Novel Techniques in Microscopy (NTM)

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)
Optical Trapping Applications (OTA)

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)
Hotel Reservation Deadline: March 25, 2009
Pre-Registration Deadline: April 1, 2009

2009 Meeting Chairs

Jerome Mertz, *Boston Univ., USA*
Min Gu, *Swinburne Univ. of Technology, Australia*

About Novel Techniques in Microscopy

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) or techniques based on molecular photoactivation (PALM, STORM, etc), or structured illumination. New techniques are also emerging to increase depth penetration in tissue, based for example of adaptive optics, or miniaturized optics with GRIN lenses or fibers, opening new directions in intravital imaging.

Examples are fluorescence endomicroscopes or optical coherence tomography (OCT) fiberscopes. Other approaches have concentrated on phase imaging, such as interference microscopies or digital holography, or polarization imaging. Still other strategies have relied on nonlinear contrast mechanisms, such as multi-photon excitation, multi-harmonic generation, or coherent anti-Stokes Raman scattering (CARS), with recent emphasis on coherent control. The list goes on ….

This topical meeting will focus specifically on novel techniques rather than applications. Emphasis will be placed on new advances and strategies that push back the limits in microscopic imaging, leading to improvements in resolution, speed, depth penetration, versatility, etc... The goal of this meeting will be to provide a forum for the interaction of inventors in optical microscopy, researchers and students, and industrial participants.

Topics to Be Considered

- Nonlinear microscopy

- Fiberscopes and Endoscopy techniques
- Adaptive optics applied to microscopy
- OCT and Holographic microscopy
- Superresolution
- New techniques

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- Adaptive optics applied to microscopy
- OCT and Holographic microscopy
- Superresolution
- New techniques

Program Committee

Program Chairs

Jerome Mertz, *Boston Univ., USA*
Min Gu, *Swinburne Univ. of Technology, Australia*

Committee Members

Christian Depeursinge, *Ecole Polytechnique Federale de Lausanne, Switzerland*
Mats Gustafsson, *Janelia Farm Res. Campus, Howard Hughes Medical Inst., USA*
Rainer Heintzmann, *King's College of London, UK*
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Yaron Silberberg, *Weizmann Inst. of Science, Israel*
Tony Wilson, *Univ. of Oxford, UK*
Chris Xu, *Cornell Univ., USA*

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)

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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)
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- National Institute of Biomedical Imaging and Bioengineering/Department of Health and Human Services / National Institutes of Health
- The OSA Foundation

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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

Novel Techniques in Microscopy (NTM) / Digital Holography and Three-Dimensional Imaging (DH) Joint Session

Digital Holography for MEMS Application, Anand Asundi, Vijay Raj Singh; *Nanyang Technological Univ., Singapore.*

Image Formation in Holographic Microscopy and Tomography, Colin Sheppard; *Data Storage Inst., Singapore.*

Digital Holography with Multiple-Plane Phase-Error Correction, Abbie E. Tippie, James R. Fienup; *Univ. of Rochester, USA.*

Invited Speakers

Adaptive Optics in Biomedical Microscopy, *Martin J. Booth; Oxford Univ., UK.*

Wide Field, Minimally Invasive OCT: Recent Advances and Clinical Implications, *Brett E. Bouma; Harvard Medical School and Massachusetts General Hospital, USA.*

Super-Resolution by Structured Illumination, *Mats Gustafsson; Janelia Farm Res. Campus Howard Hughes Medical Inst., USA.*

Microscope Resolution Enhancement with Image Inversion Interferometry, *Rainer Heintzmann; King's College London, UK.*

Probing nm-Scale Cellular Structure and Function with Coherence-Gated Quantitative Phase Microscopy, Joseph Izatt; *Duke Univ., USA.*

Multilayer and Three-Dimensional Super-Resolution Imaging of Thick Biological Samples, Alipasha Vaziri; *Janelia Farm Res. Campus, Howard Hughes Medical Inst., USA.*

Nonlinear Microscopy without Fluorescence: Seeing the Needle in the Haystack with Femtosecond Pulse Shaping, *Warren S. Warren; Duke Univ., USA.*

Far-Field Optical Nanoscopy, *Volker Westphal; Max-Planck-Inst. für Biophysikalische Chemie; Germany.*

Technology Development for Deep Tissue Optical Imaging, *Chris Xu; Cornell Univ., USA.*

	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	

Novel Techniques in Microscopy (NTM) 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

NMA • Superresolution I

Grand Ballroom B
8:30 a.m.–10:30 a.m.
Colin Sheppard; Data Storage Inst., Singapore, Presider

NMA1 • 8:30 a.m. Invited
Far-Field Optical Nanoscopy, *Volker Westphal[1], Silvio O. Rizzoli[2], Marcel A. Lauterbach[1], Dirk Kamin[2], Stefan W. Hell[1]; [1]Max-Planck-Inst. für Biophysikalische Chemie, Germany, [2]STED Microscopy of Synaptic Function, European Neuroscience Inst., Germany.* Diffraction-unlimited imaging is one of the emerging fields in microscopy. In all of these techniques, fluorophore switching is key. The first technique developed is STED, which recently has progressed to video-rate imaging of living cells.

NMA2 • 9:00 a.m.
Far-Field Optical Imaging at the Nanoscale via Absorbance Modulation, *Hsin-Yu Tsai, Euclid E. Moon, Rajesh Menon; MIT, USA.* Absorbance modulation is a technique that overcomes the far-field diffraction barrier by combining nonlinear photochemistry with nodal illumination. We present the application of absorbance modulation to optical nanoscopy.

NMA3 • 9:15 a.m.
Spatial Resolution for Fluorescence Depletion Microscopy Using Axial Electric Field Generated by Focused Radially Polarized Beams, *Shunichi Sato, Yuichi Kozawa; Tohoku Univ., Japan.* Spatial resolution for depletion microscopy is estimated when radially polarized beams are used for excitation and depletion. Axial electric fields generated by focused radially polarized beams play an important role for the improvement of resolution.

NMA4 • 9:30 a.m. Invited
Super-Resolution by Structured Illumination, *Mats Gustafsson; Janelia Farm Res. Campus, Howard Hughes Medical Inst., USA.* Abstract not available.

