Frontiers in Optics 2010/Laser Science XXVI

FiO/LS 2010 wrapped up in Rochester after a week of cutting-edge optics and photonics research presentations, powerful networking opportunities, quality educational programming and an exhibit hall featuring leading companies in the field. Headlining the popular Plenary Session and Awards Ceremony were Alain Aspect, speaking on quantum optics; Steven Block, who discussed single molecule biophysics; and award winners Joseph Eberly, Henry Kapteyn and Margaret Murnane.

Led by general co-chairs Karl Koch of Corning Inc. and Lukas Novotny of the University of Rochester, FiO/LS 2010 showcased the highest quality optics and photonics research—in many cases merging multiple disciplines, including chemistry, biology, quantum mechanics and materials science, to name a few. This year, highlighted research included using LEDs to treat skin cancer, examining energy trends of communications equipment, quantum encryption over longer distances, and improvements to biological and chemical sensors. Select recorded sessions are now available to all OSA members. Members should log in and go to “Recorded Programs” to view available presentations.

FiO 2010 also drew together leading laser scientists for one final celebration of LaserFest – the 50th anniversary of the first laser. In honor of the anniversary, the conference’s Industrial Physics Forum brought together speakers to discuss Applications in Laser Technology in areas like biomedicine, environmental technology and metrology. Other special events included the Arthur Ashkin Symposium, commemorating Ashkin's contributions to the understanding and use of light pressure forces on the 40th anniversary of his seminal paper “Acceleration and trapping of particles by radiation pressure,” and the Symposium on Optical Communications, where speakers reviewed the history and physics of optical fiber communication systems, in honor of 2009 Nobel Prize Winner and “Father of Fiber Optics” Charles Kao.

The annual meeting serves as the venue for the Optical Society to announce its board election results. Donna T. Strickland of the University of Waterloo was elected as the 2011 vice president. Strickland will become president-elect the following year and serve as president of OSA in 2013. Naomi J. Halas, Eric Mazur and Jannick P. Rolland were all elected to serve three-year terms as directors at large. Maser pioneer James Gordon was also named honorary member of OSA for his numerous high-impact, seminal contributions to quantum electronics and photonics, including the first demonstration of the maser.

With higher attendance in 2010—more than 1,700 attendees and 85 exhibiting companies—and more than 850 technical presentations, FiO 2010 was the place to be for researchers, businesspersons, educators and anyone with an interest in the optics and photonics field. Join us
next year as we head back to San Jose, California, USA for FiO 2011, October 16 – 20.

About FiO/LS

FiO/LS Pre-Conference Schedule
The Optical Society (OSA)
The APS Division of Laser Science (DLS)
Archives
Frontiers in Optics 2007 Archive (PDF)
Frontiers in Optics 2008 Archive (PDF)
Frontiers in Optics 2009 Archive (PDF)
Future Dates

Join your colleagues at the Rochester Riverside Convention Center in Rochester, NY USA, for a variety of themes, topics, and invited speakers at the Frontiers in Optics (FiO) 2010/Laser Science (LS) XXVI conference:

- **FiO 1: Optical Design, Fabrication and Instrumentation**
- **FiO 2: Optical Sciences**
- **FiO 3: Optics in Biology and Medicine**
- **FiO 4: Optics in Information Science**
- **FiO 5: Photonics**
- **FiO 6: Quantum Electronics**
- **FiO 7: Vision and Color**

These meetings focus on timely topics in optical science and engineering and provide a place for members to exchange ideas and to expand their network of colleagues in both academia and industry.

FiO/LS Pre-Conference Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week of March 29, 2010</td>
<td>Call for Papers Submission Site Opens for FiO/LS 2010</td>
</tr>
<tr>
<td>May 25, 2010, 12:00 p.m. noon EDT (16.00 GMT)</td>
<td>FiO/LS Papers Submission Deadline</td>
</tr>
<tr>
<td>June 2010</td>
<td>Registration and Housing Open</td>
</tr>
<tr>
<td>July 2010</td>
<td>Authors of submitted papers are notified of acceptance/rejection</td>
</tr>
<tr>
<td>August 2010</td>
<td>FiO/LS 2010 Conference Program Available Online</td>
</tr>
<tr>
<td>September 28, 2010</td>
<td>Housing Deadline</td>
</tr>
</tbody>
</table>
The Optical Society (OSA)

FiO 2010—the 94th OSA Annual Meeting—and LS XXVI unite the OSA and American Physical Society (APS) communities for five days of quality, cutting-edge presentations, fascinating invited speakers and a variety of special events. The FiO 2010 conference will also offer a number of Short Courses designed to increase participants’ knowledge of a specific subject while offering the experience of insightful teachers. An exhibit floor featuring leading optics companies will further enhance the meeting.

The APS Division of Laser Science (DLS)

The LS XXVI meeting serves as the annual meeting of the American Physical Society (APS) of its Division of Laser Science (DLS) and provides an important forum for presenting the latest work on laser applications and development, spanning a broad range of topics in physics, biology and chemistry.

In collaboration with our colleagues at OSA, DLS will provide thorough coverage of mutually interesting topics in a number of joint sessions. Session schedules are coordinated to encourage your intellectual wanderings among DLS, OSA and joint sessions. Be prepared to engage in outstanding technical programs, exciting special symposia and networking events scheduled for this year's annual meeting.

**Future Dates**

<table>
<thead>
<tr>
<th>Year</th>
<th>Dates</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>October 24–28</td>
<td>Rochester, NY</td>
</tr>
<tr>
<td>2011</td>
<td>October 16-20</td>
<td>San Jose, CA</td>
</tr>
<tr>
<td>2012</td>
<td>October 14–18</td>
<td>Rochester, NY</td>
</tr>
<tr>
<td>2013</td>
<td>October 6–10</td>
<td>Orlando, FL</td>
</tr>
</tbody>
</table>

Plenary Session and Awards Ceremony
The FiO 2010/LS XXVI Plenary Session and Awards Ceremony is on Monday, October 25.

**Plenary Session**

**Frederic Ives Medal/Jarus W. Quinn Endowment Winner Presentation**

**Arthur L. Schawlow Prize in Laser Science Winner Presentation**

**Awards Recipients Ceremony**

**Hanbury Brown and Twiss and other atom-atom correlations: from photon to atom quantum optics**

Alain Aspect  
*Laboratoire Charles Fabry de l’Inst. d’Optique, France*

**Abstract:** Fifty years ago, R. Hanbury Brown and R. Q. Twiss, invented a new method to measure the angular diameter of stars, based on the observation of correlations in light. The analysis of their experiment led to the development of modern quantum optics, based on photon-photon correlation experiments.

Similar quantum correlations can be observed with bosonic and fermionic atoms. I will present such experiments, after recalling the significance of the HBT landmark experiment.

**Biography:** Born in 1947, Alain Aspect studied at the Ecole Normale Supérieure de Cachan and the Biophysics of Gene Regulation, Studied One Molecule at a Time

Steven M. Block  
*Stanford Univ., USA*

**Abstract:** Advances have led to a new field, single molecule biophysics. Prominent among the enabling technologies is the laser-based optical trap, or optical tweezers. This lecture will focus on our current work on single biological macromolecules.

**Biography:** Steven M. Block is the S.W. Ascherman Chair of Sciences in the departments of Applied Physics and Biology at Stanford University. He holds degrees from Oxford University (B.A. 1974; M.A. 1978) and the California Institute of Technology (Ph.D. 1983). After postdoctoral work at Stanford (1983-87), he served as staff scientist at the Rowland...
Université d’Orsay. After a three years teaching assignment in Cameroon, he started in 1974, a series of experiments on the foundations of quantum mechanics. His "Experimental Tests of Bell's Inequalities with Correlated Photons", were the subject of his doctorate thesis presented in 1983. In 1983-86, with his student Philippe Grangier, he developed the first source of single photons and made fundamental experiments on wave-particle duality of light.

