Optical Trapping Applications (OTA)

OSA Topical Meeting and Tabletop Exhibit

Collocated with

Digital Holography and Three-Dimensional Imaging (DH)
Fourier Transform Spectroscopy (FTS)
Hyperspectral Imaging and Sensing of the Environment (HISE)
Novel Techniques in Microscopy (NTM)

Technical Conference: April 26-30, 2009
Exhibition: April 27-29, 2009
Sheraton Vancouver Wall Centre Hotel
Vancouver, BC, Canada

PDP Submissions Deadline: April 2, 2009, 12:00 p.m. noon, EDT (16.00 GMT)
Housing Deadline: March 25, 2009
Pre-Registration Deadline: April 1, 2009

2009 Meeting Chairs

Carlos Lopez-Mariscal, *NIST*, *USA,* Chair
David McGloin, *Univ. of Dundee*, *UK,* Chair

About Optical Trapping Applications

Different optical trapping schemes are widely used to uncover aspects of matter-light interactions in the microscopic and submicroscopic domains. A broad range of physical and biological phenomena are elucidated in more detail thanks to the use of these schemes. This 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.

Topics to Be Considered

- Sorting
- Microfluidics
- Plasmonic Interactions
- Optical Landscapes
- Parallel Manipulation
- Fundamental Concepts
- Manipulation of Biological Structures
- Novel Imaging
- Noise Suppression
- Particle Tracking
- High Accuracy Position Sensing

About Optical Trapping Applications

Different optical trapping schemes are widely used to uncover aspects of matter-light interactions in the microscopic and submicroscopic domains. A broad range of physical and biological phenomena are elucidated in more detail thanks to the use of these schemes. This 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.

Topics to Be Considered

- Sorting
- Microfluidics
- Plasmonic Interactions
- Optical Landscapes
- Parallel Manipulation
- Fundamental Concepts
- Manipulation of Biological Structures
- Novel Imaging
- Noise Suppression
- Particle Tracking
- High Accuracy Position Sensing

Program Committee

Program Committee Members

Carlos Lopez-Mariscal; *NIST, USA,* **Co-Chair**
David McGloin; *Univ. of Dundee, UK,* **Co-Chair**

Advisory Committee

Brooke Hester; *Univ. of Maryland at College Park, USA*
Romain Quidant; *Inst. of Photonic Sciences (ICFO), Spain*
Pavel Zemanek; *Inst. of Scientific Instruments, Czech Republic*

Exhibitor Listings

ADVANCES in IMAGING

2009 OSA OPTICS AND PHOTONICS CONGRESS

April 26-30, 2009
Vancouver, BC
Canada

Collated Meetings:

Digital Holography and Three-Dimensional Imaging (DH)

Fourier Transform Spectroscopy (FTS)

Hyperspectral Imaging and Sensing of the Environment (HISE)

Novel Techniques in Microscopy (NTM)

Optical Trapping Applications (OTA)

ABB
Analytical Business Unit
585, boulevard Chrest E., Suite 300
Quebec, QC CANADA G1K 9H4
Tel: +1 418.877.2944 ext. 356
Fax: +1 418.877.2834
www.abb.com/analytical
With more than 35 years of experience in infrared spectroscopy, ABB Analytical counts several projects in Defense & Security and Space success stories, positioning her at the forefront of the Remote Sensing Industry as an international leader. ABB Analytical designs, manufactures and markets high-performance FT-IR and FT-NIR analytical systems and spectrometers for Petroleum, Chemical, Life Science, Academic, Semiconductor, Metallurgy and Remote Sensing/Aerospace.

Amplitude Laser Inc.
One Broadway
Cambridge, MA 02142
Tel: 619.303.3022 (West Coast Office)
Tel: 617.401.2195 (Boston Office)
Cell Phone: 619.621.9111
rbraunschweig@amplitude-laser.com
http://www.amplitude-laser.com
www.amplitude-laser.com
Amplitude Laser is the US based subsidiary for Amplitude Systemes, pioneer in Ytterbium laser technology, manufactures advanced diode-pumped ultrafast lasers for scientific and industrial applications. Products include high energy oscillators (t-Pulse series), amplifiers (s-Pulse series) and fiber amplifiers (Tangerine and Satsuma series). Contact: Robert Braunschweig, US Sales Manager, rbraunschweig@amplitude-laser.com; Eric Mottay, President & Chief Executive Officer, emottay@amplitude-sytemes.com.

Channel Systems
Box 188, 402 Ara Mooradian Way
Pinawa, Manitoba R0E 1L0
CANADA
Tel: +1 204.753.5190
Fax: +1 204.753.5199
info@channelsystems.ca
www.channelsystems.ca
Channel Systems is your complete scientific imaging solution source. We specialize in spectral cameras for UV, VIS, NIR, MWIR and LWIR. Systems are based on imaging spectrographs and liquid crystal tunable filters. We supply a complete line of Infrared Cameras (Xenics) and Visible Cameras (Basler). We offer a full line of accessories including lighting, lenses, software and scanners. Our application engineering services ensure you get the best technology for your research at the best cost.

Imagine Optic
18 rue Charles de Gaulle
91 400 Orsay, France
Tel : +33 (0)1 64 86 15 60
Fax : +33(0)1 64 86 15 61
jballesta@imagine-optic.com
www.imagine-optic.com
Imagine Optic is a provider of high performances Shack-Hartmann wavefront sensing, adaptive optics technologies and associated professional services. For over 12 years, Imagine Optic has been accompanying academic and industrial researchers around the world in their work to help them improve upon the results they're already achieving. Currently our adaptive optics for microscopy are being used to improve the performance of various types of microscopy and the technology's maturation has made it accessible to researchers everywhere.

Photonics Media
Laurin Publishing
2 South Street, Berkshire Common
Pittsfield, MA 01201 USA
Tel: 413.499.0514
Fax: 413.442.3180
photonics@laurin.com
www.photonics.com
Photonics Media is Laurin Publishing Company's international suite of media and as such the pulse of the industry. More than 50 years as the leading publications. In print with the Photonics Directory, Photonics Spectra, Biophotonics International, EuroPhotonics, and Photonics Showcase magazines and online at Photonics.com.

Telops Inc.
100-2600 avenue St-Jean-Baptiste
Quebec (Quebec) Canada G2E 6J5
P : 418.864.7808
F: 418.864.7843
www.telops.com
Telops specializes in the design and production of sophisticated opto-electronic systems for the defence, aerospace and telecommunications industries. In addition to providing specialized opto-electronic engineering services, Telops has developed the Hyper-Cam, an infrared hyperspectral imager which allows standoff chemical detection and identification at a distance of up to five kilometers. We thrive on high expectations and great challenges. Our technical experts understand your business and their diverse backgrounds represent a powerful source of innovation.