NMA5 • 10:00 a.m.
Three-Dimensional Super-Resolution Imaging with a Double-Helix Microscope, *Sri Rama Prasanna Pavani[1], Rafael Piestun[1], Michael A. Thompson[2], Julie S. Biteen[2], W. E. Moerner[2]; [1]Univ. of Colorado at Boulder, USA, [2]Stanford Univ., USA.* We demonstrate three-dimensional single-molecule fluorescence imaging beyond the diffraction-limit with a double-helix point spread function microscope. Two molecules seperated 14nm (X), 26nm (Y), and 21nm (Z) are resolved within a field of view of 20x20x2μm^3(XxYxZ).

NMA6 • 10:15 a.m.
Optical Hyperlens Imaging with Resolution Go Beyond the Conventional Diffraction Limit, *Zhaowei Liu[1], Hyesog Lee[2], Yi Xiong[2], Cheng Sun[2], Xiang Zhang[2]; [1]Univ. of California at San Diego, USA, [2]Univ. of California at Berkeley, USA.* We experimentally demonstrate a new optical imaging technique based on an optical hyperlens made by metal/dielectric metamaterial. The hyperlens can magnify sub-diffraction limited objects into far field thus opens up new possibilities for optical nano-imaging.

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

NMB • Superresolution II

Grand Ballroom B
11:00 a.m.–12:30 p.m.
Volker Westphal; Max Planck Inst. für Biophysical Chemistry, Germany, Presider

NMB1 • 11:00 a.m. Invited
Multilayer and Three-Dimensional Super-Resolution Imaging of Thick Biological Samples, *Alipasha Vaziri, Jianyong Tang, Hari Shroff, Charles Shank; Janelia Farm Res. Campus, Howard Hughes Medical Inst., USA.* We have demonstrated super-resolution imaging of protein distributions in cells at depth at multiple layers with a lateral localization precision better than 50nm. The approach is based on combining photoactivated localization microscopy with temporal focusing.

NMB2 • 11:30 a.m.
Characterization of New Fluorescent Labels for Ultrahigh Resolution Microscopy, *Andriy Chmyrov[1], Jutta Arden-Jacob[2], Alexander Zilles[3], Karl-Heinz Drexhage[3], Jerker Widengren[1]; [1]Royal Inst. of Technology, Sweden, [2]ATTO-TEC GmbH, Germany, [3]Univ. of Siegen, Germany.* A set of modified dyes was investigated, of which several candidates combine prominent triplet state yield with reasonable photostability. They can be used to achieve ultrahigh optical resolution by photo-induced switching into dark (triplet) states.

NMB3 • 11:45 a.m.

Three-Dimensional Localization of Nano-Emitters with Nanometer-Level Precision, *Iwan Märki, Stefan Geissbühler, Theo Lasser, François Aguet; École Polythechnique Fédérale de Lausanne, Switzerland.* We show nanometer-level localization accuracy of a single quantum-dot in three dimensions by self-interference and diffraction-pattern analysis. We believe that this approach has the capacity to push optical microscopy to the molecular level.

NMB4 • 12:00 p.m.

Theoretical Limits on Speed, Errors, and Resolution in Microscopy with Switchable Fluorophores, *Alexander R. Small; California State Polytechnic Univ., USA.* We consider theoretical limits to microscopy techniques that involve activation and localization of sparse subsets of fluorophores. We will show that the performance of the image processing algorithm determines the trade-offs between speed and resolution.

NMB5 • 12:15 p.m.

Nanoscale X-Ray Imaging, *Anne Sakdinawat; Univ. of California at Berkeley, USA.* X-ray microscopy is a high resolution, elemental specific technique used for imaging materials, chemical, and more recently, biological samples. Specialized diffractive optics and imaging methods, both for lens-based and lensless x-ray microscopy, have been developed.

12:30 p.m.–2:00 p.m.

Lunch Break (on your own)

NMC • Nonlinear Microscopy I

Grand Ballroom B

2:00 p.m.–4:00 p.m.

Chris Xu; Cornell Univ., USA, Presider

NMC1 • 2:00 p.m. **Invited**

Nonlinear Microscopy without Fluorescence: Seeing the Needle in the Haystack with Femtosecond Pulse Shaping, *Warren S. Warren, Ivan Piletic, Martin Fischer, Dan Fu, Prathyush Samenini, Thomas Matthews; Duke Univ., USA.* Femtosecond pulse shaping and pulse envelope modulation make it possible to see very weak nonlinear signatures in tissue. Here we discuss imaging of melanins, hemoglobins, and other endogenous markers.

NMC2 • 2:30 p.m.

Optimal Coherence Using Chirped Pulse Trains for Enhanced Imaging, *Svetlana A. Malinovskaya; Dept. of Physics and Engineering Physics, Stevens Inst. of Technology, USA.* We propose adiabatic passage control scheme to maximize coherence in selected vibrational mode. We demonstrate possibility for sustaining high coherence in the presence of dephasing by two chirped pulse trains. Method may enhance CARS imaging.

NMC3 • 2:45 p.m.

Improving the Excitation Efficiency of Multiphoton Microscopy Using Ultrashort Pulses, *Shuo Tang[1], Bruce Tromberg[2]; [1]Univ. of British Columbia, Canada, [2]Univ. of California at Irvine, USA.* We investigated the effect of pulsewidth on MPM. Using an ultrafast Ti:sapphire laser, a 2-fold increase in TPEF and 4-fold increase in SHG intensities are observed when the pulsewidth is reduced from ~80fs to ~15fs.

NMC4 • 3:00 p.m.

Comparing Coherent and Spontaneous Raman Scattering Under Biological Imaging Conditions, *Meng Cui, Brandon R. Bachler, Sarah R. Nichols, Jennifer P. Ogilvie; Univ. of Michigan, USA.* We compare microscopy based on coherent and spontaneous Raman scattering under conditions relevant for biological applications, finding comparable signal levels for the two methods. We discuss the implications of the measurements for biological imaging.

NMC5 • 3:15 p.m.

Elliptically Polarized Coherent Anti-Stokes Raman Scattering Microscopy for High Contrast Vibrational Imaging, *Zhiwei Huang, Fake Lu, Wei Zheng; Natl. Univ. of Singapore, Singapore.* We report a novel coherent anti-Stokes Raman scattering (CARS) microscopy that employs an elliptically polarized pump field combined with a linearly polarized Stokes field for high contrast vibrational imaging.