From 1985 to 1992 he worked with Claude Cohen-Tannoudji at the Laboratoire Kastler Brossel de l’ENS and Collège de France, on cooling atoms with lasers, in particular “cooling below the one photon recoil”. Since 1991, he is head of the group of Atom Optics that he has established at the Institut d’Optique, now in Palaiseau. Recent scientific production concerns mainly Bose Einstein Condensates, Atom Lasers, Quantum Atom Optics with metastable Helium, Anderson localization of ultracold atoms.

A CNRS senior scientist ("Directeur de recherché CNRS") at Laboratoire Charles Fabry de l’Institut d’Optique, Alain Aspect is also professor at Institut d’Optique and Ecole Polytechnique, Palaiseau.

He is member of the French Académie des Sciences, and of the Académie des Technologies, as well as of foreign academies (USA, Austria). He is a fellow of the Optical Society of America, of the European Optical Society, of the American Physical Society, and has received several honorary doctorates (Ecole Polytechnique and University of Montreal, National Australian University at Canberra, Herriott Watt University at Glasgow). He is frequently invited as a distinguished lecturer, and has received major awards, among them: the OSA Max Born award (1999), the CNRS Gold Medal (2005), the Quantum Optics senior prize of the European Physical Society (2009), the Wolf prize in Physics (2010).

Institute for Science, Lecturer at Harvard University (1987-1993), and then Professor of Molecular Biology at Princeton University (1994-1999) prior to joining the Stanford faculty in 1999.

Block is a fellow of the National Academy of Sciences, the American Academy of Arts & Sciences, the American Association for the Advancement of Science, and the Biophysical Society.

He is a recipient of the Delbrück Prize in Biological Physics from the American Physical Society (2008), the Young Investigator (1994) and Outstanding Investigator in Single Molecule Biophysics Awards from the BPS (2008), and served as the Biophysical Society’s National Program Chair (1999) and President (2005-2006).

Block’s research lies at the interface of physics and biology, particularly in the study of molecular motors, such as kinesin and RNA polymerase, and the folding of nucleic acid-based structures. His laboratory has pioneered the use of laser-based optical traps, also known as ‘optical tweezers,’ to study the nanoscale motions of individual biomolecules.
APS Arthur L. Schawlow Prize in Laser Science

The Arthur L. Schawlow Prize recognizes outstanding contributions to basic research which uses lasers to advance our knowledge of the fundamental physical properties of materials and their interaction with light.
2010 Recipients: Henry C. Kapteyn of JILA, University of Colorado, USA and Margaret M. Murnane of JILA, University of Colorado, USA

Citation: For critical advances in the science and technology of high-harmonics generation, with particular relevance to sub-femtosecond pulse generation and related attosecond-scale physics.

Schawlow Prize Lecture Title: "Attosecond Light and Science at the Time-scale of the Electron - Coherent X-Rays from Tabletop Ultrafast Lasers"

Abstract: Using the extreme nonlinear process of high harmonic generation, light from an ultrafast laser can be coherently upshifted, generating bright ultrafast coherent beams extending into the soft and soon hard x-ray regions of the spectrum. Applications in molecular and materials dynamics, as well as nano- and attosecond science, will be discussed.

Biographies: Henry Kapteyn and Margaret Murnane have made important contributions to the development of coherent x-ray sources and have helped establish the foundations of attosecond science. In the 1990s, they led the development of new ultrafast laser technologies using
Ti:sapphire to generate unprecedented high peak power pulses only a few optical cycles in duration. They then did pioneering work in developing an understanding of extreme nonlinear optics to efficiently upshift femtosecond laser light into the soft X-ray region of the spectrum.

Henry Kapteyn is Professor of Physics and Fellow of JILA, University of Colorado, Boulder. He holds a B.S. from Harvey Mudd College, M.S. from Princeton University and a Ph.D. from the University of California, Berkeley. He previously held faculty positions at Washington State University and the University of Michigan. He is a Fellow of OSA, APS, and AAAS, and recipient of the OSA Adolph Lomb Medal, the ACS Ahmed Zewail Award, and the R.W. Wood Prize.

Margaret Murnane is Professor of Physics and Fellow of JILA, University of Colorado Boulder. She received her B.S. and M.S. degrees from University College Cork, Ireland, and her Ph.D. from the University of California, Berkeley. She previously held faculty positions at Washington State University and the University of Michigan. She is member of the NAS, a Fellow of OSA, APS and AAAS, and recipient of a MacArthur Foundation Fellowship, the ACS Ahmed Zewail Award and the R.W. Wood Prize.
OSA Frederic Ives Medal/Jarus W. Quinn Endowment

The **Frederic Ives Medal/Jarus W. Quinn Endowment** is OSA’s highest award and recognizes overall distinction in optics.

2010 Recipient: Joseph H. Eberly, University of Rochester, U.S.A.

Citation: For many important research contributions to quantum optics and optical physics, his leadership as a teacher and educator, and his tireless and visionary service to the optics community

*Ives Medal Address Title: “When Malus tangles with Euclid, who wins?”*

Biography: Joseph Eberly has a B.S. degree from Pennsylvania State University and a Ph. D from Stanford University. Eberly has been teaching graduate and undergraduate classes in the department of physics and astronomy at the University of Rochester since the 1970s. He is currently the Andrew Carnegie Professor of Physics and also a Professor of Optics.

His long-time research interests in quantum optics and radiation physics have led to a number of discoveries and innovations; including the initial description of the spontaneous collapse and revival effect, the first observation of Bessel beams, predictions of the recently observed non-spreading localized states of electrons in atoms, and the sudden-death effect in quantum
entanglement.

Eberly received the Charles Hard Townes Award from OSA, the Goergen Award for Creative Undergraduate Teaching from the University of Rochester and has been designated a Distinguished Alumnus of the Penn State College of Science. He was awarded the Smoluchowski Medal by the Polish Physical Society. Eberly has mentored more than 35 Ph.D. graduates and published more than 350 research papers, as well as three graduate texts: Optical Resonance and Two-Level Atoms with L. Allen; Lasers and Laser Physics, both with P.W. Milonni.

He is the founding editor of the journal Optics Express, and he has served as president of OSA and chair of the APS Division of Laser Physics, on the APS Council and the AIP Board of Governors, and as a member of the Advisory Boards of the Kavli Institute for Theoretical Physics and ITAMP-Harvard. He is a Fellow of OSA and APS and he is an elected Foreign Member of the Polish Academy of Science.

Honors to be presented during the Award Ceremony

APS/Division of Laser Science Awards AND HONORS

APS/Division of Laser Science Fellowships

Arthur L. Schawlow Prize
Recipient: Henry C. Kapteyn, JILA, University of Colorado and Margaret M. Murnane, JILA, University of Colorado

OSA AWARDS AND HONORS

OSA Fellowships

OSA Honorary Member
Recipient: Arthur Ashkin, Alcatel-Lucent Bell Labs, USA

Frederic Ives Medal/Jarus W. Quinn Endowment
Recipient: Joseph H. Eberly, University of Rochester, USA

Esther Hoffman Beller Medal
Recipient: Eustace Dereniak, University of Arizona, USA

Distinguished Service Award
Recipient: Gary C. Bjorklund, Bjorklund Consulting, USA

Paul F. Forman Engineering Excellence Award
Recipient: Alan E. Willner, Univ. of Southern California, USA

Joseph Fraunhofer Award/Robert M. Burley Prize
Recipient: Shin-Tson Wu, University of Central Florida, USA
Edwin H. Land Medal
Recipient: Eli Peli, Schepens Eye Research Institute, USA

OSA Leadership Award
Recipient: Rod C. Alferness, Bell Laboratories, Alcatel-Lucent, USA

Emmett N. Leith Medal
Recipient: Juris Upatnieks, University of Michigan/Environmental Research Institute of Michigan (retired), USA

Adolph Lomb Medal
Recipient: Jeremy O’ Brien, University of Bristol, U.K.

