [1]Radiation 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 Yanez[1], Carolina D. Andrade[1], Alma R. Morales[1], Takeo Urakami[3], Masanobu Komatsu[3], Kevin D. Belfield[1,2]; [1]Chemistry, Univ. of Central Florida, USA; [2]CREOL, Univ. of Central Florida, USA; [3]Sanford-Burham Medical Research Inst., USA.* Efficient two-photon (2PA) absorbing dyes and bioconjugates 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 Sulforhodamine Dyes : Intravital and *in vitro* Applications, *Florence Appaix[2], Johannes Roemer[2], Boudewijn van der Sanden[2], Sabine Girod[2], Sylvie Boisseau[2], Mireille Albrieux[2], Hartmut Wege[1], Isabelle Guillemain[2], Antoine Depaulis[2], Jean-Claude A. Vial[1,2]; [1]Lab. de Spectrometrie Physique, CNRS, Saint Martin d'Heres, France; [2]Inst. des Neurosciences de Grenoble, INSERM, France.* As compared to local injections of sulforhodamine-B and sulforhodamine-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; Physics, 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; Physics, Univ. of Dundee, 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 Frazer[1], Xuhua Wang[1], Dao M. Nguyen[1], Alma R. Morales[1], Kevin D. Belfield[1]; [1]Chemistry, 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, *Srijeeta Bagchi[1], Debasish Roy[2], Ram Mohan Vasu[1]; [1]Dept. of Instrumentation and Applied Physics, Indian Inst. of Science, India; [2]Dept. 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
Evanescent Wave Optical Trapping Using Tapered Optical Fibers, *Marios Sergides[1], Susan E. Skelton[1], Radhika Patel[1], Agata Pawlikowska[1,2], Phil Jones[1]; [1]Physics and Astronomy, Univ. College London, UK; [2]Natl. 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, *Onofrio Marago[1], Phil Jones[2], Rosalba Saija[3], Ferdinando Borghese[3], Paolo Denti[3], Maria A. Iati[3], Pietro Gucciardi[1]; [1]CNR-Inst. per i Processi Chimico-Fisici, Italy; [2]Physics and Astronomy, Univ. College London, UK; [3]Dip. di Fisica della Materia e Ing. Elettronica, Univ. di Messina, Italy.* We investigate plasmon-enhanced trapping of metal 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.

JTuA26

Radially Polarized Optical Tweezers, *Susan E. Skelton[1], Marios Sergides[1], Radhika Patel[1], Agata Pawlikowska[1,2], Onofrio Marago[3], Phil Jones[1]; [1]Dept. of Physics and Astronomy, Univ. College London, UK; [2]Natl. Physical Lab, Teddington, Middlesex, UK; [3]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.

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[1], Helge Eggert[1], Gerd Behme[1], Claudia Böttcher[1]; [1]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.

JTuA29

Dark Spot Trapping Using a Double-Ring-Shaped Radially Polarized Beam, *Yuichi Kozawa[1], Shunichi Sato[1]; [1]Inst. of Multidisciplinary Res. for Advanced Materials, Tohoku Univ., Japan.* 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[1,2], Galvin Khara[1], Sile Nic Chormaic[1,2]; [1]Physics Dept., Univ. College Cork, Ireland; [2]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.

JTuA31
Please see OTTuC2

JTuA32

Optical Binding in the Asymmetrical Configurations, *Vitezslav Karasek[1], Oto Brzobohaty[1], Pavel Zemanek[1]; [1]Inst. of Scientific Instruments of the ASCR, Czech Republic.* 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.

JTuA33

An Approach to Selective Optical Isolation and Cloning of Cyanobacterias of Atacama Desert, *Gabriel Araneda[1,2], Nataly Cisternas San Martín[1,2], Juan Pablo Staforelli[1,2]; [1]Dept. de Física, Univ. de Concepciòn, Chile; [2]Ct. for Optics and Photonics, Chile.* We propose a low-cost, highly precise and robust protocol for individual isolation of Cyanobacterias 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 Kotova, Nikolay Losevsky, Vsevolod Patlan, Eugenia Razueva[1], Vladimir Volostnikov, Evgeny Vorontsov[1]; LPI Samara Branch, Russian Federation.* The possibility is shown to form vortical light fields with the desired intensity distribution by means of phase-only DOEs based on spiral beams optics. Experiments on fields generation with SLM and laser manipulation are presented.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BTuC • Biomedical Optical Imaging

Tuesday, 5 April
16.00.-18.00
Presider to Be Announced

BTuC1 • 16.00 **Invited**

Title to Be Announced, *Ruikang Wang; Univ. of Washington, USA.* Abstract not available.