The organizers of the Advances in Imaging Congress and Tabletop Exhibit wish to acknowledge the following for their support:

Grants:

- Air Force Office of Scientific Research (AFOSR)
- National Aeronautics and Space Administration (NASA)
- National Institute of Biomedical Imaging and Bioengineering/Department of Health and Human Services / National Institutes of Health
- The OSA Foundation

Corporate Sponsors:

Special Events

Meet the Applied Optics Editors Dinner

Date: April 28, 2009
Time: 7:00 PM
Where: The Relish Restaurant & Lounge, 888 Nelson ST. (Between Hornby & Howe), Vancouver, BC, Canada (Website: http://www.relishrestaurants.com/relish/index.asp).

Don’t miss this great opportunity to meet Applied Optics Information Processing Editors:

Prof. T.-C. Poon (Division Editor, Virginia Tech)
Prof. Partha P. Banerjee (Topical Editor, Univ. of Dayton)
Prof. Byoungho Lee (Topical Editor, Seoul National Univ., Korea)

All conference attendees, especially students, are invited to this casual networking dinner. You can sign-up onsite at the OSA Registration Desk at the Grand Ballroom Foyer Coatroom. Please RSVP by Tuesday, April 28 by 1:00 pm. **Please note: Participants pay for their own dinners.**

2009 OSA Optics & Photonics Congress
Advances In Imaging
April 26-30, 2009
Vancouver, British Columbia, Canada

OSA GROUP DINNER

Have Dinner with *Applied Optics* Editors

Students are Welcome!

All OSA conference attendees are invited to a casual networking dinner where you will have the opportunity to meet *Applied Optics Information Processing* Editors:

Prof. T.- C. Poon (Division Editor, Virginia Tech)
Prof. Partha P. Banerjee (Topical Editor, Univ. of Dayton)
Prof. Byoungho Lee (Topical Editor, Seoul National Univ., Korea)

Tuesday, April 28, 2009, 7:00 p.m.

THE RELISH RESTAURANT & LOUNGE
888 Nelson St. (between Hornby & Howe) Vancouver, BC
Website: http://www.relishrestaurants.com/relish/index.asp

Sign up at the OSA Registration Desk
[Grand Ballroom Foyer, Coat Room]
by 1:00 p.m. on Tuesday, April 28

Note: Participants pay for their own dinners

Sponsored by the OSA External Relations Advisory Group

Invited Speakers

Optical Trapping Applications (OTA) / Digital Holography and Three-Dimensional Imaging (DH) Joint Session

Three-Dimensional Imaging by Three-Dimensional Point Spread Function Encoding, Rafael Piestun; *Univ. of Colorado at Boulder, USA.*

Optoelectronic Trapping of Cells, Nanowires, and Nanoparticles, Ming C. Wu; *Univ. of California at Berkeley, USA.*

Invited Speakers

Microrheology of the Endothelial Glycocalyx and Extracellular Matrix, *Elliot Botvinick; Univ. of California at Irvine, USA.*

Advances in the Biological Applications of Optical Micromanipulation, *Daniel Chiu; Univ. of Washington, USA.*

Life at the Edge: Optical Force Probe Measurements of the Pericellular Coat, *Jennifer Curtis; Georgia Tech, USA.*

Optical Tweezers Shed Light on Cell Motility, *Eric Dufresne; Yale Univ., USA.*

Single Molecule Studies of DNA Hybridization Kinetics within Optically Trapped Femtoliter Droplets, *Ana Jofre; Univ. of North Carolina at Charlotte, USA.*

Optical Trapping and Manipulation of Aerosols, *Jonathan Reid; Univ. of Bristol, UK.*

Colloidal Statistical Mechanics in Optical Vortices, *Yael Roichman; Tel Aviv Univ., Israel.*

Optical Tweezers: From Matter Physics to Biological Applications, *Giulia Rusciano; Univ. of Naples, Italy.*

Insights into Statistical Physics by Optically Trapped Particles, *Giovanni Volpe; Inst. of Photonic Sciences (ICFO), Spain.*

	Grand Ballroom A	*Junior Ballroom D*	*Junior Ballroom C*	*Grand Ballroom B*	*Junior Ballroom A/B*
Sunday, April 26					
3:00 p.m.–6:00 p.m.	**Registration Open,** *Grand Ballroom Foyer Coatroom*				
Monday, April 27					
7:30 a.m.–6:30 p.m.	**Registration Open,** *Grand Ballroom Foyer Coatroom*				
8:30 a.m.–10:30 a.m.	**DMA • Advances in Digital Holography**	**JMA • FTS/HISE Joint Session**		**NMA • Superresolution I**	**OMA • Transport, Guiding and Sorting**
10:30 a.m.–11:00 a.m.	**Coffee Break,** *Grand Ballroom C/D*				
10:30 a.m.–4:30 p.m.	**Exhibits Open,** *Grand Ballroom C/D*				
11:00 a.m.–12:30 p.m.	**DMB • Novel Technologies in Holography (ends at 1:00 p.m.)**	**FMA • James W. Brault Memorial Session**	**HMA • Climate Absolute Radiance and Refractivity Observatory**	**NMB • Superresolution II**	**OMB • Physics Insights by Means of Optical Trapping I**
12:30 p.m.–2:00 p.m.	**Lunch Break (on your own)**				
2:00 p.m.–4:00 p.m.	**JMB • DH/OTA Joint Session**	**FMB • Combs and Static FTS**	**HMB • Clouds and Aerosols I**	**NMC • Nonlinear Microscopy I**	
4:00 p.m.–4:30 p.m.	**Coffee Break/Exhibits,** *Grand Ballroom C/D*				
4:30 p.m.–6:00 p.m.	**DMC • Metrology by Digital Holography and Profilometry (ends at 6:15 p.m.)**	**FMC • Space and Flight Projects**	**HMC • Future Missions and Sensor Calibration**	**NMD • Nonlinear Microscopy II**	**OMC • Physics Insights by Means of Optical Trapping II**
6:30 p.m.–8:00 p.m.	**Conference Reception,** *Junior Ballroom Foyer*				
Tuesday, April 28					
7:30 a.m.–6:30 p.m.	**Registration Open,** *Grand Ballroom Foyer Coatroom*				
8:30 a.m.–10:30 a.m.	**JTuA • DH/NTM Joint Session: Digital Holographic Microscopy**	**FTuA • FTS for Astronomy and Astrophysics**	**HTuA • Interpretation of Hyperspectral/Multispectral Data Through Observations and Simulations**		**OTuA • Biophotonics Applications**
10:30 a.m.–11:00 a.m.	**Coffee Break,** *Grand Ballroom C/D*				
10:30 a.m.–6:00 p.m.	**Exhibits Open,** *Grand Ballroom C/D*				
11:00 a.m.–12:30 p.m.	**DTuA • Holographic Microscopy**	**FTuB • Combs, Optical Fiber and Fast-Scanning**	**HTuB • Particle Scattering Models**	**NTuA • Phase Microscopy and Tomography**	**OTuB • Novel Uses and Applications**
12:30 p.m.–2:00 p.m.	**Lunch Break (on your own)**				
2:00 p.m.–4:00 p.m.	**DTuB • Holography Applications**	**FTuC • Gosat and Akari**	**HTuC • New Remote Sensing Perspectives**	**NTuB • Optical Coherence Tomography**	**OTuC • Dynamics of Multiple and Parallel Trapping (ends at 3:30 p.m.)**
4:00 p.m.–4:30 p.m.	**Coffee Break/Exhibits,** *Grand Ballroom C/D*				
4:30 p.m.–6:00 p.m.	**JTuB • DH/FTS/HISE/NTM/OTA Joint Poster Session,** *Grand Ballroom C/D*				
6:00 p.m.–6:45 p.m.	**DTuC • Optical Scanning Holography**				