NMC6 • 3:30 p.m.

Quantum Dot (Qdot) Labeling of Gene Expression in Fresh Frozen Brain Tissue Using Multiplex High-throughput *in situ* Hybridization, *Andreas Jeromin, Evan Lazarz, Nick Dee, Zack Riley; Allen Inst. for Brain Science, USA.* We have developed a high-throughput Qdot ISH platform. This new ISH tool provides a mechanism to systematically examine spatial gene expression patterns in mouse and human brain aided by multispectral imaging.

NMC7 • 3:45 p.m.

Oxygen Microscopy with Two-Photon-Enhanced Phosphorescent Nanoprobes, *Louise E. Sinks, Olga S. Finikova, Sergei A. Vinogradov; Univ. of Pennsylvania, USA.* A new method for non-invasive high-resolution imaging of oxygen distributions using phosphorescent nanoprobes with enhanced two-photon absorption cross-sections is being developed. Validation of the phosphorescence lifetime imaging microscope and characterization of new probes was performed.

Grand Ballroom C/D

4:00 p.m.–4:30 p.m.

Coffee Break/ Exhibits

NMD • Nonlinear Microscopy II

Grand Ballroom B
4:30 p.m.–6:00 p.m.
Warren S. Warren; Duke Univ., USA, Presider

NMD1 • 4:30 p.m. **Invited**
Technology Development for Deep Tissue Optical Imaging, *Chris Xu; Cornell Univ., USA.* Results on long wavelength multiphoton imaging and two-color multiphoton excitation are discussed, showing promise to improve the tissue penetration depth. A new fiber based excitation source that will greatly facilitate these imaging techniques is presented.

NMD2 • 5:00 p.m.
Microprisms for *in vivo* Multiphoton Microscopy of Cortex, *Michael J. Levene, Thomas H. Chia; Yale Univ., USA.* We demonstrate the use of microprisms for *in vivo* multiphoton microscopy of mouse cortex. These prisms enable a point-of-view more typical of *ex vivo*, cortical slice preparations, but in an *in vivo* context.

NMD3 • 5:15 p.m.
Two-Photon Differential Aberration Imaging Using a Modulating Retroreflector Mirror, *Kengyeh K. Chu, Thomas G. Bifano, Jerome Mertz; Boston Univ., USA.* Differential Aberration Imaging (DAI) uses a deformable mirror to improve two-photon fluorescence microscopy by enhancing rejection of out-of-focus background from scattering. We report a new implementation of DAI using a Modulating Retroreflector Mirror.

NMD4 • 5:30 p.m.
Simultaneous Imaging of Multiple Focal Planes via Multiphoton, Photon-Counting Microscopy, *Eric V. Chandler, Erich E. Hoover, Jeff Field, Kraig Sheetz, Ramon Carriles, Jeff Squier; Colorado School of Mines, USA.* We present an inexpensive design for multiphoton, multifocal microscopy by coupling a home-built Yb:KGW laser to an Olympus IX-71 microscope, while performing photon-counting detection with single-element detectors and field programmable gate arrays.

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

JTuA • DH/NTM Joint Session: Digital Holographic Microscopy

Grand Ballroom A
8:30 a.m.–10:30 a.m.
Demitri Psaltis; École Polytechnique Fédérale de Lausanne (EPFL), Switzerland, Presider

JTuA1 • 8:30 a.m. **Invited**
Image Formation in Holographic Microscopy and Tomography, *Colin Sheppard[1], Shan S. Kou[2]; [1]Div. of Bioengineering, Natl. Univ. of Singapore, Singapore. [2]Graduate School for Integrative Sciences and Engineering, Natl. Univ. of Singapore, Singapore.* Coherent transfer functions for imaging in holographic microscopy and holographic tomography are discussed. For holographic microscopy, there is poor spatial frequency coverage, but it can be extended by illumination at a range of different angles.

JTuA2 • 9:00 a.m. **Invited**
Digital Holography for MEMS Application, *Anand Asundi[1], Vijay Raj Singh[2]; [1]Nanyang Technological Univ., Singapore, [2]Ngee Ann AEM Ctr. of Innovation, Singapore.* Studies on digital holographic microscopy for full field high resolution 3-D profiling of MEMS and micro-devices are presented. Applications for thin film thickness measurement and studies on a MEMS accelerometer are presented.

JTuA3 • 9:30 a.m.
Second Harmonic and Fundamental Wavelength Digital Holographic Microscopy, *Etienne Shaffer, Nicolas Pavillon, Jonas Kühn, Christian Depeursinge; École Polytechnique Fédérale de Lausanne, Switzerland.* We report on a new, multi-functional second harmonic generation digital holographic microscope that allows retrieval of an object complex diffraction wavefront at both second harmonic and fundamental wavelengths.

JTuA4 • 9:45 a.m.
Three-Dimensional Phase Images Using Photothermal Microscope Integrated with Digital Holographic Interferometry, *Srivathsan Vasudevan, George C. K. Chen, Andass C. K. Teu, Niladri B. Puhan, Zhiping Lin; Nanyang Technological Univ., Singapore.* Photothermal microscope (PTM), offering high resolutions (~ 40 nanometers and nanoseconds) provides temperature distribution within a cell. Integrating PTM with digital holography is proposed to obtain quantitative three-dimensional images aiding real-time monitoring of biological assays.

JTuA5 • 10:00 a.m. **Invited**
Digital Holography with Multiple-Plane Phase-Error Correction, *Abbie E. Tippie, James R. Fienup; Univ. of Rochester, USA.* We correct phase screens that introduce anisoplanatic blurring in digital holography. Numerical propagations of fields, avoiding non-physical aliasing, and a sharpness metric in a nonlinear optimization designed to overcome false oversharpening effects are described.

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

NTuA • Phase Microscopy and Tomography

Grand Ballroom B
11:00 a.m.–12:30 p.m.
Joseph Izatt; Dept. of Biomedical Engineering, Duke Univ., USA.

NTuA1 • 11:00 a.m.
Quantitative Live Cell Imaging with Tomographic Phase Microscopy, *Wonshik Choi[1], Yongjin Sung[1], Yongkeun Park[1], Christopher Fang-Yen[1], Kamran Badizadegan[1,2], Ramachandra R. Dasari[1], Michael S. Feld[1]; [1]MIT, USA, [2]Harvard Medical School and Massachusetts General Hospital, USA.* We developed a tomographic microscopy for quantitative three-dimensional mapping of refractive index in live cells. We performed noninvasive quantification of hemoglobin content in the red blood cells as the disease progression of malaria infection.