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.

NTuC • Phase II

Tuesday, 5 April
16.00–18.00
Presider to Be Announced

NTuC1 • 16.00 **Invited**

High-Speed Nonlinear Harmonic Generation Holographic Microscopy, *Randy Bartels[1,2], Philip Schlup[1], Jesse Wilson[1]; [1]Electrical and Computer Engineering, Colorado State Univ., USA; [2]School 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.

NTuC2 • 16.30

Holographic Second Harmonic Generation Microscopy, *Etienne Shaffer[1], Pierre Marquet[1,2], Christian D. Depeursinge[1]; [1]École Polytechnique Fédérale de Lausanne (EPFL), Switzerland; [2]Dépt. 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.

OTuC • Novel Probes III

Tuesday, 5 April
16.00–17.15
Dietrich Schweitzer; Univ. of Jena, Germany, Presider

OTuC1 • 16.00 **Invited**

Fluorescence Lifetime in Optical Molecular Imaging, *Walter J. Akers[1], Mikhail Berezin[1], Hyeran Lee[1], Samuel Achilefu[1,2]; [1]Dept. of Radiology, Washington Univ. School of Medicine, USA; [2]Dept. 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.

OTuC2 • 16.30

A New Optical Nano-Construct Composed of a Genome-Depleted Plant Virus Doped with a Near Infrared Organic Chromophore, *Bongsu Jung[1], Ayala L. Rao[2], Bahman Anvari[1]; [1]Bioengineering, Univ. of California at Riverside, USA; [2]Plant 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.

OTTuC • Trapping Techniques and Applications III

Tuesday, 5 April
16.00–18.00

OTTuC1 • 16.00 **Invited**

Optoelectronic Tweezers as a Tool for Medical Diagnostics, *Steve L. Neale[1], Clemens Kremer[1], Michael Barrett[2], Jonathan Cooper[1]; [1]Biomedical Engineering Res. Division, Univ. of Glasgow, UK; [2]Wellecome Trust Centre for Molecular Parasitology, Univ. of Glasgow, UK.* Optoelectronic Tweezers (OET) allows the patterning 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.

OTTuC2 • 16.30

Resolving Interparticle Position and Optical Forces along the Axial Direction Using Optical Coherence Gating, *Woei Ming Lee[1], Tzu Hao Chow[2,3], Beng Koon Ng[2]; [1]Wellman Photomedicine, Harvard Medical School and Massachusetts General Hospital, USA; [2]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore; [3]Singapore-MIT Alliance, Natl. Univ. of Singapore, Center for Singapore-MIT Alliance, Singapore.* We demonstrate the use of coherence gating to resolve particle positions and forces in the axial direction. High depth resolvability (micrometers) and weak optical force (femtonewton) measurements in an optical trapping system is achieved.

Big Sur Room	**Regency 1 & 2**	**Regency 3**	**Cypress Room**
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BTuC • Biomedical Optical Imaging–Continued

BTuC3 • 16.45
Automated 3-D Detection of Giardia Lamblia Cysts as an Assessment of Potential Drinking-Water Resources using DHM with Partially Coherent Source, *Ahmed El Mallahi[1], Christophe Minetti[1], Frank Dubois[1], Catherine Yourassowsky[1], Aurélie Detavernier[2], Jingxing Ma[2], Michel Verbanck[2]; [1]Microgravity Research Center, Univ. libre de Bruxelles, Belgium; [2]Dept. Water Pollution Control, Univ. libre de Bruxelles, Belgium.* Digital holographic microscopy under partially coherent source allows to identify intracellular morphologic features of parasitic protozoan (oo)cysts. A new rationale for the unambiguous detection of Giardia lamblia contamination risks is proposed.