William F. Meggers Award
Recipient: Frédéric Merkt, ETH Zürich, Switzerland

FiO Invited Speakers

Check back often as speakers are still being confirmed and updated!

FiO 1: Optical Design, Fabrication and Instrumentation
FiO 2: Optical Sciences
FiO 3: Optics in Biology and Medicine
FiO 4: Optics in Information Science
FiO 5: Photonics
FiO 6: Quantum Electronics
FiO 7: Vision and Color

View Symposia Speakers

FiO 1: Optical Design, Fabrication and Instrumentation

1.1 Image-Based Wavefront Sensing

Wednesday, October 27, 2010

Invited Speakers:

10:30 AM, Measurement-Diverse Wavefront Sensing, Rick Paxman, General Dynamics Corp., USA

11:00 AM, Rays and Waves in Wavefront Sensing, Jim Fienup, Univ. of Rochester, USA
4:00 PM, Sequential Diversity Imaging: Phase Diversity with AO Changes as the Diversities, Bob Gonsalves, Tufts Univ., USA

4:30 PM, JWST Integrated System Modeling, Scott Knight, Ball Aerospace and Technologies Corp., USA

1.2 Diffractive and Holographic Optics

Thursday, October 28, 2010

Tutorial Speaker:

1:30 PM, What Is and Is Not a Hologram and Why it Matters, H. John Caulfield, Alabama A&M Univ., USA

Invited Speakers:

2:15 PM, 3-D Optics: From Diffractive to Subwavelength, George Barbastathis; MIT, USA

4:00 PM, Theoretical and Practical Implementation of Novel Nanostructured Diffractive and Micro-Optics, Mohammad R. Taghizadeh, Andrew J. Waddie; Heriot-Watt Univ., UK

4:30 PM, Plasmonic Diffractive Optics - Its Analogy to Classical Diffractive Optics and Use for Subwavelength Metallic Devices, Byoungho Lee¹, Junghyun Park¹, Seung-Yeol Lee¹, Hwi Kim², Seong-Woo Cho¹, Seyoon Kim¹; ¹Seoul Natl. Univ., Republic of Korea, ²Korea Univ., Republic of Korea

1.3 Three-Dimensional Structure Design, Fabrication and Nanopatterning

Wednesday, October 27, 2010

Invited Speakers:

1:30 PM, Active and Passive Nanophotonics for Information Systems Applications, Shaya Fainman, Univ. of California at San Diego, USA

2:00 PM, Nanopatterning Technology and the Future of Semiconductor Devices beyond 32nm, Bruce W. Smith, Rochester Inst. of Technology, USA

Thursday, October 28, 2010

Invited Speakers:

4:00 PM, Understanding Three-Dimensional Meta-Materials, from Refractive Index Concept to Rigorous Photonic Band Theory, Shanhui Fan, Stanford Univ., USA
4:30 PM, 3-D Integration of RF and Photonic Devices for High Frequency Operation, Dennis Prather, *Univ. of Delaware, USA*

**1.4 Optical Design for Biomedical Systems (Joint with FiO 3: Optics in Biology and Medicine)**

Tuesday, October 26, 2010

Invited Speakers:

10:30 AM, Degrees of Freedom in Computational Volume Optics, Rafael Piestun, *Univ. of Colorado, USA*

11:00 AM, Optical Ring Resonator Based Biological and Chemical Sensors, Xudong (Sherman) Fan, Jonathan D. Suter, Yuze Sun, Jing Liu, Hao Li, Karthik R. C. Balareddy; *Univ. of Michigan, USA*

Wednesday, October 27, 2010

Invited Speakers:

4:00 PM, High Resolution Optical Volumetric Imaging of Blood Perfusion with Microcirculation Tissue Beds, Ruikang Wang, *Oregon Health and Science Univ., USA*

4:30 PM, Breaking the Optical Diffusion Limit: Photoacoustic Tomography, Lihong Wang, *Washington Univ. in St. Louis, USA*

**1.5 Optical Design with Unconventional Polarization**

Wednesday, October 27, 2010

Tutorial Speaker:

8:00 AM, Some Applications of the Unified Theory of Coherence and Polarization of Light, Emil Wolf, *Univ. of Rochester, USA*

Invited Speakers:

8:45 AM, Unconventional Polarization States Applied to Projection Imaging, Thomas Brown, *Univ. of Rochester, USA*

1:30 PM, Polarization and the Focusing of Light, Colin Sheppard, *Natl. Univ. of Singapore, Singapore*

2:00 PM, Polarization and Modal Degrees of Freedom for Tight Confinement of Light, Uriel Levy, *The Hebrew Univ. of Jerusalem, Israel*
1.6 Astrophyotonics (joint with FiO 5: Photonics) NEW!

Tuesday, October 26, 2010

Invited Speakers:

4:00 PM, Fibers Are Looking Up: Optical Fiber Transition Structures in Astrophyotonics, Tim Birks¹, Antonio Diez², Jose L. Cruz², Sergio G. Leon-Saval³, Dominic F. Murphy⁴; ¹Univ. of Bath, UK, ²Univ. of Valencia, Spain, ³Univ. of Sydney, Australia, ⁴Univ. of Adelaide, Australia

4:30 PM, Processing in Next Generation Telescope Arrays: Coherent Signal Combining, Pierre Kern, Univ. of Grenoble, France

Wednesday, October 27, 2010

Tutorial Speaker:

8:00 AM, Astrophophotonics: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn, Univ. of Sydney, Australia

Invited Speaker:

9:00 AM, Coronagraphy for Exo-Planetary Detection, Richard Lyon, NASA Goddard Space Flight Ctr., USA

1.7 Adaptive Optics for the Eye (joint with FiO 7: Vision and Color)

Tuesday, October 26, 2010

Invited Speakers:

8:00 AM, Multifunctional Imaging Device for Adaptive Optics Compensation in Humans and Small Animals, Daniel X. Hammer¹, R. Daniel Ferguson¹, Mircea Mujat¹, Ankit H. Patel¹, Nicusor Iftimia¹, T. Y. P. Chui², J. D. Akula², A. B. Fulton²; ¹Physical Sciences Inc., USA, ²Children’s Hospital and Harvard Medical School, USA.

8:30 AM, Designing AO Retinal Imaging Systems for Real World Uses: Issues and Limitations, Steve Burns, Indiana Univ., USA

9:00 AM, Optical Design of Clinical Adaptive Optics Instruments for Retinal Imaging, Alf Dubra, Univ. of Rochester, USA

8:00 AM, Multifunctional Imaging Device for Adaptive Optics Compensation in Humans and Small Animals, Dan Hammer, Physical Sciences Inc., USA

View speakers for 5.6 Photonics and Optics for Energy Efficiency and Sustainability
FiO 2: Optical Sciences

2.1 Attosecond Optics and Technology

Tuesday, October 26, 2010

Tutorial Speaker:

4:00 PM, Carrier to Envelope Offset and Carrier to Envelope Phase—How Their Control Impacts Femtosecond and Attosecond Phenomena, Jean-Claude Diels, Univ. of New Mexico, USA

Invited Speakers:

5:00 PM, High-Order Harmonic Generation on Plasma Mirrors: Toward Attosecond Sources of Second Generation, Fabien Quere, Inst. du CEA Saclay, France

Wednesday, October 27, 2010

Invited Speakers:

8:00 AM, XUV Time-Domain Spectroscopy Using Isolated Attosecond Pulses from Double Optical Gating, Zenghu Chang; Kansas State Univ., USA

9:00 AM, Molecular Orbital Imaging Using Laser Driven Attosecond Emission, Bertrand Carre, SPAM, Inst. du CEA Saclay, France

2.2 Advances in High-Energy Ultrafast Laser Systems

Monday, October 25, 2010

Invited Speakers:

5:00 PM, Advances in Energetic Short-Pulse Fiber Lasers, Michael J. Messerly1, Jay W. Dawson1, John K. Crane1, David J. Gibson1, Constantin Haefner1, Miroslav Y. Shverdin1, Henry H. Phan1, Richard P. Hackel1, Craig W. Siders1, Christopher P. J. Barty1, Matthew A. Prantil2; 1Photon Science and Applications Program, Lawrence Livermore Natl. Lab, USA, 2Lawrence Berkeley Natl. Lab, USA.