NTuA2 • 11:15 a.m.
Optical Diffraction Tomography for High Resolution Live Cell Imaging, *Yongjin Sung[1], Wonshik Choi[1], Christopher Fang-Yen[1], Kamran Badizadegan[1,2], Ramachandra R. Dasari[1], Michael S. Feld[1]; [1]G. R. Harrison Spectroscopy Lab, MIT, USA, [2]Dept. of Pathology, Harvard Medical School and Massachusetts General Hospital, USA.* We report the experimental implementation of optical diffraction tomography for quantitative 3-D mapping of refractive index in live biological cells. Diffraction-free high resolution 3-D images are obtained throughout the entire sample volume.

NTuA3 • 11:30 a.m.
Synthetic Wavelength-Based Phase Unwrapping for Nanoscale Cellular Profiling with Spectral Domain Phase Microscopy, *Hansford C. Hendargo, Mingtao Zhao, Neal Shepherd, Joseph A. Izatt; Duke Univ., USA.* Phase sensitive optical coherence tomography allows for nanometer scale resolution of cellular dynamics, but suffers from phase wrapping artifacts. We present a synthetic wavelength spectral windowing technique for phase ambiguity removal in phase based OCT.

NTuA4 • 11:45 a.m.
Imaging of Intracellular Surface Motility Using a Low-Coherent Quantitative Phase Microscope, *Toyohiko Yamauchi, Hidenao Iwai, Yutaka Yamashita; Hamamatsu Photonics K. K., Japan.* We report the imaging of intracellular surface fluctuation in living cells by Low-Coherent Quantitative Phase Microscopy. The motility images of non-labeled cells were obtained in subcellular resolution.

NTuA5 • 12:00 p.m.
Linear Phase-Gradient Imaging with Asymmetric Illumination Based Differential Phase Contrast (AIDPC), *Shalin B. Mehta[1,2,3], Colin J. R. Sheppard[1,2,4]; [1]Optical Bioimaging Lab, Div. of Bioengineering, Natl. Univ. of Singapore, Singapore, [2]Graduate School for Integrative Sciences and Engineering, Natl. Univ. of Singapore, Singapore, [3]Liver Cancer Functional Genomics Lab, Humphrey Oei Inst. of Cancer Res., Natl. Cancer Ctr. Singapore, Singapore, [4]Dept of Biological Sciences, Natl. Univ. of Singapore, Singapore.* This paper demonstrates how one could engineer the transfer function of AIDPC, a novel optical thickness (phase) gradient measurement method suitable for live cell imaging, for linear imaging of the specimen phase-gradient.

NTuA6 • 12:15 p.m.
Far-Field Vectorial Polarimetry, *Oscar Rodriguez[1], David Lara[2], Chris Dainty[1]; [1]Applied Optics, Natl. Univ. of Ireland, Ireland, [2]Blackett Lab, Imperial College London, UK.* We present the far-field vectorial polarimetry method for the study of the interaction between a sub-resolution scatterer and the three-dimensional field generated in the focal region of a high numerical aperture lens.

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

NTuB • Optical Coherence Tomography

Grand Ballroom B
2:00 p.m.–4:00 p.m.
Wonshik Choi; G. R. Harrison Spectroscopy Labs, MIT , USA, Presider

NTuB1 • 2:00 p.m. **Invited**
Probing nm-Scale Cellular Structure and Function with Coherence-Gated Quantitative Phase Microscopy, *Joseph Izatt; Dept. of Biomedical Engineering, Duke Univ., USA.* New technology adapted from phase-resolved spectral domain optical coherence tomography allows for far-field nanoscopy of temporal and spatial variations in cellular morphology with millisecond temporal resolution.

NTuB2 • 2:30 p.m.
Combined Hyperspectral and Optical Coherence Tomography Microscope for Non-Invasive Hemodynamic Imaging, *Melissa C. Skala, Andrew Fontanella, Hansford Hendargo, Mark Dewhirst, Joseph Izatt; Duke Univ., USA.* Hyperspectral microscopy of hemoglobin oxygenation and optical coherence microscopy of three-dimensional microvessel morphology and blood velocity was demonstrated in growing tumors in the mouse skin fold window chamber.

NTuB3 • 2:45 p.m.
Three-Dimensional Optical Coherence Tomography Based on a High-Fill-Factor Microelectromechanical Mirror, *Shuguang Guo, Lei Wu, Jingjing Sun, Lin Liu, Huikai Xie; Univ. of Florida, USA.* A miniature optical imaging probe based on a high-fill-factor MEMS mirror has been designed, manufactured and packaged. Three dimensional optical coherence tomography of human tissues has been successfully demonstrated.

NTuB4 • 3:00 p.m. **Invited**
Wide Field, Minimally Invasive OCT: Recent Advances and Clinical Implications, *Brett E. Bouma; Harvard Medical School and Massachusetts General Hospital, USA.* Recent advances in minimally-invasive probes and illumination and detection strategies for optical coherence tomography have enabled dramatically faster imaging speeds and opened the possibility of high-resolution diagnostic imaging of entire organ epithelial and endothelial surfaces.

NTuB5 • 3:30 p.m.
Enhanced Contrast Dual Modality Imaging Approach for Screening of Epithelial Cancers, *Nicusor V. Iftimia[1], Anton Chestukhin[1], Daniel Hammer[1], Teoman Ustun[1], Mircea Mujat[1], Jinda Fan[2], Yupeng Ye[2], Samuel Achilefu[2]; [1]Physical Sciences, Inc., USA, [2]School of Medicine, Washington Univ. in St. Louis, USA.* A novel approach for epithelial cancer screening based on the use of a high specificity cancer targeting contrast agent in combination with a dual imaging capability is presented in this paper.

NTuB6 • 3:45 p.m.
Detecting Nanoscale Refractive Index Fluctuations Using Partial Wave Spectroscopic Microscopy, *Hariharan Subramanian, Prabhakar Pradhan, Dhwanil Damania, Daniel Balikov, Sameer Maheshwari, Vadim Backman; Northwestern Univ., USA.* Partial-wave spectroscopic microscopy (PWS) provides unprecedented insights into the nanocale refractive index fluctuations within biological cells. We demonstrate the nanoscale sensitivity of PWS using experiments with nanostructure models and human colon adenocarcinoma (HT29) cell lines.