BTuC4 • 17.00 **Invited**
Cataract Surgery with OCT-guided Femtosecond Laser, *Daniel Palanker[1], Georg Schuele[2], Neil Friedman[1], Dan Andersen[2], William Culbertson[3]; [1]Ophthalmology, Stanford Univ., USA; [2]OptiMedica Corp., USA; [3]Bascom Palmer Eye Inst., 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.

NTuC • Phase II–Continued

NTuC3 • 16.45
Surface Contrast Microscopy, *Yousef Nazirizadeh[1], Uli Lemmer[2], Martina Gerken[1]; [1]Integrated Systems and Photonics, Inst. of Electrical and Information Engineering, Germany; [2]Light Technology Inst. and Center for Functional Nanostructures (CFN), Germany.* We report a purely optical method for contrast enhancement of specimen on surfaces. This method utilizes a photonic crystal slab between two crossed polarization filters as the microscope slide.

NTuC4 • 17.00
Contrast Enhancing Microscopy by Multi-pass Phase Conjugation, *Nicolas C. Pégard, Jason W. Fleischer; Electrical Engineering, Princeton Univ., USA.* We have developed a bright field microscopy technique by phase conjugation and multiple transmission of a coherent light source. For microscopic biomaterial, we demonstrate all-optical contrast enhancement and aberration reduction.

NTuC5 • 17.15
Nonlinear Restoration of Diffused Images, *Laura Waller[2], Dmitry V. Dylov[1], Jason W. Fleischer[2]; [1]GE Global Res. Ctr., Niskayuna, USA; [2]Electrical Engineering, Princeton Univ., USA.* We develop a method to recover diffused and noise-hidden images by using spatial nonlinearity to seed instability. Optimal recovery depends on signal content, scattering statistics, and nonlinear coupling strength.

OTuC • Novel Probes III–Continued

OTuC3 • 16.45
***Ex vivo* Tumor Imaging with a VEGFR-2 Selective Two-Photon Absorbing (2PA) Bioconjugate,** *Carolina D. Andrade[1], Ciceron Yanez[1], Hyo-Yang Ahn[1], Kevin D. Belfield[1], Takeo Urakami[2], Masanobu Komatsu[2]; [1]Chemistry, Univ. of Central Florida, USA; [2]Sanford-Burnham Medical Res. Inst. at Lake Nona, USA.* *Ex vivo* imaging of tumors has been successfully achieved by using a two-photon absorbing (2PA) fluorescent bioconjugate that selectively binds the vascular endothelial growth factor receptor 2 (VEGFR-2).

OTuC4 • 17.00
How to Enhance the Two-Photon Brightness of Fluorescent Proteins? *Mikhail Drobizhev[1], Nikolay Makarov[1], Shane Tillo[1], Thomas Hughes[1], Aleksander Rebane[1]; [1]Montana State Univ., Bozeman, USA.* Fluorescent proteins (FPs) are widely used in 2-photon absorption (2PA) microscopy as genetically-targeted probes. We provide the guidelines for increasing their peak 2PA cross section by tuning (via mutations) local electric field inside protein.

OTTuC • Trapping Techniques and Applications III–Continued

OTTuC3 • 16.45
Optical Forces near Surface: Full 3-D Finite Element Method Based Calculations, *Martin Siler[1], Vitezslav Karasek[1], Pavel Zemanek[1]; [1]Inst. of Scientific Instruments of the ASCR, v.v.i., Czech Republic.* Optical forces acting upon a microparticle placed near the surface are evaluated using full 3-D solution of Maxwell equations based on the Finite Element Method. The stress is put on the evanescent field illumination.

OTTuC3 • 17.00 **Invited**
A Next Generation BioPhotonics Workstation, *Jesper Glückstad; Dept. Photonics Engineering, Techn. Univ Denmark, DTU Fotonik, Denmark.* We are developing a Next Generation BioPhotonics Workstation to be applied in research on regulated microbial cell growth including their underlying physiological mechanisms, in vivo characterization of cell constituents and manufacturing of nanostructures and meta-materials.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
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)

BTuC • Biomedical Optical Imaging–Continued

BTuC5 • 17.30 **Invited**
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.