	Grand Ballroom A	*Junior Ballroom D*	*Junior Ballroom C*	*Grand Ballroom B*	*Junior Ballroom A/B*
Wednesday, April 29					
7:30 a.m.–6:30 p.m.	**Registration Open,** *Grand Ballroom Foyer Coatroom*				
8:30 a.m.–10:30 a.m.	**DWA • Three-Dimensional Imaging and Display**	**FWA • Earth Sensing**	**HWA • Hyperspectral IR and Imager Data Analyses (ends at 10:00 a.m.)**	**NWA • New Techniques I**	
10:30 a.m.–11:00 a.m.	**Coffee Break,** *Grand Ballroom C/D*				
10:30 a.m.–12:30 p.m.	**Exhibits Open,** *Grand Ballroom C/D*				
11:00 a.m.–12:30 p.m.	**DWB • DH Poster Session,** *Grand Ballroom C/D*				
11:00 a.m.–12:30 p.m.		**FWB • Visible and Ultra Violet**	**HWB • Clouds and Aerosols II**	**NWB • Superresolution III**	
12:30 p.m.–2:00 p.m.	**Lunch Break (on your own)**				
2:00 p.m.–4:00 p.m.	**DWC • Computer-Generated Holograms**	**FWC • Spatial Heterodyne**	**HWC • Validation of Cloud and Aerosol Products**	**NWC • Endomicroscopy**	
4:00 p.m.–4:30 p.m.	**Coffee Break,** *Grand Ballroom C/D*				
4:30 p.m.–6:30 p.m.	**DWD • Electro-Holography and Computer-Generated Holography**	**FWD • Laboratory and Miniature FTS (ends at 6:00 p.m.)**	**HWD • Hyperspectral Applications (ends at 6:00 p.m.)**	**NWD • New Techniques II (ends at 5:30 p.m.)**	
Thursday, April 30					
7:30 a.m.–10:30 a.m.	**Registration Open**, *Grand Ballroom Foyer Coatroom*				
8:30 a.m.–10:30 a.m.	**FThA • Spectral Imaging,** *Grand Ballroom A*				

Key to Shading	
DH Sessions	No Shading
FTS Sessions	
HISE Sessions	
NTM Sessions	
OTA Sessions	

Optical Trapping Applications (OTA) Abstracts

• Sunday, April 26, 2009 •

Grand Ballroom Foyer Coatroom
3:00 p.m.–6:00 p.m.
Registration Open

• Monday, April 27, 2009 •

Grand Ballroom Foyer Coatroom
7:30 a.m.–6:30 p.m.
Registration Open

OMA • Transport, Guiding and Sorting

Junior Ballroom A/B
8:30 a.m.–10:30 a.m.
Carlos Lopez-Mariscal; NIST, USA, Presider

OMA1 • 8:30 a.m. **Invited**
Microrheology of the Endothelial Glycocalyx and Extracellular Matrix, *Samir Shreim, Maxwell Kotlarchyk, Elliot Botvinick; Univ. of California at Irvine, USA.* Our lab is constructing photonic systems to seek correlates between cell signaling and laser-induced mechanical stresses as well as laser-based measurements of deformation and mechanical properties in engineered tissues.

OMA2 • 9:00 a.m. **Invited**
Advances in the Biological Applications of Optical Micromanipulation, *Daniel Chiu; Univ. of Washington, USA.* This presentation will describe some of our recent work at the interface of optics and microfluidics, the development of techniques at this interface, and application of these methods towards studying problems in chemistry and biology.

OMA3 • 9:30 a.m.
Calculations of Torques on Particles in Laguerre-Gaussian Beams, *Stephen H. Simpson, Simon Hanna; Univ. of Bristol, UK.* The angular momentum transferred by Laguerre-Gaussian beams is calculated using the T-matrix method, and a simple formula derived for the induced torque. Coupling mechanisms are compared for weakly absorbing spheres, non-absorbing spheroids, and birefringent spheres.

OMA4 • 9:45 a.m.
Optical Tweezers and Integrated Waveguide System for Cell Selection and Transport in Polymer Microfluidic Devices, *Luc G. Charron, Duoaud Shah, Lothar Lilge; Princess Margaret Hospital, Univ. of Toronto, Canada.* A laser-based optical system for cell selection and passive transportation inside a polymer microfluidic device is presented. Optical tweezers and integrated waveguides are used to select and transport multiple cells in a network of channels.

OMA5 • 10:00 a.m.
Using Holographic Optical Tweezers to Measure Forces with AFM-Like Probes, *David M. Carberry[1], Leo Ikin[1], James A. Grieve[1], Simon Hanna[1], Graham M. Gibson[2], Miles J. Padgett[2], Mervyn J. Miles[1]; [1]Univ. of Bristol, UK, [2]Univ. of Glasgow, UK.* We demonstrate the optical assembly and control of SPM-like probes, using holographic optical tweezers. We show that these probes can exert a force in excess of 60pN with a force sensitivity of 50fN.

OMA6 • 10:15 a.m.
Controlled Particle Guidance in a Liquid-Filled Single-Mode Hollow-Core Photonic Crystal Fiber, *Martin K. Garbos, Tijmen G. Euser, Jocelyn S. Y. Chen, Philip St.J. Russell; Max Planck Inst. for the Science of Light, Germany.* We present controlled optical trapping and guidance of silica microparticles in the fundamental mode of D2O-filled hollow-core PCF, and show that a particle can be held stationary against an opposing fluid flow using optical propulsion.