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.

JTuB22
Multiplex Coherent Anti-Stokes Raman Scattering Microscopy with Broadband Pump Beam for Spectroscopic Analysis of Atherosclerotic Lesions, *Jae Y. Lee, Eun S. Lee; Korea Res. Inst. of Standards and Science, Republic of Korea.* We demonstrated 3-color multiplex coherent anti-Stokes Raman scattering microscopy in which a femtosecond broadband laser is used as a pump beam. Imaging and spectral analysis of atherosclerotic lipids are performed concurrently in mouse cardiovascular tissues.

JTuB23
Spherical Aberration Compensation Using Rotating Phase Filters, *Manuel P. Cagigal, Vidal F. Canales, Pedro J. Valle; Univ. de Cantabria, Spain.* We describe a simple method for overcoming the drawbacks caused by spherical aberration in confocal microscopy. The method is based on the use of a couple of identical phase filters that can be rotated.

JTuB24
Spectrally Encoded Coherent Anti-Stokes Raman Scattering Microscopy, *Eun S. Lee, Jae Y. Lee; Korea Res. Inst. of Standards and Science, Republic of Korea.* We propose a coherent anti-Stokes Raman scattering microscopy based on spectral encoding. The signal is generated in such a way that its spectrum reflects the spatial distribution of sample molecules with the same vibrational frequencies.

JTuB25
Nanoscopic Inspection of Surfaces Based on Plasmonic Resonances, *Pablo Albella, Jose María Saiz, Francisco González, Fernando Moreno; Univ. de Cantabria, Spain.* We present a nanoscopic surface inspection method based on the study of spectral variations of localized surface plasmon resonances in a 3-D-probe metallic nanoparticle scanned over an inhomoegeneous dielectric surface.

JTuB26
Circularly Polarization-Sensitive Optical Coherence Tomography Constructed by Fiber-Optics Devices, *Hermann Lin, Chih-Ling Wang; Dept. of Optoelectronics and Communication Engineering, Natl. Kaohsiung Normal Univ., Taiwan.* A circularly polarization-sensitive optical coherence tomography constructed by fiber-optics devices is proposed. The measured retardations of quarter wave plate and glass substrate are 88.78^0 and 0.092^0 respectively. The results are in good agreement with sample specifications.

JTuB27
New Microscopy Technique for Detecting the Invisible Material Structures, *Yury Kuporosov[1], Maxim Tomilin[1], Anatoly Evstrapov[2]; [1]State Univ. of Information Technologies, Mechanics and Optics, Russian Federation, [2]Inst. for Analytical Instrumentation, Russian Federation.* We suggest new type of optical polarizing microscope with new functions that gives the possibilities to observe and detect invisible physical fields on the surface of materials.

JTuB28
Measurement of Hair Cuticle Structure Using High-Q Near-Field Scanning Optical Microscopy, *Kyoung-Duck Park[1], Dae-Chan Kim[1], Won-Soo Ji[2], Beom-Hoan O[1], Se-Geun Park[3], El-Hang Lee[3], Seung Gol Lee[1]; [1]Precision Inspection Measurement Ctr., Inha Univ., Republic of Korea, [2]Samsung Electro-Mechanics, Republic of Korea, [3]Inha Univ., Republic of Korea.* The surface structure and the near-field image of a hair cuticle were measured with collection mode near-field scanning optical microscopy having high Q value of 1000, where the Q-value was enhanced with mechanical vibration control.

JTuB29
The Prototyping of Colored Skin Imaging System with RGB LEDs by Optical Coherence Tomography, *Bor-Wen Yang[1], Xin-Chang Chen[2], Yuan-Shuo Chang[2]; [1]Dept. of Opto-Electronic System Engineering, Ming-Hsin Univ. of Science and Technology, Taiwan, [2]Inst. of Electronic Engineering, Ming-Hsin Univ. of Science and Technology, Taiwan.* To take place of normal 2-D skin camera, new hand-held imaging system is proposed for 3-D skin imaging. With RGB colored beams applied in optical coherence tomography, full-colored medical image is achieved for dermatology.

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 JTuB30–JTuB35 can be found in the OTA abstracts section.

• Wednesday, April 29, 2009 •

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

NWA • New Techniques I

Grand Ballroom B
8:30 a.m.–10:30 a.m.
Rainer Heintzmann; King's College London, UK, Presider

NWA1 • 8:30 a.m. **Invited**
Adaptive Optics in Biomedical Microscopy, *Martin J. Booth, Anisha Kubasik-Thayil, Alexander Jesacher, Delphine Debarre, Kate Grieve, Tony Wilson; Univ. of Oxford, UK.* Specimen-induced aberrations frequently affect microscopes, particularly when high aperture lenses image deep into specimens. We have applied adaptive optics to correct aberrations in confocal, two-photon, widefield sectioning and harmonic generation microscopes, restoring image quality.

NWA2 • 9:00 a.m.
Dual Modal Three-Dimensional Imaging of Single Cell Using Optical Projection Tomography Microscope, *Qin Miao[1], Benjamin Hawthorne[2], Michael Meyer[2], J. Richard Rahn[2], Thomas Neumann[2], Alan C. Nelson[2], Eric J. Seibel[1]; [1]Univ. of Washington, USA, [2]VisionGate Inc., USA.* The optical projection tomography microscope (OPTM) acquires three-dimensional images with isometric high resolution both in absorption and fluorescence modes, employing computed tomographic image reconstruction. The three-dimensional chromosome structure of a female muntjac cell is shown.

NWA3 • 9:15 a.m.
Fourier Analysis and Synthesis Tomography: Dynamic Measurement of 2-D and 3-D Structure, *Daniel Feldkhun, Kelvin Wagner; Univ. of Colorado at Boulder, USA.* We present a full-field imaging technique that measures an object's fluorescent or coherent spatial spectrum using projected dynamic interference patterns and a fast single-pixel detector, and reconstructs its 2-D or 3-D structure using tomographic algorithms.