5:30 PM, Grating Development for High-Peak-Power CPA Laser Systems, Terrance J. Kessler; Lab for Laser Energetics, Univ. of Rochester, USA.

Tuesday, October 26, 2010
Invited Speakers:

10:30 AM, New Source of Ultra-Broadband Mid-IR Frequency Combs for Spectroscopic Applications, Konstantin Vodopyanov¹, Nick C. Leindecker¹, Alireza Marandi¹, Robert L. Byer¹, Vladimir Pervak²; ¹Stanford Univ., USA, ²Ludwig-Maximilians-Univ. München, Germany

Tutorial Speaker:

1:30 PM, Optical Dispersion Management in Laser Amplifier Systems, Catherine LeBlanc, LULI - École Polytechnique, France

Invited Speakers:

3:00 PM, Development and Operation of Large-Aperture Tiled-Grating Compressors for High-Energy, Petawatt-Class Laser Systems, Jie Qiao, A. Kalb, T. Nguyen, D. Canning, J. Price; Lab for Laser Energetics, Univ. of Rochester, USA

2.3 Laser-Plasma Based Particle Acceleration

Wednesday, October 27, 2010

Tutorial Speaker:

10:30 AM, Laser Plasma Accelerators: Concepts, Progress and Dreams, Wim Leemans, Lawrence Berkeley Natl. Lab, USA

Invited Speakers:

11:15 AM, Acceleration of Electrons by A Laser Wakefield Accelerator (LWFA) Operating in the Self-Guided Regime, Chan Joshi, C. Clayton¹, D. Froula², K. Marsh¹, A. Pak¹, J. Ralph¹; ¹Univ. of California at Los Angeles, USA, ²Lawrence Livermore Natl. Lab, USA

1:30 PM, Recent Advances in Proton Acceleration and Beam Shaping, Marcus Roth¹, V. Bagnoud², T. Burris³, S. Busold¹, T. Cowan³, O. Deppert¹, M. Geissel4, D. P. Grote5,6, K. Harres¹, G. Hoffmeister¹, G. Logan5, F. Nürnberg¹, G. Schaumann¹, M. Schollmeier4, D. Schumacher¹; ¹Technische Univ. Darmstadt, Germany, ²Helmholtzzentrum für Schwerionenforschung, Germany, ³Forschungszentrum Dresden-Rossendorf, Germany, 4Sandia Natl. Labs, USA, 5Lawrence Berkeley Natl. Lab, USA, 6Lawrence Livermore Natl. Lab, USA

2:00 PM, Ion Acceleration with Ultra-Intense Lasers, Anatoly Maksimchuk, Univ. of Michigan, USA

2:30 PM, Particle Acceleration by the Light Pressure of High-Power Laser Pulses, Joerg Schreiber, MPQ, Garching, Germany

2.4 High-Peak-Power THz Field Generation and Applications

Thursday, October 28, 2010
Tutorial Speaker:

1:30 PM, **High-Peak-Power THz Field Generation and Applications**, Keith Nelson, *MIT, USA*

Invited Speakers:

4:00 PM, **High Energy THz Pulse Generation by Tilted Pulse Front Excitation and Its Applications**, János Hebling, József A. Fülöp, László Pálfalvi, Gábor Almási; *Dept. of Experimental Physics, Univ. of Pécs, Hungary*

4:30 PM, **Ultrafast THz Studies of Electronic Dynamics and Correlations in Carbon Nanomaterials**, Robert Kaindl, *Lawrence Berkeley National Lab., USA*

### 2.5 Laser Systems for Fusion and Fast Ignition

**Thursday, October 28, 2010**

Invited Speakers:

8:00 AM, **Progress in Experiments for the National Ignition Campaign**, Brian MacGowan, *Lawrence Livermore Nat'l Lab., USA*

8:30 AM, **Inertial Confinement Fusion Research at the Laboratory for Laser Energetics**, David Meyerhofer, *Lab. for Laser Energetics, Univ. of Rochester, USA*

9:00 AM, **Fast Ignition Integrated Experiments Using Gekko-XII and LFEX Lasers**, Hiroyuki Shiraga, *Inst. of Laser Engineering, Osaka Univ., Japan*

9:30 AM, **Status of the HiPER Project**, Chris Edwards, *Central Laser Facility, Rutherford Appleton Lab, UK*

**FiO 3: Optics in Biology and Medicine**

### 3.1 Optical Trapping and Manipulation

**Tuesday, October 26, 2010**

Invited Speakers:

10:30 AM, **Suppression of Brownian Motion Explores Cooperativity for Single Multi-Subunit Enzymes in Solution**, Yan Jiang¹,², Nick Douglas³, Nick Conley⁴, Eric Miller⁵, Judith Frydman⁶, W.E. Moerner⁷; ¹Chemistry Dept., Stanford Univ., USA, ²Applied Physics Dept., Stanford Univ., USA, ³Biology Dept., Stanford Univ., USA, ⁴Radiology Dept., Stanford Univ., USA
11:30 AM, Optical Sculpting: Changing the Shape of Micromanipulation, Kishan Dholakia, Janelle Shane, Michael Mazilu, Tomas Cizmar; Univ. of St. Andrews, UK

Wednesday, October 27, 2010

10:30 AM, High-Speed Holographic Tweezers and Imaging, Miles Padgett¹, Richard Bowman¹, Daryl Preece¹, Arran Curran¹, Graham Gibson¹, David Carberry², Mervyn Miles²; ¹Univ. of Glasgow, UK, ²Univ. of Bristol, UK

11:30 AM, Applications of Spatial Light Modulators for Optical Trapping and Imaging, Monika Ritsch-Marte, Medizinische Univ. of Innsbruck, Germany

3.2 Microscopy and OCT

Monday, October 25, 2010

4:00 PM, Improving 2-Photon Microscopy by Beam Multiplexing and Extended Excitation Bandwidth, Thomas Pingel, LaVision Biotec, Germany

Tuesday, October 26, 2010

Invited Speakers:

8:00 AM, Nonlinear Optical Tools for Studying Small-Stroke at Microscopic Scales, Nozomi Nishimura, Cornell Univ., USA

Tutorial Speaker:

4:45 PM, Coherence Imaging, Adam Wax, Duke Univ., USA

3.3 Optics for Diagnostics and Therapy

Monday, October 25, 2010

1:30 PM, Monitoring Breast Cancer Tumor Response at Different Timepoints during Pre-Surgical Chemotherapy with Diffuse Optical Spectroscopic Imaging, Albert Cerussi¹, Vaya W. Tanamai¹, Darren Roblyer¹, Shigeto Ueda¹, Amanda F. Durkin¹, Rita S. Mehta², David Hsiang², John Butler², Bruce J. Tromberg¹; ¹Beckman Laser Inst., Univ. of California at Irvine, USA, ²Chao Comprehensive Cancer Ctr., Univ. of California at Irvine, USA

Tuesday, October 26, 2010

1:30 PM, Laser Speckle Imaging of Blood-Flow Dynamics During Laser Surgery of Vascular Birthmarks, Bernard Choi; Univ. of California at Irvine, USA

View speakers for 1.4 Optical Design for Biomedical Systems
FiO 4: Optics in Information Science

4.1 Encoding Optical Information—Nano-Photonics, Diffractive Optics and Refractive Optics for Shaping Optical Signals

Thursday, October 28, 2010

Invited Speakers:

1:30 PM, Fundamental Limits to Optical Components, David Miller, *Stanford Univ., USA*

2:00 PM, Progress towards Windows Performing Forbidden Light-Ray Direction Changes, Johannes Courtial, *Univ. of Glasgow, UK*

2:30 PM, On Breaking The Abbé Diffraction Limit In Optical Nanopatterning, Nicole Brimhall¹, Trisha Andrew², Rajakumar Manthena¹, Mohit Diwekar¹, Rajesh Menon¹; ¹Univ. of Utah, USA, ²MIT, USA.