Grand Ballroom C/D
10:30 a.m.–11:00 a.m.
Coffee Break/ Exhibits

OMB • Physics Insights by Means of Optical Trapping I

Junior Ballroom A/B
11:00 a.m.–12:30 p.m.
David McGloin; Univ. of Dundee, UK, Presider

OMB1 • 11:00 a.m. **Invited**
Optical Tweezers: From Soft-Matter Physics to Biological Applications, *Giulia Rusciano; Univ. of Naples, Italy.* Optical tweezers have recently emerged as an interesting tool for performing advanced biophysical/biomechanical characterizations of biosystems. Here, we discuss on the application of this emerging technology to various systems, including erythrocytes, liposomes and starfish oocytes.

OMB2 • 11:30 a.m.
Optical Tweezing Red-Shifted from Resonance, *Brooke C. Hester[1], Rani Kishore[1], Kristian Helmerson[1], Carly Levin[2], Naomi J. Halas[2]; [1]NIST, USA, [2]Dept. of Electrical and Computer Engineering, Rice Univ., USA.* We study the enhancement of optical forces associated with optical trapping red-shifted from resonance absorption. Particles with tunable resonances are manipulated using a single-focus optical trap with tunable wavelength, and studied using back- focal-plane interferometry.

OMB3 • 11:45 a.m.
Position and Intensity Modulations in Holographic Optical Traps Created by a Liquid Crystal Spatial Light Modulator, *Astrid van der Horst, Benjamin P. B. Downing, Nancy R. Forde; Simon Fraser Univ., Canada.* The addressing of the liquid crystals in spatial light modulators gives rise to temporal modulation of the phase pattern.

Here we investigate the effect of this on the intensity and position of holographic optical traps.

OMB4 • 12:00 p.m.
Multiple Trapping with Optical Bottle Beam, *Vladlen G. Shvedov[1,2,3], Andrei V. Rode[1], Yana V. Izdebskaya[2,3], Anton S. Desyatnikov[2], Wieslaw Z. Krolikowski[1], Yuri S. Kivshar[2]; [1]Laser Physics Ctr., RSPhysE, Australian Natl. Univ., Australia, [2]Nonlinear Physics Ctr., RSPhysE, Australian Natl. Univ., Australia, [3]Taurida Natl. Univ., Ukraine.* We report on multiple optical trapping of particles in air using random phase optical bottle beam. The particles were trapped in micro-cavities of a speckle pattern in a macro-trap formed by the bottle beam.

OMB5 • 12:15 p.m.
Radiation Torques and Forces in Scattering from Spheres and Acoustical Analogues, *Philip L. Marston, Likun Zhang; Washington State Univ., USA.* The radiation torque on a sphere in circularly polarized light is proportional to absorption [Marston and Crichton, Phys. Rev. A30, 2508 (1984)]. We note related developments concerning torques and forces of optical and acoustical vortices.

12:30 p.m.–2:00 p.m.
Lunch Break (on your own)

JMB • DH/OTA Joint Session

Grand Ballroom A
2:00 p.m.–4:00 p.m.
Christian Depeursinge; École Polytechnique Fédérale de Lausanne, Switzerland, Presider

JMB1 • 2:00 p.m. Invited
Optoelectronic Trapping of Cells, Nanowires, and Nanoparticles, *Ming C. Wu; Univ. of California at Berkeley, USA.* The principle and recent experimental results of optoelectronic tweezers (OET) will be presented. Based on light-induced dielectrophoresis, OET can trap and sort colloidal particles, biological cells, nanowires and nanoparticles using a digital light projector.

JMB2 • 2:30 p.m. Invited
Three-Dimensional Imaging by Three-Dimensional Point Spread Function Encoding, *Rafael Piestun; Univ. of Colorado at Boulder, USA.* Pupil-encoded point spread functions are implemented for three-dimensional image data acquisition. These systems are passive and work under broadband illumination. Applications include nanolocalization of small emitters and machine vision.

JMB3 • 3:00 p.m. Invited
Optical Tweezers Shed Light on Cell Motility, *Eric Dufresne; Yale Univ., USA.* Optical tweezers are an elegant platform for the biochemical and mechanical stimulation of live cells. I will discuss the application of holographic optical tweezers to chemotaxis in neutrophils and mechanotransduction in neurons.

JMB4 • 3:30 p.m.
Motility-Contrast Imaging: Digital Holography of Cellular Motion in 3-D Tissues, *David D. Nolte, John Turek; Purdue Univ., USA.* We present the first three-dimensional assays of intrinsic cellular motion applied to tissues using motility contrast imaging (MCI), a new digital holographic imaging technique that detects sub-cellular motion as a novel fully-endogenous imaging contrast agent.

JMB5 • 3:45 p.m.
Application of 3-D Tracking, Multi-Wavelength Techniques and Color Imaging in Digital Holographic Microscopy, *Björn Kemper[1], Patrik Langehanenberg[1], Sebastian Kosmeier[1], Xiaoli Mo[1], Sabine Przibilla[1], Angelika Vollmer[1], Steffi Ketelhut[1], Jinghui Xie[2], Gert von Bally[1]; [1]Ctr. for Biomedical Optics and Photonics, Univ. of Muenster, Germany, [2]School of Information Science and Technology, Beijing Inst. of Technology, China.* In an overview results obtained by digital holographic microscopy demonstrate 3-D-tracking of cells without mechanical focus realignment, reduction of amplitude and phase noise by using multi-wavelength techniques and prospects for subsequent refocusing of color images.

Grand Ballroom C/D
4:00 p.m.–4:30 p.m.
Coffee Break/ Exhibits

OMC • Physics Insights by Means of Optical Trapping II

Junior Ballroom A/B
4:30 p.m.–6:00 p.m.
Brooke C. Hester; NIST, USA, Presider

OMC1 • 4:30 p.m. Invited
Colloidal Statistical Mechanics in Optical Vortices, *Yael Roichman, David G. Grier; Tel Aviv Univ., USA.* Holographic optical tweezers can be used to create a variety of optical landscapes in which particles can be trapped and driven. We study particles driven by optical vortices in the framework of non-equilibrium statistical mechanics.

OMC2 • 5:00 p.m.
Thermal Motion of Optically Trapped Nanotools, *Stephen H. Simpson, Mervyn J. Miles, Simon Hanna; Univ. of Bristol, UK.* Calculations of hydrodynamic resistance and mechanical susceptibility for complex particles held in multiple optical traps are presented. The subsequent thermal motion is quantified and the implications for a novel form of force microscopy are discussed.