NTuC • Phase II–Continued

NTuC6 • 17.30
Quantitative Phase from Defocus, *Shan Shan Kou[1,2], Colin J. R. Sheppard[2], Nicolas Pavillon[1], Pierre Marquet[3], Christian D. Depeursinge[1]; [1]STI, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; [2]Bioengineering, Natl. Univ. of Singapore (NUS), Singapore; [3]Dépt. de Psychiatrie DP-CHUV, 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.

NTuC7 • 17.45
Complex Field imaging for Diffraction Tomography, *Isabelle Bergoend[1], Cristian Arfire[1], Yann Cotte[1], Christian D. Depeursinge[1]; [1]Microvision 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.

OTuC • Novel Probes III–Continued

OTTuC • Trapping Techniques and Applications III–Continued

OTTuC4 • 17.30
Dynamic Biomolecule Sensing Bead Array Held by Optical Tweezers, *Mael Manesse[1], Christopher N. Lafratta[1,2], Manuel A. Palacios[1], Aaron F. Phillips[1], David R. Walt[1]; [1]Chemistry Dept., Tufts Univ., USA; [2]Chemistry 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.

OTTuC5 • 17.45
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.

NOTES

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

Wednesday, 6 April, 2011 **7.30–15.45 Registration Open**, *Regency Foyer South*

BWA • Design for Biomedical Optical Imaging

Wednesday, 6 April
8.00–10.00
Presider to Be Announced

BWA1 • 8.00 **Invited**

Toward Low Cost Imaging: A Laser Scanning Digital Camera, *Ann E. Elsner[1], Matthew S. Muller[1,2], Benno L. Petrig[1,2], Joel A. Papay[1], Christopher A. Clark[1], Jovan Alavanja[1], Bryan P. Haggerty[1]; [1]Indiana Univ., USA; [2]Aeon 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 Czajkowski[1]; [1]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 Chu[1], Zachary J. Smith[1], Denis Dwyre[2], Dennis Matthews[1], Stephen Lane[1], Sebastian Wachsmann-Hogiu[1,2]; [1]Center for Biophotonics, Univ. of California at Davis, USA; [2]Dept. 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
Presider to Be Announced

NWA1 • 8.00 **Invited**

Scanning Fiber-Optic Nonlinear Endomicroscopy, *Kartikeya Murari[1], Jiefeng Xi[1], Ming-Jun Li[1], Xingde Li[2], Yuying Zhang[1]; [1]Biomedical Engineering, Johns Hopkins Univ., USA; [2]Science 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.

NOTES

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)

BWA4 • 9.15

Miniaturized Microscope for Multi-spectral Laser Imaging, *Janaka Senarathna[1]; [1]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 Xi[1], Kartikeya Murari[1], Yuying Zhang[1], Yongping Chen[1], Jiasong Li[1], Xingde Li[1]; [1]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.

10.00–10.30 Coffee Break, *Regency Main*

NOTES

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BWB • Two-Photon Imaging

Wednesday, 6 April
10.30–12.30
Presider to Be Announced

BWB1 • 10.30 **Invited**

Technology Development for Multiphoton Imaging, *Chris Xu*[1]; [1]*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.*

BWB2 • 11.00 **Invited**

Title to Be Announced, *James V. Jester; Univ. of California Irvine, USA.* Abstract not available.

BWB3 • 11.30 **Invited**

Nonlinear Optical Probes of Ovarian Cancer, *Paul J. Campagnola*[1], *Molly Brewer*[2], *Ronald LaComb*[2], *Oleg Nadiarnykh*[2], *Xiyi Chen*[1], *Reui-Yu He*[2]; [1]*Dept. of Biomedical Engineering, Univ. of Wisconsin, USA;* [2]*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.

NWB • New Techniques

Wednesday, 6 April
10.30–12.30
Presider to Be Announced

NWB1 • 10.30 **Invited**

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.

NWB2 • 11.00 **Invited**

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.

NWB3 • 11.30

Optically Sectioned Fluorescence Imaging with HiLo, *Tim N. Ford*[1], *Daryl Lim*[1], *Kengyeh K. Chu*[1], *Eladio Rodriguez-Díaz*[2], *Satish K. Singh*[2], *Jerome Mertz*[1]; [1]*Biomedical Engineering, Boston Univ., USA;* [2]*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.