4.2 Sensing in Higher Dimensions—Theory and Hardware for Computational Imaging

Wednesday, October 27, 2010

Invited Speakers:

10:30 AM, Computational Photography in 4-D, 6-D and 8-D, Ramesh Raskar, *MIT, USA*

Thursday, October 28, 2010

Invited Speakers:

10:30 AM, Spatio-Temporal Processing Methods for Mitigating Bandwidth Issues Associated with Advanced Infrared Sensors, Dean Scribner, *Northrop Grumman, USA*

4.3 Plasmonics and Metamaterials for Information Processing

Wednesday, October 27, 2010

Invited Speakers:
1:30 PM, Infrared Plasmonic Metamaterials for Slow-Light Applications, Gennady Shvets, \textit{Univ. of Texas Austin, USA}

Thursday, October 28, 2010

Invited Speakers:

1:30 PM, Super-Resolution Imaging Based on Interfering Plasmon Waves, Peter So, \textit{MIT, USA}

4:00 PM, Simple Demonstration of Visible Evanescent Wave Enhancement with Far-Field Detection, Rene Lopez, \textit{Univ. of North Carolina at Chapel Hill, USA}

4.4 \textit{Structured Wavefields for Communications and Sensing}

Monday, October 25, 2010

Invited Speakers:

1:30 PM, Effects of Type of Incidence on the Second and Fourth Order Moment Parameters Evaluated in Turbulent Atmosphere, Yahya Baykal, \textit{Cankaya Univ., Turkey}

4:00 PM, Optical Coherence Microscopy Using Bessel Beam, Kye-Sung Lee, \textit{Univ. of Rochester, USA}

5:30 PM, Advanced Studies of ‘Non-Diffracting’ Light Fields, Kishan Dholakia, Jörg Baumgartl, Tomas Cizmar, Xanthi Tsampoula, Frank Gunn-Moore, Michael Mazilu; \textit{Univ. of St. Andrews, United Kingdom.}

4.5 \textit{Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing}

Tuesday, October 26, 2010

Invited Speakers:

10:30 AM, Quantum Inspired Imaging with Compressive Sensing, Ori Katz, Yaron Bromberg, Yaron Silberberg; \textit{Weizmann Inst. of Science, Israel.}

Wednesday, October 27, 2010

Invited Speakers:

4:15 PM, Infrared Spectroscopic Imaging for Label-Free and Automated Histopathology, Rohit Bhargava, Rohith K. Reddy, Jason Ip, Frances N. Pounder, Matthew V. Schulmerich, David Mayerich, Xavier Llora, Rong Kong, Michael J. Walsh; \textit{Univ. of Illinois at Urbana-Champaign, USA}
Thursday, October 28, 2010

Invited Speakers:

10:30 AM, Spatial Light Interference Microscopy (SLIM), Zhuo Wang, Huafeng Ding, Gabriel Popescu; Univ. of Illinois at Urbana-Champaign, USA

FiO 5: Photonics

5.1 Novel Fiber Optical Devices

Tuesday, October 26, 2010

Invited Speakers:

10:30 AM, Self Assembled Periodicity in a Liquid Filled Hollow Optical Fiber, Kyunghwan Oh¹, Hojoong Jung¹, Sohee An¹, Yongmin Jung²; ¹Yonsei Univ., Republic of Korea, ²Optoelectronics Res. Ctr., Univ. of Southampton, UK

10:30 AM, Short-Pulse Fiber Lasers Based on Dissipative Solitons, Frank Wise; Cornell Univ., USA

4:00 PM, Semiconductor Core Optical Fibers, John Ballato; Clemson Univ., USA

Wednesday, October 27, 2010

Invited Speakers:

10:30 AM, Fibers for Dispersion Management in fs Fiber Lasers, Lars Grüner-Nielsen, Kim G. Jespersen, Martin E. V. Pedersen, Bera Pálsdóttir; OFS Denmark, Denmark

4:00 PM, Manipulation of Pulse Duration and Wavelength Conversion in Optical Fibres, William Wadsworth; Univ. of Bath, UK

5.2 Optical Communication

Tuesday, October 26, 2010

Invited Speakers:

4:00 PM, Rate-Adaptive Transmission Techniques for Optical Fiber Systems, Joseph Kahn; Stanford Univ., USA
4:30 PM, Digital Compensation of Fiber Nonlinearities, Guifang Li; CREOL, Univ. of Central Florida, USA

Wednesday, October 27, 2010

Invited Speakers:

10:30 AM, Promising Technologies for Capacity Growth in Future Optical Networks, R. J. Essiambre; Bell Labs, Alcatel-Lucent, USA

11:15 AM, Next Generation 400 Gb/s Transmission, I. B. Djordjevic; Univ. of Arizona, USA

5.3 Integrated Optics

Monday, October 25, 2010

Invited Speakers:

4:00 PM, Monolithic Ge-on-Si Lasers, Lionel Kimerling, Jifeng Liu; MIT, USA

Tuesday, October 26, 2010

Invited Speakers:

8:00 AM, Noise, Broadband Gain, Inverse Stimulated Scattering, and Extreme Value Fluctuations; Recent Developments in Silicon Raman Amplifiers, Bahram Jalali; Univ. of California at Los Angeles, USA

9:00 AM, Nonlinear Mixing in Silicon Waveguides for Short Wave Infrared and Mid-Infrared Applications, Sanja Zlatanovic; Univ. of California at San Diego, USA

Wednesday, October 27, 2010

Invited Speakers:

2:00 PM, Theoretical Investigation of Attractive Optical Force in Periodically-Patterned Silicon Waveguides, Jing Ma, Michelle Povinelli; Univ. of Southern California, USA

5.4 Photonic Sensing Devices

Monday, October 25, 2010

Invited Speakers:

1:30 PM, Long-Term Monitoring of Local Temperature and Strain Changes in a Buried Fiber-Optic Cable Using Brillouin OTDR, Jon Nagel; AT&T Labs, USA
2:30 PM, Raman-Based Distributed Temperature Sensors, Arthur Hartog; Schlumberger, UK

4:30 PM, New Imaging and Sensing Techniques Base on Surface Plasmon Resonance, N. J. Tao, Arizona State Univ., USA

Wednesday, October 27, 2010

Invited Speakers:

8:00 AM, Sensor Challenges for Deep Tissue Imaging, Martin Leahy, Univ. of Limerick, Ireland

5.5 Novel Hybrid Integration NEW!

Tuesday, October 26, 2010

Invited Speakers:

1:30 PM, Hybrid Integration of III-V and Si for Photonic Integrated Circuits, John Bowers; Univ. of California at Santa Barbara, USA

2:30 PM, Active-Passive Photonic Integration with an Eye Toward Large Scale Integration, James Jaques; LGS Innovations, LLC, USA

3:00 PM, Hybrid Chalcogenide/Lithium Niobate, Christi Madsen; Texas A&M Univ., USA

Wednesday, October 27, 2010

Invited Speakers:

8:00 AM, Rare-Earth-Ion Doped Waveguide Amplifiers and Lasers in Alumina and Polymers, Markus Pollnau, Univ. of Twente, Netherlands

9:00 AM, Optimized Nonlinear Optical Molecules for Silicon-Organic-Hybrid Systems, Ivan Biaggio, Lehigh Univ., USA

5.6 Photonics and Optics for Energy Efficiency and Sustainability (joint with FiO 1: Optical Design, Fabrication and Instrumentation) NEW!