OMC3 • 5:15 p.m.
High-Speed Camera Particle Tracking and Force Measurment, with Real-Time Haptic Feedback, *Richard W. Bowman[1], Cécile Pacoret[2,3], D. Sinan Haliyo[2], Stéphane Régnier[2], Graham M. Gibson[1], Miles J. Padgett[1]; [1]Dept. of Physics, Univ. of Glasgow, UK, [2]Inst. des Systèmes*

Intelligents et de Robotique, Pierre et Marie Curie Univ., France, [3]CEA-LIST, Sensory Interfaces Lab, France. Modern cameras can provide real-time position and force measurement of multiple trapped particles at several kHz. We investigate the accuracy and stability of this method and use it to implement a force-feedback interface.

OMC4 • 5:30 p.m.
Optical Tweezers for Velocity Mapping in Microfluidic Channels, *Jing Wu, Daniel Day, Min Gu; Ctr. for Micro-Photonics, Swinburne Univ. of Tech., Australia.* We have successfully applied an optical tweezer for mapping the velocity profile in microfluidic channels. The velocity profiles for a straight and a u-shaped microfluidic channels were determined by direct measurement of the Stokes force.

OMC5 • 5:45 p.m.
Wavelength Dependence of Optical Tweezer Trapping Forces on Resonant Particles, *Mark J. Kendrick, David H. McIntyre, Oksana Ostroverkhova; Dept. of Physics, Oregon State Univ., USA.* Optical tweezers are typically used with transparent dielectric particles. Particles with optical resonances should experience a larger trapping force near resonance. We present a numerical and experimental study of the trapping forces on such particles.

Junior Ballroom Foyer
6:30 p.m.–8:00 p.m.
Conference Reception

NOTES

• Tuesday, April 28, 2009 •

Grand Ballroom Foyer Coatroom
7:30 a.m.–6:30 p.m.
Registration Open

OTuA • Biophotonics Applications

Junior Ballroom A/B
8:30 a.m.–10:30 a.m.
Giovanni Volpe; Inst. of Photonic Sciences (ICFO), Spain, Presider

OTuA1 • 8:30 a.m. Invited
Optical Manipulation of Femtoliter Aqueous Droplets for Nanochemistry Applications, *Ana Jofre, Ben Faulk, Jason Case; Univ. of North Carolina at Charlotte, USA.* We control and observe femtoliter volume reactions within aqueous nanodroplets. Chemical reagents sequestered in the nanodroplets mix when the nanodroplets are fused via optical manipulation. The subsequent reaction is probed by means of fluorescence excitation.

OTuA2 • 9:00 a.m. Invited
Life at the Edge: Optical Force Probe Measurements of the Pericellular Coat, *Jennifer Curtis; Georgia Tech., USA.* The pericellular coat plays a prominent and possibly mechanical role in modulating cell adhesion during cell migration and proliferation. We report on the cell coat's mechanics and structure evaluated using optical tweezer force probe studies.

OTuA3 • 9:30 a.m.
Probing the Elasticity of Short Proteins with Optical Tweezers, *Benjamin P. B. Downing[1], Astrid van der Horst[1], Ming Miao[2], Fred W. Keeley[2,3], Nancy R. Forde[1]; [1]Dept. of Physics, Simon Fraser Univ., Canada, [2]Molecular Structure and Function Programme, Hospital for Sick Children, Univ. of Toronto, Canada, [3]Dept. of Biochemistry, Univ. of Toronto, Canada.* Probing relatively short proteins, such as elastin (~200 nm), with optical tweezers requires manipulating trapped polystyrene beads at very small separations. We discuss experimental complications arising from this proximity, and our efforts to minimize them.

OTuA4 • 9:45 a.m.
Transport of Multi-Particle Clusters by Motional Standing Wave Optical Traps, *Martin Šiler[1], Tomas Čižmár[1,2], Pavel Zemánek[1]; [1]Inst. of Scientific Instruments, Acad. of Sciences of the Czech Republic, Czech Republic, [2]School of Physics and Astronomy, Univ. of St Andrews, UK.* Upon illumination with a traveling standing wave, clusters of microparticles bound by scattered laser light can be transported much faster than a single particle.

OTuA5 • 10:00 a.m.
Spiral Beams Based Optical Traps, *Kirill Afanasiev, Alexander Korobtsov, Svetlana Kotova, Nikolay Losevsky, Vsevolod Patlan, Eugenia Razueva, Vladimir Volostnikov, Evgeny Vorontsov; P.N. Lebedev Physical Inst., Samara Branch, Russian Federation.* The possibility is shown to form light fields with the desired intensity distribution and non-zero angular momentum by means of phase-only diffractive elements based on spiral beams optics. Experimental applications for laser manipulation are presented.

OTuA6 • 10:15 a.m.
New Compact Optical Trapping Device by Using Bessel Beam with a Novel Hybrid Fiber Structure, *Jongki Kim[1], Yoonseob Jeong[1], Sejin Lee[1], Woosung Ha[1], Rene-Paul Salathe[2], Fabrice Merenda[2], Yongmin Jung[3], Junki Kim[4], K. Oh[1]; [1]Yonsei Univ., Republic of Korea, [2]Ecole Polytechnique Federale de Lausanne, Switzerland, [3]Optoelectronic Res. Ctr., Univ. of Southampton, UK, [4]Fraunhofer Inst., Applied Optics and Precision Engineering, Germany.* We simulated the Bessel beam generator with special fiber and lens and fabricated the device. We verified the Bessel beam profile and observed the optical trapping on the various Z-axis positions.

Grand Ballroom C/D
10:30 a.m.–11:00 a.m.
Coffee Break/ Exhibits

OTuB • Novel Uses and Applications

Junior Ballroom A/B
11:00 a.m.–12:30 p.m.
Nancy Forde; Simon Fraser Univ., Canada, Presider

OTuB1 • 11:00 a.m. Invited
Optical Control of Aerosols, *Jonathan Reid, Jonathan Wills; Univ. of Bristol, UK.* Aerosols play a significant role in many areas of science. We will examine the latest developments in using light to control aerosol and to characterise individual particles, concentrating on optical tweezers and Raman spectroscopy.

OTuB2 • 11:30 a.m.
Laser Trapping in Air by Photophoretic Forces, *Vladlen G. Shvedov[1,2,3], Anton S. Desyatnikov[1], Andrei V. Rode[3], Wieslaw Z. Krolikowski[3], Yuri S. Kivshar[1]; [1]Nonlinear Physics Ctr., Australian Natl. Univ., Australia, [2]Taurida Natl. Univ., Ukraine, [3]Laser Physics Ctr., Australian Natl. Univ., Australia.* We report on optical trapping of agglomerates of carbon nanoparticles in air. Stable positioning and guiding of nanoparticles is achieved by photophoretic forces in an optical trap created by two counter-propagating and co-rotating optical vortices.