NWA4 • 9:30 a.m. **Invited**
Wide-Field Fluorescence Sectioning with HiLo Microscopy, *Daryl Lim, Kengyeh K. Chu, Jerome Mertz; Boston Univ., USA.* HiLo microscopy is a wide-field fluorescence imaging technique that provides depth discrimination by combining two images, one with non-uniform illumination and one with uniform illumination. We discuss theoretical and practical results regarding this new technique.

NWA5 • 10:00 a.m.
Implementation of Spatial Phase Modulation for Focal Modulation Microscopy, *Chee Howe Wong, Shau Poh Chong, Nanguang Chen; Natl. Univ. of Singapore, Singapore.* Spatial phase modulation in the excitation light path is the key to generate intensity modulation in focal modulation microscopy. A simple spatial phase modulator is designed to enhance the signal stability and image quality.

NWA6 • 10:15 a.m.
CMOS Descanning and Acousto-Optic Scanning Enable Faster Confocal Imaging, *Dejan Vučinić[1], Yu M. Chi[2], Gert Cauwenberghs[2], Terrence J. Sejnowski[1]; [1]Salk Inst. for Biological Studies, USA, [2]Univ. of California at San Diego, USA.* Fast pixel random access capabilities of CMOS imagers are exploited to create a virtual pinhole or slit in synchrony with acousto-optic laser beam scanning to significantly speed up confocal microscopy.

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

NWB • Superresolution III

Grand Ballroom B
11:00 a.m.–12:30 p.m.
Alipasha Vaziri; Howard Hughes Medical Inst., USA, Presider

NWB1 • 11:00 a.m. **Invited**
Microscope Resolution Enhancement with Image Inversion Interferometry, *Kai Wicker[1], Simon Sindbert[1,2], Rainer Heintzmann[1]; [1]King's College London, UK, [2]Univ. of Heidelberg, Germany.* We present experimental results on image inversion interferometric setups with significant potential to increase efficiency and resolution in fluorescence confocal microscopy. Results agree with theory in terms of a reduction of FWHM.

NWB2 • 11:30 a.m.
The Stochastic Transfer Function: Noise Performance and Bandwidth of Optical Microscopes, *Ken Hsu, Michael G. Somekh, Mark C. Pitter; Inst. of Biophysics, Imaging and Optical Science, Univ. of Nottingham, UK.* The stochastic transfer function extends the concept of the conventional transfer function by incorporating noise statistics. This provides a convenient and standardized metric to assess noise performance for a diverse range of resolution enhancement techniques.

NWB3 • 11:45 a.m.
Effects of Polarization on the Focusing of Light, *Colin J. R. Sheppard[1,2], Naveen K. Balla[1], Shakil Rehman[1], Elijah Y. S. Yew[1]; [1]Div. of Bioengineering, Natl. Univ. of Singapore, Singapore, [2]Computation and Systems Biology, Singapore-MIT Alliance, Singapore.* The effects of apodization and polarization on the focusing properties of high numerical aperture systems are discussed. Transverse electric

polarization can give a smaller focal spot even than radial polarization.

NWB4 • 12:00 p.m.
Measuring the 3-D Point Spread Function of Super-Resolving Pupil Filters Focused into a Refractive Medium, *Daniel Iwaniuk, Erwin Hack; Empa, Switzerland.* The focal spot size of superresolution pupil filters is measured with a new technique based on a fluorescent screen for imaging through air and a refractive index mismatch. It allows to measure high NA lenses.

NWB5 • 12:15 p.m.
Imaging Response of Optical Microscopes Containing Angled Micromirrors, *Andrew J. Berglund, Matthew D. McMahon, Jabez J. McClelland, J. A. Liddle; NIST, USA.* We describe the aberrations induced by introducing micromirrors into the object space of a microscope. These play a critical role in determining the accuracy of recent three-dimensional particle tracking methods based on such devices.

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

NWC • Endomicroscopy

Grand Ballroom B
2:00 p.m.–4:00 p.m.
Alexander R. Small; California State Polytechnic Univ., USA, Presider

NWC1 • 2:00 p.m.
***In vivo* Clinical and Intravital Imaging with MEMS Based Dual-Axes Confocal Microscopes,** *Wibool Piyawattanametha[1,2], Hyejun Ra[1], Michael J. Mandella[1], Jonathan T. C. Liu[1], Emilio Gonzalez[1], Roger Kaspar[3], Gordon S. Kino[1], Olav Solgaard[1], Christopher H. Contag[1]; [1]Stanford Univ., USA, [2]NECTEC, Thailand, [3]TransDerm, Inc., USA.* We demonstrate microelectromechanical systems (MEMS) based near infrared fluorescence dual-axes confocal (DAC) microscopes in both a 10-mm microscope and a 5-mm endoscope for three-dimensional (3-D) cellular imaging of both *ex vivo* and *in vivo* samples.

NWC2 • 2:15 p.m.
Ratiometric 3-D Scanning Cytometer for Quantifying Cell-Surface Biomarker Expression within Intact Tissues, *Jonathan T. C. Liu[1], Michael J. Mandella[1], Mike W. Helms[1], James M. Crawford[2], Christopher H. Contag[1], Gordon S. Kino[1]; [1]Stanford Univ., USA, [2]North Shore-LIJ Health System, USA.* We have developed a two-color ratiometric microscopy technique that not only reduces image contrast due to nonspecific probe accumulation, but also provides a quantitative 3-D map of cellular biomarker expression.

NWC3 • 2:30 p.m.
Optically Sectioned Fluorescence Endomicroscopy with Hybrid-Illumination Imaging through a Flexible Fiber Bundle, *Silvia Santos[1], Kengyeh K. Chu[1], Daryl Lim[1], Nenad Bozinovic[1], Tim N. Ford[1], Claire Hourtoule[1], Aaron C. Bartoo[2], Satish K. Singh[2], Jerome Mertz[1]; [1]Boston Univ., USA, [2]Boston Univ. School of Medicine, USA.* We present an endomicroscope apparatus that exhibits out-of-focus background rejection based on widefield illumination through a flexible imaging fiber bundle. Our technique, called HiLo microscopy, involves acquiring two images using modified structured illumination technique.