Monday, October 25, 2010

Invited Speakers:
1:30 PM, Luminescent Solar Concentrators: From Optical Heat Pumps to Solar Pumped Lasers, C. Rotschild¹, M. Tomes², H. Mendoza¹, T. Carmon², M. Baldo¹; ¹MIT, USA, ²Univ. of Michigan, USA

2:00 PM, Depleted Heterojunction Colloidal Quantum Dot Solar Cells, Illan Kramer, Univ. of Toronto, Canada

2:30 PM, Nanoscale Photon Management for Efficient Photovoltaic Energy Harvesting, Mark Brongersma, Stanford Univ., USA

Tuesday, October 26, 2010

Invited Speakers:

8:00 AM, Organic Semiconductors for Photovoltaic and Light-Emitting Devices: Status and Promise, Bernard Kippelen, School of Electrical and Computer Engineering., Georgia Tech, USA

8:30 AM, Optical Transmission Energy Consumption in the Internet, Dan Kilper, Bell Labs, Alcatel-Lucent, USA

9:00 AM, Photonics and Optics for Energy Efficiency and Sustainability – Is this Green Photonics?, Michael Lebby, Optoelectronics Industry Development Association, USA

View speakers for 1.6 Astrophotonics

View speakers for 6.6 Nonlinear Optics in Micro/Nano-Optical Structures

FiO 6: Quantum Electronics

6.1 Opto-Mechanics and Quantum Measurement

Tuesday, October 26, 2010

Invited Speakers:

10:30 AM, Quantum Back Action in Tabletop Interferometers, Jack Harris, Yale Univ., USA

11:30 AM, Silicon Monolithic Acousto-Optic Modulators, Sunil Bhave, Cornell Univ. USA

4:00 PM, The Engima of Optical Momentum, Stephen M. Barnett; Univ. Strathclyde, UK

4:45 PM, Testing Macroscopic Quantum Superpositions, Dirk Bouwmeester, Univ. of California at Santa Barbara, USA
6.2 Quantum Information and Communications

Monday, October 25, 2010

Invited Speakers:

2:45 PM, Quantum Optics in Wavelength Scale Structures, John Rarity, Univ. of Bristol

4:00 PM, Interference of Photons from Remote Solid-State Sources, A. J. Bennett¹, R. B. Patel¹,², I. Farrer², C. A. Nicoll², D. A. Ritchie², Andrew Shields¹; ‘Toshiba Res. Europe Ltd., United Kingdom, ²Cavendish Lab, Cambridge Univ., UK

Tuesday, October 26, 2010

Invited Speakers:

2:00 PM, Quantum Limits to Lossy Optical Interferometry, Luiz Davidovich; Univ. Federal do Rio de Janeiro, Brazil.

6.3 Non-Linear Imaging (joint with FiO 3: Optics in Biology and Medicine)

Monday, October 25, 2010

Invited Speakers:

1:30 PM, Non-Linear Imaging with Ultrashort Shaped Pulses, Marcos Dantus, Michigan State Univ., USA

2:15 PM, Nonlinear Imaging of Coherent Fields Demetri Psaltis, École Polytechnique Fédérale de Lausanne, Switzerland

3:00 PM, Stimulated Raman Scattering Microscopy for Biology and Medicine, Sunney Xie, Harvard University, USA

6.4 Nonlinearities and Gain in Plasmonics and Metamaterials

Wednesday, October 27, 2010

Invited Speakers:

8:00 AM, Metamaterials and Symmetry, Xiang Zhang, Univ. of California at Berkeley, USA

9:30 AM, Switchable and Nonlinear Metamaterials: Controlling Light on the Nanoscale, Nikolay I. Zheludev, Univ. of Southampton, UK
Thursday, October 28, 2010

Invited Speakers:

10:30 AM, Active Plasmonic Metamaterials, Mikhail A. Noginov, Norfolk State Univ., USA

11:30 AM, Nonlinear Plasmonics, Lukas Novotny, Univ. of Rochester, USA

6.5 Transformation Optics and Cloaking with Metamaterials

Thursday, October 28, 2010

Invited Speakers:

8:00 AM, Transforming Integrated Optics, Jensen Li, City Univ. of Hong Kong, China

8:30 AM, Taming the Fields and Waves with Extreme Metamaterials, Nadar Engheta, Univ. of Pennsylvania, USA

9:00 AM, Active and Tunable Metamaterials, Vladimir M. Shalaev; Purdue Univ., USA

9:30 AM, Molding the Flow of Light with Artificial Optical Materials, Dentcho Genov, Louisiana Tech, USA

6.6 Nonlinear Optics in Micro/Nano-Optical Structures (joint with FiO 5: Photonics)

Thursday, October 28, 2010

Invited Speakers:

8:45 AM, Nonlinear Optical Processes in Subwavelength Optical Waveguides—Revised Fundamentals and Implications, Shahraam Afshar, Univ. of Adelaide, Australia

8:30 AM, Nonlinear Silicon Photonics, Michal Lipson, Cornell Univ., USA

10:30 AM, Nonlinear Silicon Photonics, Michal Lipson, Cornell Univ., USA

11:30 AM, Light Scattering in a Random but Non Diffusive Nonlinear Medium, Jordi Martorell, Inst. de Ciències Fotòniques, Spain

1:30 PM, CMOS Compatible All-Optical Chips, David Moss¹, A. Pasquazi², M. Peccianti², L. Razzari², D. Duchesne², M. Ferrera², S. Chu³, B. E. Little³, R. Morandotti²; ¹Univ. of Sydney, Australia, ²INRS-EMT, Canada, ³Infinera Corp., USA

Tutorial Speaker:

2:30 PM, Phonon Lasers in Cavity Optomechanics, Kerry Vahala, Caltech, USA
6.7 Disorder in Integrated Optical Devices and Circuits

Tuesday, October 26, 2010

Invited Speakers:

1:30 PM, Strong Localization by Disorder in Photonic Crystal Waveguides, Frank Vollmer, Harvard Univ., USA

3:00 PM, Disorder-Induced Multiple Scattering and Light Localization in Photonic Crystal Waveguides, Stephen Hughes, Queen's Univ., Canada

Wednesday, October 27, 2010

Invited Speakers:

1:30 PM, Evolution of Photonic Band-Gap and Lasing from Polycrystalline to Amorphous Photonic Structures, Hui Cao, Yale Univ., USA

3:00 PM, Ultrasensitive Raman Sensor Based on Highly Scattering Porous Structures, Vladislav Yakovlev, Univ. of Wisconsin at Milwaukee, USA

FiO 7: Vision and Color

7.1 Individualized Optical Correction of the Eye

Monday, October 25, 2010

Invited Speakers:

1:30 PM, The Use of Adaptive Optics to Study Optical and Neural Impact on Visual Performance, Geunyoung Yoon, Univ. of Rochester, USA

2:15 PM, Performance of Aspheric IOLs, Susana Marcos, Inst. de Óptica, Spanish Council for Scientific Res., Spain

Tutorial Speaker:

2:45 PM, The Role of the Eye's Aberrations in Vision, Pablo Artal, Univ. de Murcia, Spain

7.2 Emerging in vivo Imaging Techniques for Ocular Imaging (joint with FiO 3: Optics in Biology and Medicine)
Monday, October 25, 2010

Invited Speaker:

4:00 PM, Imaging the Development of Neural Circuits in the Mammalian Retina, Daniel Kerschensteiner; Washington Univ. in St. Louis, USA.