OTuB3 • 11:45 a.m.
Modelling Aerosol Optical Tweezers, *Daniel Burnham, David McGloin; Univ. of Dundee, UK.* In this talk we discuss our recent work on the modelling of airborne optical traps, looking at the Brownian motion the particles, but paying particular attention to the optical forces that influence trap behavior.

OTuB4 • 12:00 p.m.
Optical Bottles: Using Light to Confine and Analyze Nanoparticle Suspensions, *Joseph Junio, H. Daniel Ou-Yang; Lehigh Univ., USA.* We present in this paper a new experimental method termed the optical bottle which uses optical trapping for the determination of the optical trapping energy per particle and the isothermal bulk modulus of the suspension.

OTuB5 • 12:15 p.m.
A Plasmonic Nano-Trap for the Optical Confinement of Quantum Dots, *Colm Dineen[1], M. Reichelt[1], S. W. Koch[2], Jerome V. Moloney[1]; [1]Univ. of Arizona, USA, [2]Philipps Univ., Germany.* We numerically compute the optical forces on a quantum dot, under excitonic resonance conditions, confined to a sub diffraction limited volume in the resonantly enhanced near-field of a suitably engineered metal nano-structure optical trap.

12:30 p.m.–2:00 p.m.
Lunch Break (on your own)

OTuC • Dynamics of Multiple and Parallel Trapping

Junior Ballroom A/B
2:00 p.m.–3:30 p.m.
Giulia Rusciano; Univ. of Naples, Italy, Presider

OTuC1 • 2:00 p.m. Invited
Insights into Statistical Physics by Optically Trapped Particles, *Giovanni Volpe; Inst. of Photonic Sciences (ICFO), Spain.* An optically trapped Brownian particle moves under the effect of both the random thermal motion and the deterministic optical forces. Therefore it provides a powerful means for the experimental study of certain statistical physics phenomena.

OTuC2 • 2:30 p.m.
Particle Spin Manipulation by Four-Core Single Fiber Optical Tweezers, *Zhihai Liu, Yu Zhang, Jun Yang, Libo Yuan; Harbin Engineering Univ., China.* We present a novel four-core micro structured single fiber optical tweezers, which can trap, manipulate and even spin trapped micro-particle in 3-D. Simulation and experiment are carried out to support our options.

OTuC3 • 2:45 p.m.
Optically Bound Chain of Microparticles, *Oto Brzobohatý[1], Vítězslav Karásek[1], Pavel Zemánek[1], Tomáš Čižmár[1,2], Veneranda Garcés-Chávez[2], Kishan Dholakia[2]; [1]Inst. of Scientific Instruments of the Acad. of Sciences of the Czech Republic, Czech Republic, [2]School of Physics and Astronomy, Univ. of St. Andrews, UK.* We present the first creation of extended longitudinally optically bound chains of microparticles in one dimension. Two counter-propagating Bessel beams were used to illuminate the submicrometer sized polystyrene particles immersed in water.

OTuC4 • 3:00 p.m.
Optical Pipeline for Transport of Particles, *Vladlen G. Shvedov[1,2,3], Andrei V. Rode[1], Yana V. Izdebskaya[2,3], Anton S. Desyatnikov[2], Wieslaw Z. Krolikowski[1], Yuri S. Kivshar[2]; [1]Laser Physics Ctr., Australian Natl. Univ., Australia, [2]Nonlinear Physics Ctr., Res. School of Physics and Engineering, Australian Natl. Univ., Australia, [3]Taurida Natl. Univ., Ukraine.* We developed an optical pipeline for laser-guiding particles in air using vortex beams. Transport of agglomerates of nanoparticles forward and backward between two optical traps through the optical pipeline over a 60-cm distance was demonstrated.

OTuC5 • 3:15 p.m.
A New Optimized Trapping Method to Create Ultra-Cold and Degenerate Atomic Samples, *Philippe Bouyer; Inst. d'Optique Graduate School, CNRS et Univ. Paris Sud, France.* An atom laser represents an ideal atomic source for atom optics and interferometry. We present a simple all optical approach to create this atom source where a single laser source at 1560 nm is used.

Grand Ballroom C/D
4:00 p.m.–4:30 p.m.
Coffee Break/ Exhibits

JTuB • DH/FTS/HISE/NTM/OTA Joint Poster Session

Grand Ballroom C/D
4:30 p.m.–6:00 p.m.

JTuB30
The Study of Mechanism and Characterization of Cell Interaction in Blood Coagulation by Optical Tweezers, *Bor-Wen Yang[1], Yu-Hong Mu[2], Kui-Teng Huang[2]; [1]Dept. of Opto-Electronic System Engineering, Ming-Hsin Univ. of Science and Technology, Taiwan, [2]Inst. of Electrical Engineering, Ming-Hsin Univ. of Science and Technology, Taiwan.* Patients with severe diseases like hemophilia, apoplexy and hemorrhage are dependent on the well function of platelets. Optical tweezers are configured to explore the mechanism of blood coagulation and the restoring effects of hemagglutination pharmaceuticals.

JTuB31
Research on Multi Particles Simultaneous Trapping by Single Fiber Optical Tweezers, *Zhihai Liu, Yu Zhang, Zhongfu Wu, Jun Yang, Libo Yuan; Harbin Engineering Univ., China.* We present an etched-tapered single fiber optical tweezers, which can trap and manipulate two yeast cells in water simultaneously and then the theory analysis, numerical stimulation and experiment implementation are employed to research the trapping.

JTuB32
Optical Trapping Efficiency Measured for Dielectric Particles by Using Cylindrical Vector Beams, *Yuichi Kozawa, Shunichi Sato; Inst. of Multidisciplinary Res. for Advanced Materials, Tohoku Univ., Japan.* Axial and transverse optical trapping efficiencies were measured by using cylindrical vector beams when a dielectric particle was trapped three-dimensionally. Radially polarized beams showed the highest axial trapping efficiency for a micrometer-sized glass bead.

JTuB33
Holographic Optical Manipulation of Motor-Driven Subcellular Structures, *Arnau Farré, Carol López-Quesada, Jordi Andilla, Estela Martín-Badosa, Mario Montes-Usategui; Univ. de Barcelona, Spain.* Intracellular transport is a fast mechanism required in different processes within cells. We show that dynamic holographic optical tweezers are desirable to block these driven cargos to mechanically interact with the associated motor proteins.