NWB4 • 11.45

4-D Image Mapping Spectrometer (IMS) with Structured Illumination, *Liang Gao*[1,3], *Noah Bedard*[1], *Robert Kester*[1], *Nathan Hagen*[1], *Tomasz Tkaczyk*[1,2]; [1]*Bioengineering* **,** *Rice Univ., USA;* [2]*Electrical and Computer Engineering, Rice Univ. USA;* [3]*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.

NOTES

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BWB4 • 12.00
Effects of Ultrashort Femtosecond Laser Pulses Upon Embryogenesis of Eukaryotic Organisms, *Sergey Arkhipov[1]; [1]Chemistry, 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. Nawaz[1], Xiaole Mao[1], Yanhui Zhao[1], Sz-Chin Steven Lin[1], Tony J. Huang[1]; [1]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, *Kengyeh K. Chu[1], Daryl Lim[1], Jerome Mertz[1]; [1]Biomedical 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 Microcopy by a Single On-Axis Measurement, *Rodrigo Aviles-Espinosa[1], Jordi Andilla[2], Rafael Porcar-Guezenec[2], Omar Olarte[1], Xavier Levecq[2], David Artigas[1,3], Pablo Loza-Alvarez[1]; [1]Biophotonics, ICFO – Inst.de Ciències Fotòniques, Spain; [2]Imagine Optic, France; [3]Dept. of Signal Theory and Communications, Univ. Politècnica 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.

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, *Jeeseong 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.

Big Sur Room	Regency 1 & 2	Regency 3	Cypress Room
Bio-Optics: Design and Application (BODA)	Novel Techniques in Microscopy (NTM)	Optical Molecular Probes, Imaging and Drug Delivery (OMP)	Optical Trapping Applications (OTA)

BWC • Spectroscopic Imaging–Continued

BWC4 • 15.00
Real-Time Hyperspectral Imaging of Pancreatic β-cell Dynamics with Image Mapping Spectrometer (IMS), *Liang Gao[1], Amicia Elliott[2], Robert Kester[1], Nathan Hagen[1], David Piston[2], Tomasz Tkaczyk[1]; [1]Bioengineering, Rice Univ., USA; [2]Department of Molecular Physiology and Biophysics, USA.* Real-time hyperspectral imaging of pancreatic β-cell dynamics is achieved by utilizing an Image Mapping Spectrometer (IMS). The calcium signal was successfully monitored during caspase-3 mediated FRET in cellular apoptosis.

BWC5 • 15.15
Study of Cationic Polymer/DNA Complex (Polyplex) Formation by Time-Resolved Fluorescence Spectroscopy, *Cosimo D'Andrea[1], Andrea Bassi[1], Paola Taroni[1], Daniele Pezzoli[2], Alessandro Volonterio[2], Gabriele Candiani[2]; [1]Physics, IFN-CNR, IIT, Politecnico di Milano, Italy; [2]Dipartimento di Chimica, Materiali e Ingegneria Chimica, Politecnico di Milano, Italy.* Time-resolved fluorescence spectroscopy of SYBR Green is carried out to characterize cationic polymer/DNA complex (polyplex) formation in solution. Both fluorescence amplitude and lifetime prove to be very sensitive to the Charge Ratio polymer/DNA.

BWC6 • 15.30
Fluorescence Lifetime Imaging Microscopy (FLIM) for Intraoperative Tumor Delineation: A Study in Patients, *Yinghua Sun[1], Jeremy Meier[2], Nisa Hatami[1], Jennifer Phipps[1], Rudolph J. Schrot[2], Brian Poirier[2], Gregory Farwell[2], Daniel Elson[3], Laura Marcu[1]; [1]Dept. of Biomedical Engineering, Univ. of California at Davis, USA; [2]School of Medicine, Univ. of California at Davis, USA; [3]Inst. of Biomedical Engineering, Imperial College London, UK.* This work demonstrates a novel application of an endoscopic fluorescence lifetime imaging microscopy system to the intraoperative diagnosis of brain tumor glioblastoma multiforme (GBM) and head&neck tumor squamous cell carcinoma (SCC) in patients.

NOTES

Key to Authors and Presiders

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2011 Optics in the Life Sciences: OSA Optics and Photonics Congress
Topical Meeting Update Sheet and Exhibit Guide

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 Ricard[3], Boudewijn van der Sanden[2], Raphaél Serduc[2], Pascale Vérant[3]. [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.