4:30 PM, Multimodal Retinal Imaging, Hao Zhang¹,², Qing Wei¹, Tan Liu¹, Jing Wang¹, Dennis P. Han³, Janice M. Burke³, Shuliang Jiao&sup4;; ¹Univ. of Wisconsin at Milwaukee, USA, ²Northwestern Univ., USA, ³Medical College of Wisconsin, USA, &sup4;Univ. of Southern California, USA

View speakers for 1.7 Adaptive Optics for the Eye

LS Invited Speakers

Check back often as speakers are still being confirmed and updated!

1. Frontiers in Cold Molecules
2. Hybrid Quantum Systems
3. Metrology and Precision
4. Novel Imaging, Spectroscopy and Manipulation in Microstructures
5. Attosecond and Strong Field Physics
6. Chemical Dynamics—Multi-Dimensional Ultrafast Spectroscopy
7. Photophysics of Nanostructured Materials
8. Photophysics of Energy Conversion
9. Single Molecule Approaches to Biology-Inspired Problems
10. Optofluidics in the Near-Field
11. Quantum Enhanced Information Processing
12. Nonlinear Optics
13. Nanophotonics, Photonic Crystals and Structural Slow Light

View Symposia Speakers
View FiO Speakers

1. Frontiers in Cold Molecules

Tuesday, October 26, 2010

Invited Speakers:

4:00 PM, Tunable Excitons in Ordered Arrays of Ultracold Molecules of Optical Lattices, Roman Krems, Univ. of British Columbia, Canada
4:30 PM, Dipolar Effects in an Ultracold Gas of LiCs Molecules, Matthias Weidemeuller, Heidelberg Univ., Germany
Thursday, October 28, 2010

Invited Speakers:

8:00 AM, Manipulation of Ultracold Chemistry, John Bohn, JILA, NIST, Univ. of Colorado, USA

8:30 AM, Implementation of a New Method to Produce Ultracold Polar Molecular Ions, Wade Rellergert, Scott Sullivan, Kuang Chen, Steven Schowalter, Eric R. Huson; Univ. of California at Los Angeles, USA

9:30 AM, Sympathetic Heating Spectroscopy: Probing Molecular Ions with Laser-Cooled Atomic Ions, Ken Brown, Georgia Tech, USA

1:30 PM, Laser Cooling of a Diatomic Molecule, David DeMille, E. S. Shuman, J. F. Barry; Yale Univ., USA

2:00 PM, Testing the Time-Invariance of Fundamental Constants Using Cold, and Not So Cold, Molecules, Rick Bethlem, Vrije Univ., Amsterdam

2. Hybrid Quantum Systems

Wednesday, October 27, 2010

Invited Speakers:

8:00 AM, Hybrid Nanophotonic and Nanomechanical Interfaces for Spin Qubits, Mikhail Lukin, Harvard Univ., USA

8:30 AM, Optical Manipulation and Detection of the Collective Motion and Spin of an Ultracold Atomic Gas, Dan Stamper-Kurn, Univ. of California at Berkeley, USA

9:30 AM, Measurement of Nanomechanical Motion with Precision Sufficient to Detect Zero-Point Motion, K. W. Lehnert, JILA, NIST, Univ. of Colorado, USA

10:30 AM, Quantum Measurement of Phonon Shot Noise Using Optomechanical Systems, Aashish Clerk, McGill Univ., Canada

11:00 AM, Nonlinear Optomechanical Couplings: Tools for Dealing with Solid Mechanical Objects in the Quantum Regime, Jack Sankey, Yale Univ., USA

11:30 AM, Measuring the Quantum Harmonic Oscillator, Andrew Cleland, Univ. of California at Santa Barbara, USA
12:15 PM, Title to Be Announced, Tobias J. Kippenberg, Max-Planck-Inst. fur Quantenoptik, Germany

3. Metrology and Precision Measurements

Invited Speakers:

Wednesday, October 27, 2010

8:00 AM, Precise Determination of h/M(Rb) Using Bloch Oscillations and Atomic Interferometry: A Mean to Deduce the Fine Structure Constant, Francois Biraben, Laboratoire Kastler Brossel, École Normale Supérieure, CNRS, France

8:30 AM, Optical Clock with Lattice-Confined Sr Atoms, Jun Ye, JILA, Univ. of Colorado

9:15 AM, Al+ Optical Clocks for Fundamental Physics, Geodesy, and Quantum Metrology, Till Rosenband, NIST, USA

1:30 PM, New Limit on Lorentz and CPT Violation for Neutrons, Michael Romalis, Princeton Univ., USA

Thursday, October 28, 2010

Invited Speakers:

2:00 PM, Results of Table-Top Fundamental Physics Experiments at Berkeley, Dmitry Budker, Univ. of California at Berkeley, USA

2:45 PM, An Improved Limit on the Permanent Electric Dipole Moment (EDM) of 199Hg, Tom Loftus, Univ. of Washington, USA

4. Novel Imaging, Spectroscopy and Manipulation in Microstructures

Monday, October 25, 2010

Invited Speakers:

4:00 PM, Linear and Nonlinear Optical Nano-Crystallography, Markus Raschke, Univ. of Washington, USA

4:30 PM, 10 kHz Accuracy Spectroscopy in Acetylene-filled Hollow-Core Kagome Fiber and Improved Linewidths, Kristan Corwin Kansas State Univ., USA

Tuesday, October 26, 2010

Invited Speakers:
10:30 AM, Coherent Rydberg Excitation in Microscopic Thermal Vapor Cells, Tilman Pfau, Univ. of Stuttgart, Germany

11:15 AM, Single-Particle Spectroscopy and Manipulation in Optofluidic Devices, Holger Schmidt, Univ. of Southern California

5. Attosecond and Strong Field Physics

Tuesday, October 26, 2010

Invited Speakers:

1:30 PM, Attosecond Physics: Real-Time Tracking of Valence Electron Motion in Atoms, Eleftherios Goulielmakis, Max-Planck-Inst. für Quantenoptik, Germany

2:00 PM, Probing Electron Dynamics by High Harmonic Generation, Markus Guehr, Stanford Univ., USA

Wednesday, October 27, 2010

Invited Speakers:

2:45 PM, High Order Harmonics Driven by 1.5μm Parametric Source: A Tool for Attosecond Science, Caterina Vozzi, Politecnico di Milano, Italy

4:00 PM, Time-Resolved High-Harmonic Spectroscopy of Photochemical Dynamics, Hans Jakob Worner, National Res. Council, Canada

4:45 PM, Ultrafast Dynamics in Helium Nanodroplets Studied by Femtosecond EUV Photoelectron and Ion Imaging, Oliver Gessner, Lawrence Berkeley Natl. Lab, USA

6. Chemical Dynamics—Multi-Dimensional Ultrafast Spectroscopy

Wednesday, October 27, 2010

Invited Speakers:

1:30 PM, Advances in Ultrafast 2-D Spectroscopy, Chris T. Middleton, Martin T. Zanni; Univ. of Wisconsin at Madison, USA

2:00 PM, Multiply Resonant Coherent Multidimensional Spectroscopy, John Wright, Univ. of Wisconsin at Madison, USA

2:45 PM, Watching Chemical Reactions and Dynamics with Ultrafast Multidimensional Infrared Spectroscopy, Carlos R. Baiz, Jessica M. Anna, Robert McCanne, John T. King, Kevin J. Kubarych; Univ. of Michigan, USA
Thursday, October 28, 2010

Invited Speakers:

8:00 AM, Two Dimensional Ultraviolet Spectroscopy of Proteins and Amyloid Fibrils, Jun Jiang, Shaul Mukamel; Univ. of California at Irvine, USA

8:30 AM, Two-Dimensional Electronic Spectroscopy of the Photosystem II Reaction Center, J. A. Myers, K. L. M. Lewis, F. Fuller, P. F. Tekavec, J. P. Ogilvie; Univ. of Michigan, USA

7. Photophysics of Nanostructured Materials

Monday, October 25, 2010

Invited Speakers:

1:30 PM, Photophysical Consequences of Interactions Between Conjugated Chromophores, Lewis Rothberg, Univ. of Rochester, USA

2:00 PM, Effects of Aggregation on the Emission Spectra and Dynamics of Electroluminescent Materials, Linda Peteanu, Carnegie Mellon Univ., USA

2:30 PM, Transient Microwave Conductivity Studies of Poly (3-alkyl thiophene)s and Blends with PCBM, Garry Rumbles, Natl. Renewable Energy Lab., USA

Tuesday, October 26, 2010

Invited Speakers:

8:00 AM, Excitonic Dynamics of Quantum Dots Monitored by Near-Infrared Transient Absorption, Emily Weiss, Northwestern Univ., USA

8:30 AM, Quantum Dot Electron Transfer Probed by Transient Photoluminescence, Marcus Jones; Univ. of North Carolina at Charlotte, USA.