JTuB34
Multi-Beam Laser Manipulator Based on Diffraction Grating, *Kirill Afanasiev, Alexander Korobtsov, Svetlana Kotova, Nikolay Losevsky, Evgeny Vorontsov; P.N. Lebedev Physical Inst., Samara Branch, Russian Federation.* A simple technique for the formation of an array of laser traps on the basis of phase diffraction gratings is proposed. The array allows trapping transparent elongated micro objects at several points simultaneously and deforming them.

JTuB35
Volumetric Multiple Optical Traps Produced by Devil's Lenses, *Walter D. Furlan[1], F. Giménez[2], MH Giménez[2], Juan A. Monsoriu[2]; [1]Univ. de Valencia, Spain, [2]Univ. Politécnica de Valencia, Spain.* We propose the use of a novel diffractive optical element, coined *devil´s lens* as a multiple foci optical element to produce optical tweezers and vortices.

Posters JTuB1–JTuB7 can be found in the DH abstracts section.
Posters JTuB8–JTuB16 can be found in the FTS abstracts section.
Posters JTuB17–JTuB21 can be found in the HISE abstracts section.
Posters JTuB22–JTuB29 can be found in the NTM abstracts section.

NOTES

Key to Authors and Presiders

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

Advances in Imaging
OSA Optics & Photonics Congress and Tabletop Exhibit 2009
UPDATE SHEET

Withdrawals:

NMC6	JTuB34
FTuA4	JTuB35
OTuA5	HTuC6
JTuB23	DWA3
JTuB29	DWB2
JTuB30	HWD4

Substituted Papers:

The paper **HTuC6** that is in your program will not be presented. During this time slot, the following postdeadline paper will be presented in its place: **PHTuC6, Airborne Radiometer Measurements of Above Cloud Reflectance in the Presence and Absence of Aerosols,** *Odele Coddington[1], Peter Pilewskie[1], Tomislava Vukicevic[1], John Livingston[2], Steve Platnick[3], Gala Wind[3], Jens Redemann[4], Philip B. Russell[4]; [1]Univ. of Colorado at Boulder, USA, [2]SRI Intl., USA, [3]NASA GSFC, USA, [4]NASA AMES, USA.*

The poster **JTuB17** will be presented during the session **HWA•Hyperspectral IR and Imager Data Analyses** (April 29, 2009, 8:30 a.m.–10:30 a.m., Junior Ballroom C) as oral presentation **HWA5.**

Presider Updates:

Nickolai V. Kukhtarev; Alabama A&M Univ., USA, will preside over session **DMB• Novel Technologies in Holography,** on Monday, April 27, 2009, 11:00 a.m. –1:00 p.m. in Grand Ballroom A.

Yoshio Hayasaki; Utsunomiya Univ., Japan, will preside over session **DWC•Computer-Generated Holograms**, on Wednesday, April 29, 2009, 2:00 p.m.–4:00 p.m. in Grand Ballroom A.

Presenter Changes:

DTuA1, Harmonic Holography will now be presented by *Chia-Lung Hsieh[1,2], [1]Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, [2]Caltech, USA.*

NTuA5, Linear Phase-Gradient Imaging with Asymmetric Illumination Based Differential Phase Contrast (AIDPC), will now be presented by *Colin J. R. Sheppard, Natl. Univ. of Singapore, Singapore.*

Time Changes:

HWA will end a half hour later at 10:30 a.m.
Exhibits will end at 12:30 p.m. on Wednesday, April 29, 2009.

Postdeadline Paper Programs:

Post deadline Paper Programs are available at Registration.

Special Events:

Meet the *Applied Optics* Editors Dinner on Tuesday, April 28, 2009, 7:00 p.m. All conference attendees, especially students, are invited to this casual networking dinner. More information is available at Registration.

2009 | OSA Optics & Photonics Congress

POSTDEADLINE PAPERS

ADVANCES IN IMAGING

- Digital Holography and Three-Dimensional Imaging (DH)
- Fourier Transform Spectroscopy (FTS)
- Hyperspectral Imaging and Sensing of the Environment (HISE)
- Novel Techniques in Microscopy (NTM)
- Optical Trapping Applications (OTA)

April 26-30, 2009

Sheraton Vancouver Wall Centre Hotel
VANCOUVER, BRITISH COLUMBIA, CANADA

ISBN: 978-1-55752-872-8

OSA®

•Tuesday, April 28, 2009•

Junior Ballroom C
2:00 p.m.–4:00 p.m.
HTuC • New Remote Sensing Perspectives
Anthony Baran; Met Office, UK, Presider

PHTuC6 • 3:45 p.m.
Airborne Radiometer Measurements of above Cloud Reflectance in the Presence and Absence of Aerosols, *Odele Coddington[1], Peter Pilewskie[1], Tomislava Vukicevic[1], John Livingston[2], Steve Platnick[3], Gala Wind[3], Jens Redemann[4], Philip B. Russell[4]; [1]Univ. of Colorado at Boulder, USA, [2]SRI Intl., USA, [3]NASA GSFC, USA, [4]NASA AMES, USA.* We present cloud retrieval results from SSFR measurements made in the presence and absence of aerosols and show comparisons to MODIS. A method for treating aerosol bias in retrievals as systematic model uncertainty is described.

Grand Ballroom C/D
4:30 p.m.–6:00 p.m.
JTuB • DH/FTS/HISE/NTM/OTA Joint Poster Session

PJTuB36
Automated Particle Characterization Using Holographic Video Microscopy, *Fook Chiong Cheong, David G. Grier; New York Univ., USA.* With an efficient particle identification algorithm, combine with hardware acceleration and software optimization, holographic microscopy data can be analysis in near real time with sufficient accuracy to enable unattended holographic tracking and particle characterization.

PJTuB37
Incoherent Optical Imaging Using Synthetic Aperture with Fresnel Elements, *Barak Katz, Joseph Rosen; Ben-Gurion Univ. of the Negev, Israel.* We present a new lensless incoherent holographic system operating in a synthetic aperture mode. Spatial resolution exceeding the Rayleigh limit is obtained by tiling several holographic elements into a complete Fresnel hologram of observed objects.

PJTuB38
CrIS Radiance Spectra Modeling and End-to-End Error Analysis, *Nikita Pougatchev, Gregory Cantwell, Gail Bingham; Space Dynamics Lab, Utah State Univ., USA.* We present the Cross-track Infrared Sounder (CrIS) end-to-end error model consisting of instrument model and Validation Assessment Model. Models' descriptions along with examples of application are presented.