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. Kou; *EPFL, Switzerland* will present **JTuA13, Early Glutamate-mediated Cell Death Detection with Digital Holographic Microscopy**

Presider Updates
• *Mary-Ann 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.

EXHIBIT GUIDE

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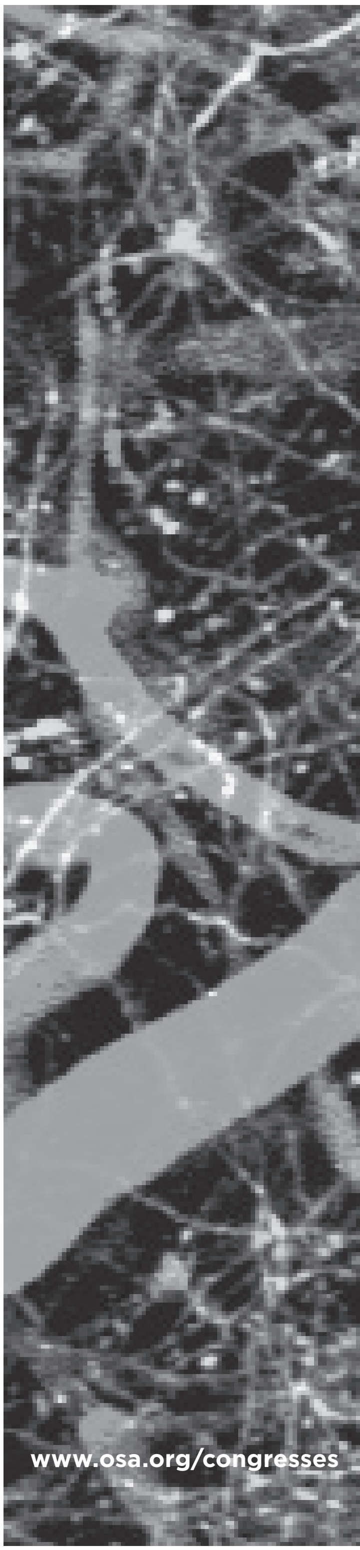

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POSTDEADLINE PAPERS

Optics in the Life Sciences

Bio-Optics: Design and Application (BODA)

Optical Molecular Probes, Imaging and Drug Delivery (OMP)

Optical Trapping Applications (OTA)

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4–6 April 2011

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Monterey, California, USA

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• Monday, April 4, 2011 •

OTMD • Trapping with Shaped Beams
Big Sur 1-3 (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 Suzuki[1], Takatsugu Maeda[1], Osami Sasaki[1], Samuel Choi[1]; [1]Niigata 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. Mishra,[2, 1], Nelson Cardenas[1], Samarendra K. Mohanty[1]; [1]Physics, Univ. of Texas at Arlington, USA; [2]CELOS, 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 1-3 (Hyatt)
16:00—18:00
Presider to Be Announced

OTTuC2p • 16:30
Free-form optical trapping systems, *Andreas Oeder[1,2], Sebastian Stoebenau[1,2], Stefan Sinzinger[1,2]; [1]Technische Optik, Technische Univ. Ilmenau, Germany; [2]IMN 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 1-3 (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 Steenbergen[1], Khalid Daoudi[1]; [1]MIRA 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 Young[1], Rebekah Drezek[1,2]; [1]Electrical and Computer Engineering, Rice Univ., USA; [2]Bioengineering, 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 Guo[1], Hossein Aleyasin[1], Scott Howard[2], Bryan C. Dickinson[3], Renee Haskew-Layton[1], Demirhan Kobat[2], Vivian Lin[3], David R. Rivera[2], Christopher J. Chang[3,4], Rajiv R. Ratan[1], Chris Xu[2]; [1]Burke Medical Research Inst., Weill Medical College of Cornell Univ., USA; [2]School of Applied Physics & Engineering, Cornell Univ., USA; [3]Dept. of Chemistry, Univ. of California, USA; [4]Howard 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 acetoxymethyl ester, a highly sensitive, small-molecule probe for selective imaging of H2O2 within the living cells.