NWC4 • 2:45 p.m.
A Novel Multi-Point Scan Architecture for a High Frame Rate Multi-Spectral Confocal Microendoscope, *Arthur F. Gmitro, Anthony A. Tanbakuchi, Houssine Makhlouf, Andrew R. Rouse; Univ. of Arizona, USA.* A new architecture for a confocal microscope is presented. The approach is a hybrid multi-point scanning system that allows real-time grayscale and multi-spectral imaging and is being developed for confocal microendoscopy.

NWC5 • 3:00 p.m.
Electromagnetically-Controlled Fiber-Scanning Confocal Microscope, *Nenad Mihajlovic, Gert W. 't Hooft, Benno H. W. Hendriks, Walter C. J. Bierhoff, Cees A. Hezemans, Rik Harbers, A. L. Braun, Jeroen J. L. Horikx, Adrien E. Desjardins; Philips Res., Netherlands.* Here, we present a novel fiber-scanning confocal microscope with a 3 mm outer diameter. The microscope has a lateral resolution below 0.6 micron and can operate both in resonant and non-resonant scanning modes.

NWC6 • 3:15 p.m.
Endoscopic Polarization Imaging of Biological Tissues, *Jérôme Desroches, Dominique Pagnoux, Frederic Louradour, Eric Suran, Julien Brevier, Alain Barthelemy; XLIM UMR 6172 CNRS, France.* For the first time polarization images using an endoscopic technique are reported. Images based on the degree of polarization measurement allow to discriminate sound and degraded regions in a type I collagen sample.

NWC7 • 3:30 p.m.
Design and Evaluation of an Ultra-Slim Objective for the *in vivo* Diagnosis of Breast Cancer, *Sara M. Landau[1], Robert T. Kester[2], Todd C. Christenson[3], Tomasz S. Tkaczyk[2], Michael R. Descour[1]; [1]Univ. of Arizona, USA, [2]Rice Univ., USA, [3]HT Micro, USA.* To advance breast cancer diagnosis, we designed an ultra-slim objective to fit the 1-mm, hypodermic tubes used for breast biopsies. We discuss objective design and performance, and the limitations of lens imaging at this scale.

NWC8 • 3:45 p.m.
A Mechanical-Scan-Free Single-Fiber Probe for Simultaneous Microscopy and High-Precision Laser Microsurgery, *Kevin Tsia, Keisuke Goda, Bahram Jalali; Univ. of California at Los Angeles, USA.* We demonstrate an endoscope-compatible single-fiber probe that performs simultaneous confocal microscopy and high-precision laser microsurgery without any mechanical movement of the probe or the sample by mapping two-dimensional sample coordinates onto the optical spectrum.

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

NWD • New Techniques II

Grand Ballroom B
4:30 p.m.–5:30 p.m.
Jerome Mertz; Boston Univ., USA, Presider

NWD1 • 4:30 p.m.
Nonlinear Imaging by an Endoscope Probe Incorporating a Tip-Tilt-Piston Microelectromechanical System Mirror, *Dru Morrish[1], Lei Wu[2], Huikai Xie[2], Jeremy Reynolds[3], Alex Boussioutas[1,3], Min Gu[1]; [1]Swinburne Univ. of Technology, Australia, [2]Univ. of Florida, USA, [3]Peter MacCallum Cancer Ctr., Australia.* We present multiphoton nonlinear imaging from an endoscope probe. Femtosecond pulses are delivered via double-clad photonic crystal fibre. Imaging is performed by the three-dimensional scanning of the tip-tilt-piston microelectromechanical system (MEMS) mirror.

NWD2 • 4:45 p.m.
Use of a Radially Polarized Beam for Ultra-Low Energy Threshold for Cancer Photothermal Therapy with Gold Nanorods, *Hong Kang, Jingliang Li, Baohua Jia, Dru Morrish, Min Gu; Swinburne Univ. of Technology, Australia.* We demonstrate that the use of a radially polarized beam is more efficient for both imaging and therapy for cancer cells labeld with gold nanorods, compared with that of a linearly polarized beam.

NWD3 • 5:00 p.m.
Detecting Cancer Cells Labeled with Gold Nanorods Using Nonlinear Endomicroscopy, *Hong Chun Bao, JingLiang Li, Min Gu; Swinburne Univ. of Technology, Australia.* Cervical cancer cells, HeLa cells, labeled by gold nanorods were first detected by multi-photon-excited photoluminescence endomicroscopy, which shows that multi-photon-photoluminescence endomicroscopy could be used in noninvasively detecting cancers.

NWD4 • 5:15 p.m.
A System for Multi-Modality Optical and MR Imaging of Implanted Window Chambers, *Arthur F. Gmitro, Yuxiang Lin, Mir Farrokh Salek; Univ. of Arizona, USA.* Window chambers implanted in mice provide a useful model system for many studies in cancer and vascular biology. A system allowing simultaneous optical and magnetic resonance imaging of window chambers is described and results presented.

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:

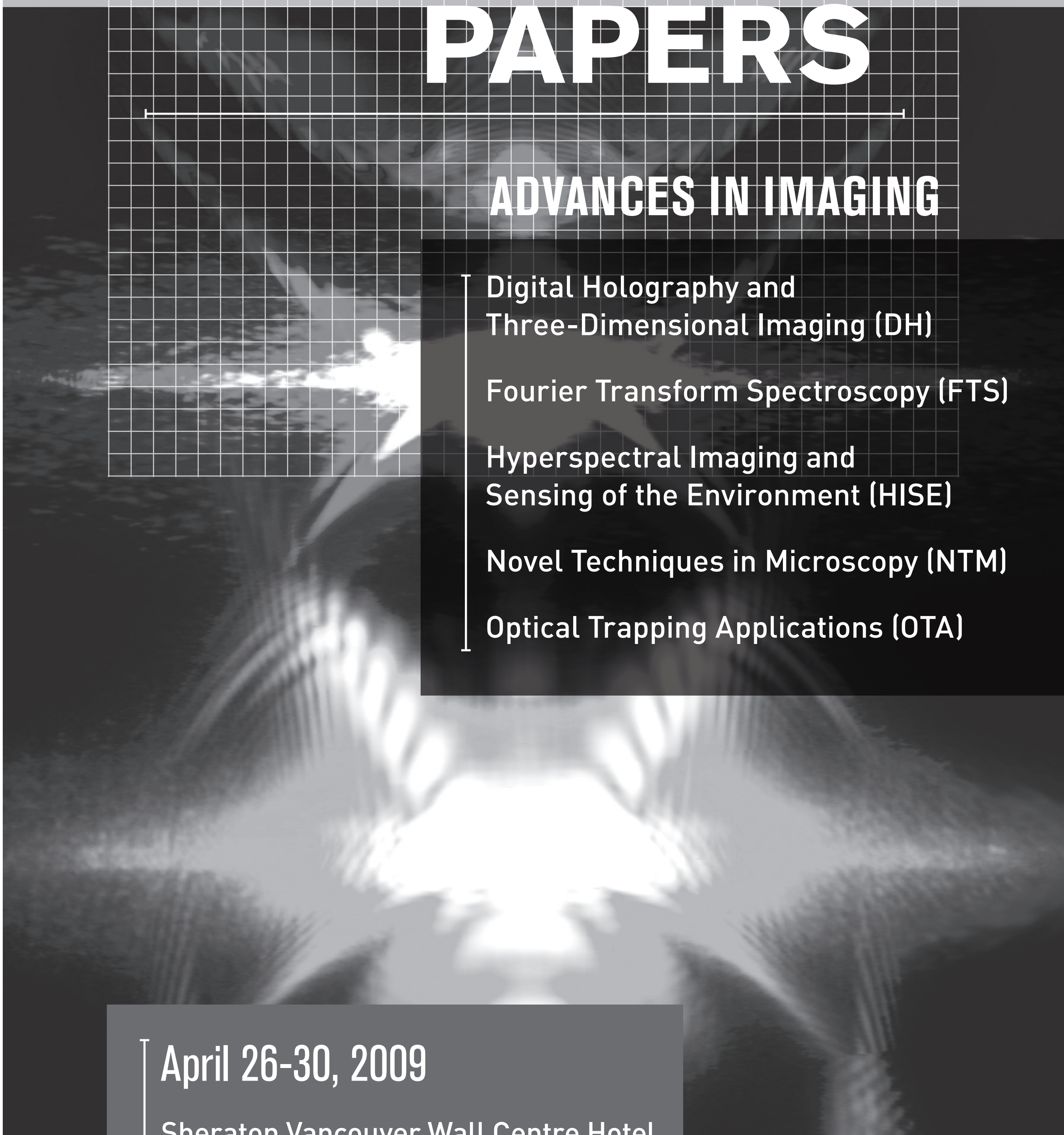
Post deadline Paper Programs are available at Registration.

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

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•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)

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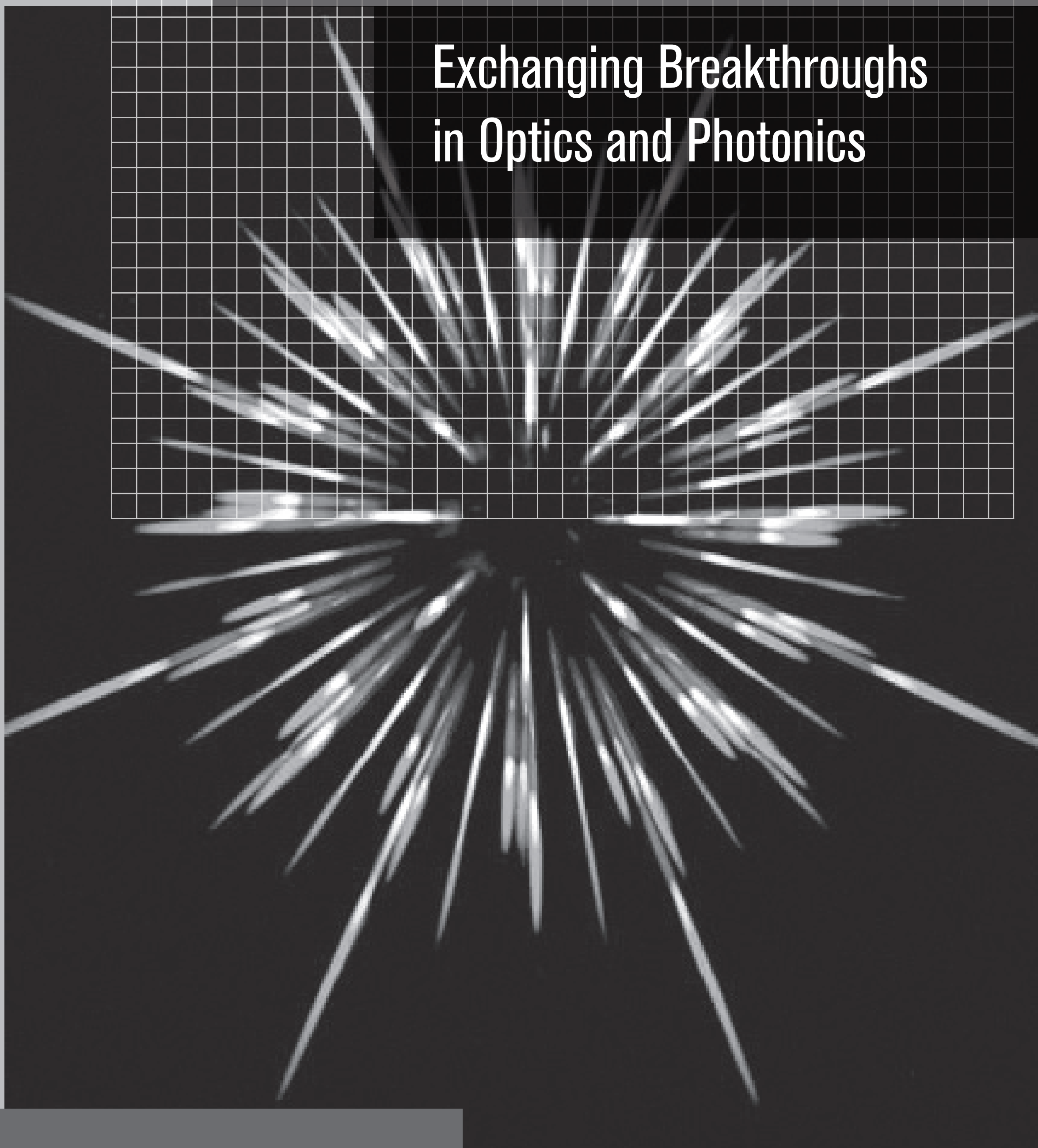

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