PJTuB39
SPDM - Single Molecule Superresolution of Receptor Clusters in *E. coli* Bacteria, *Thomas Ruckelshausen[1], Paul Lemmer[1], Victor Sourjik[2], Christoph Cremer[1,3,4]; [1]Kirchhoff-Inst. for Physics, Univ. of Heidelberg, Germany, [2]Ctr. for Molecular Biologie Heidelberg, Univ. of Heidelberg, Germany, [3]Inst. for Pharmacy and Molecular Biotechnology, Univ. of Heidelberg, Germany, [4]Inst. for Molecular Biophysics, The Jackson Lab, USA.* In *E. coli* bacteria the chemotaxis phosphatase protein CheZ was labeled with YFP (yellow fluorescent protein). Their reversible photobleaching is used for an optical isolation in time. An average localization precision of 22nm was achieved.

•Wednesday, April 29, 2009•

Junior Ballroom C
8:30 a.m.–10:30 a.m.
HWA • Hyperspectral IR and Imager Data Analyses
Allen Huang; Univ. of Wisconsin at Madison, USA, Presider

PHWA6 • 10:15 a.m.
Investigations of Cirrus in the Far Infrared with the Tropospheric Airborne Fourier Transform Spectrometer (TAFTS), *Caroline Cox[1], Neil Humpage[1], Paul Green[1], Juliet Pickering[1], John Harries[1], Jonathan Taylor[2], Anthony Baran[2], Alan Last[1], Jon Murray[1]; [1]Imperial College London, UK, [2]Met Office, UK.* An overview of the results of recent field campaigns performed with the Tropospheric Airborne Fourier Transform Spectrometer (TAFTS) to study the radiative properties of cirrus in the far infrared spectral region is presented.

Grand Ballroom C/D
11:00 a.m.–12:30 p.m.
DWB • DH Poster Session

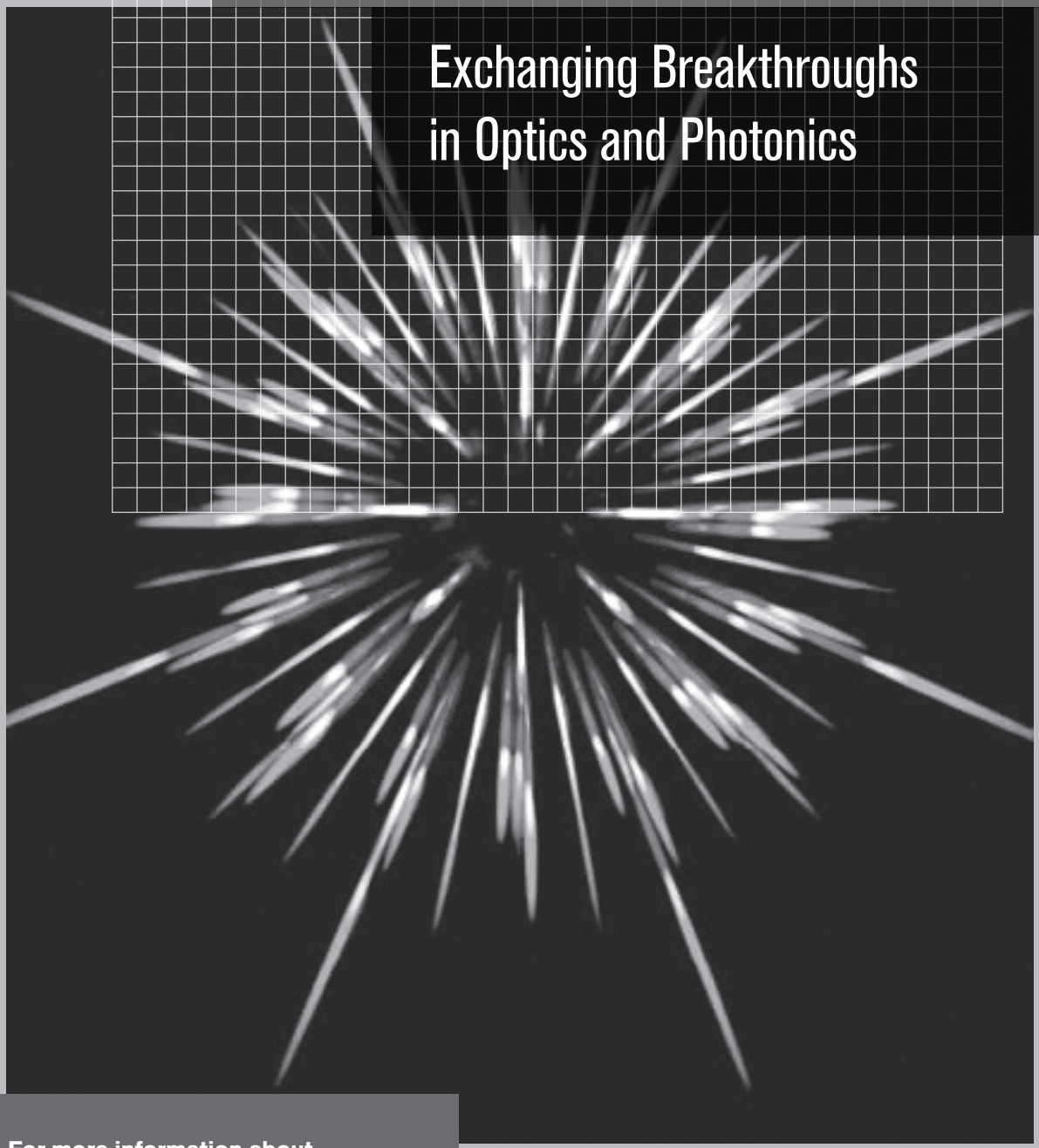
PDWB37
Femtosecond Time-Resolved Off-Axis Digital Holography, *Tadas Balciunas, Andrius Melninkaitis, Andrius Vanagas, Valdas Sirutkaitis; Laser Res. Ctr., Vilnius Univ., Lithuania.* We present time-resolved off-axis digital holography for investigation of laser-induced plasma filaments in condensed media. An experimental setup with tilted reference pulse allows larger crossing angles to be used for recording of digital holograms.

PDWB38
A High-Definition Full-Parallax CGH Created by the Polygon-Based Method, *Kyoji Matsushima, Sumio Nakahara; Kansai Univ., Japan.* A large-scaled full-parallax CGH with 4 billion pixels is produced by a polygon-based method. The CGH reconstructs a fine 3-D image and gives a large sensation of depth owing to the silhouette-masking technique.

Key to Authors and Presiders
(Bold denotes Presider or Presenting Author)

OSA | Optics & Photonics Congresses

Exchanging Breakthroughs in Optics and Photonics



For more information about OSA Optics & Photonics Congresses, visit www.osa.org/congresses

The Optical Society
2010 Massachusetts Ave., NW
Washington, DC 20036 USA

OSA®