• Tuesday, April 5, 2011 •

OTuD4 • 18:00
Characterization of Orthopoxvirus Protein Affinity to Chondroitin Sulfate Using TIRF Microscopy, *Jesse Aaron[1], Jerilyn Timlin[1], Masood Hadi[2]; [1]Dept. Bioenergy and Defense Technologies, Sandia Natl. Labs., USA; [2]2Biomass Science and Conversion Technology, Sandia Natl. Labs., USA.* We investigated the properties of F8L 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

BTuD1 • 18:15
Intraocular Implanted Mirror Telescope for Age Related Macular Degeneration, *Isaac Lipshitz[1]; [1]OptoLight Vision Technology, Israel.* The implanted mirror telescope magnifies the image that is projected on the retina so that eyes with compromised vision like AMD can detect objects that otherwise they cannot see.

BTuD2 • 17:30
Visual Prosthesis: Recent Development and Future Challenges, *Qiushi Ren[1]; [1]College of Engineering, China.* Electrical stimulating the different parts of visual pathway for visual recovery had been proposed by many groups. The latest progress and future challenges was presented.

BTuD3 • 18:45
Endogenous Fluorescence Imaging for the Management of Oral and Cervical Cancers, *Pierre Lane[1], Caherine Poh[1,2], Scott Durham[5], Lewei Zhang[2,4], Sylvia F. Lam[1], Miriam Rosin[3,6], Michele Follen[7], Calum MacAulay1; [1]Integrative Oncology, BC Cancer Research Center, Canada; [2]Faculty of Dentistry, Univ. of British Columbia, Canada; [3]Cancer Control Res., BC Cancer Res. Ctr., Canada; [4]Dept. of Pathology, Vancouver General Hospital, Canada; [5]Dept. of Otolaryngology, Vancouver General Hospital, Canada; [6]Biomedical Physiology and Kinesiology, Simon Fraser Univ., Canada; [7]Dept. 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. Arif[1,2], Cagri A. Savran[1,2], Stefan Sinzinger[1,2]; [1]Mechanical Engineering, Purdue Univ., USA; [2]Birck 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 Jacob[1], William Sullivan[2]; John Hoffnagle[1,3];[1]CytoRay Inc., USA; [2]Univ. of California, Santa Cruz, USA; [3]Picarro 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.

Key to Authors and Presiders

(**Bold** denotes Presider or Presenting Author)

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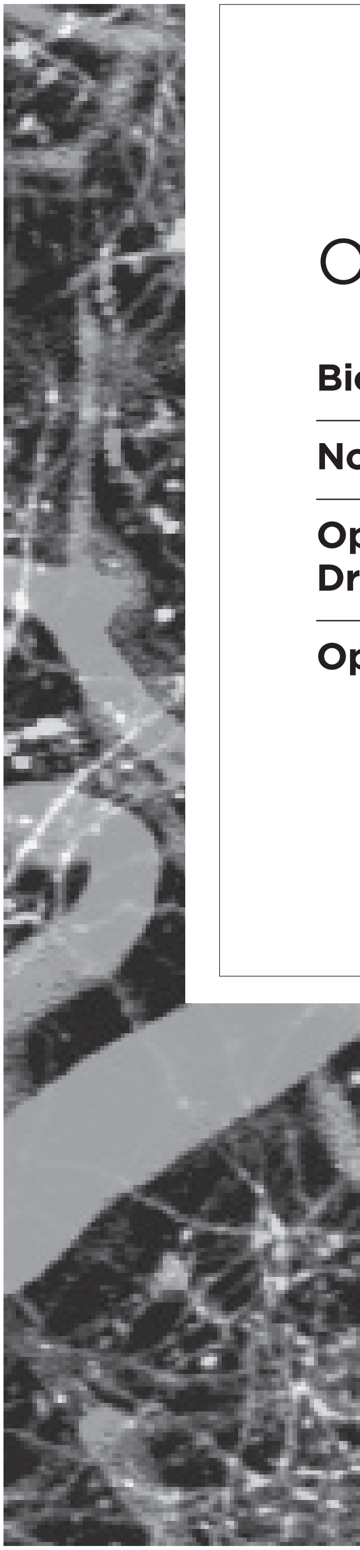

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