11:00 AM, Two-Dimensional Photon Echo Measurements on CdTe/CdSe Heterostructured Quantum Dots, Shun Shang Lo¹, Roman Vaxenburg², Cathy Y. Wong¹, Efrat Lifshitz², Gregory D. Scholes¹; ¹Univ. of Toronto, USA, ²Russell Berrie Nanotechnology Inst. and Solid State Inst., Israel.

10:30 AM, Mixed Quantum Classical Simulations of Vibrational Excitations in Peptide Helices, Anne Goj, Eric Bittner; Univ. of Houston, USA.

8. Photophysics of Energy Conversion
Wednesday, October 27, 2010

Invited Speakers:

8:00 AM, Multi-Exciton Dissociation Dynamics in CdSe Quantum Dots, Tianquan Lian, Emory Univ., USA

8:30 AM, Inter- and Intra-chain Electronic Coherence in Conjugated Polymers, Greg Scholes, Univ. of Toronto, Canada

9:00 AM, Transient Absorption Studies of Charge Photogeneration in Organic and Dye Sensitized Solar Cells, James Durrant, Imperial College London, UK

9:45 AM, Exciton Diffusion and Interfacial Charge Separation in Photovoltaic Materials Studied by Microwave Conductivity, Tom J. Savenije, Laurens D. A. Siebbeles; Delft Univ. of Technology, Netherlands.

1:30 PM, Spin Signatures of Light Induced Charge Separated States in Polymer-Fullerene Bulk-Heterojunctions: High-Frequency Pulsed EPR Spectroscopy, Oleg Poluektov¹, Salvatore Filippone², Nazario Martin², Andreas Sperlich³, Carsten Deibel³, Vladimir Dyakonov³; ¹Argonne Natl. Lab, USA, ²Univ. Complutense de Madrid, Spain, ³Julius-Maximilians Univ. of Würzburg and Bavarian Ctr. for Applied Energy Res. e. V., Germany

2:00 PM, Optically and Electrically Detected Magnetic Resonance Studies of Organic Light-Emitting Materials and Devices, Joe Shinar, Iowa State Univ., USA.

2:30 PM, Carrier Dynamics of Films of Zinc Phthalocyanine and C60 Measured by Terahertz Time Domain Spectroscopy, Paul Lane, NRL, USA

3:00 PM, Time-Resolved Microwave Conductivity, Nikos Kopidakis, Natl. Renewable Energy Lab., USA

9. Single Molecule Approaches to Biology-Inspired Problems

Wednesday, October 27, 2010

Invited Speakers:

10:30 AM, Optical Chirality and Superchiral Fields, Adam Cohen, Harvard Univ., USA

11:00 AM, Local Dynamics Probing by Real-Time Single-Particle Tracking Spectroscopy, Li Sun, Princeton Univ., USA

11:30 AM, Exploring Chromatin Biochemistry with Single-Molecule Fluorescence Diffusometry, Hideo Mabuchi, Stanford Univ., USA
4:00 PM, Bacteriophager Lambda Life Cycle: The View from the Single Virus, Ido Golding, Baylor College of Medicine, USA

4:30 PM, Imaging Dynamic Events Inside Living Cells: Intracellular Degradation of LDL, Christine Payne, Georgia Tech, USA

5:00 PM, Time-Resolved 3D Tracking of Individual Quantum Dot Labeled Proteins in Live Cells via Confocal Feedback, Jim Werner, Los Alamos Natl. Lab, USA

Thursday, October 28, 2010

Invited Speakers:

10:30 AM, Single Molecule Photon Trajectories and Transition Paths in Protein Folding, Bill Eaton, NIH and Natl. Inst. of Diabetes and Digestive and Kidney Diseases, USA

11:00 AM, Title to Be Announced, Norbert Scherer, Univ. of Chicago, USA

11:30 AM, Superresolution Optical Fluctuations Imaging (SOFI), Shimon Weiss, Univ. of California at Los Angeles, USA

10. Optofluidics in the Near-Field

Tuesday, October 26, 2010

Invited Speakers:

1:30 PM, The Reactive Sensing Principle (RSP) in Optically Resonant Biosensing and Nanoparticle Trapping within a WGM Carousel, Stephen Arnold, Siyka I. Shopova, Stephen Holler; Polytechnic Inst. of New York Univ., USA.

2:00 AM, Title to Be Announced, Sudeep Mandal, Cornell Univ., USA

2:30 PM, Surface Optofluidics, Andreas E. Vasdekis¹, Wuzhou Song¹, Julien R. Cuennet¹, Luciano De Sio², Jae-Woo Choi¹, Demitri Psaltis¹; ¹École Polytechnique Fédérée de Lausanne, Switzerland, ²Univ. of Calabria., Italy.

3:00 PM, Optofluidic Ring Resonator Lasers, Xudong (Sherman) Fan, Yuze Sun, Jonathan D. Suter, Chung-Shieh Wu, Wonsuk Lee, Balareddy Chinna Reddy Karthik; Univ. of Michigan, USA.

4:00 PM, Optofluidic Nano-Plasmonics for Biochemical Sensing, Shaya Y. Fainman, L. Pang, B. Slutsky, J. Ptasinski, L. Feng, M. Chen; Univ. of California at San Diego, USA.

4:30 PM, Plasmonics for Optical Manipulation and Enhanced Spectroscopy, Kenneth Crozier, Harvard Univ., USA
11. Quantum Enhanced Information Processing

Wednesday, October 27, 2010

Invited Speakers:

10:30 AM, Entanglement and Quantum Algorithms with Superconducting Circuits, Robert Schoelkopf, Yale Univ., USA

11:00 AM, Benchmarking Quantum Information Processing Devices, Raymond Laflamme, Univ. of Waterloo, Canada

11:30 AM, Coherent Splitting, Rocking and Blinding of Single Atoms in an Optical Lattice, Dieter Meschede, Inst. für Angewandte Physik der Univ. Bonn Wegelerstr, Germany

4:00 PM, Progress towards Scalable Quantum Information Processing with Trapped Ions, David Hanneke, NIST, USA

5:00 PM, Quantum Illumination for Improved Detection, Imaging, and Communication, Jeffrey Shapiro, MIT, USA

Thursday, October 28, 2010

Invited Speakers:

10:30 AM, Quantum Teleportation And Quantum Information Processing, Akira Furusawa, Univ. of Tokyo, Japan

11:00 AM, Integrated Quantum Photonics, Jeremy L. O'Brien; Univ. of Bristol, UK

12. Quantum Nonlinear Optics

Tuesday, October 26, 2010

Invited Speakers:

8:00 AM, Toward Single-Photon Nonlinear Optics via Self-Assembled Ultracold Atoms, Daniel J. Gauthier, Duke Univ., USA

8:30 AM, Prospects for Strong Cavity Free Single Atom Nonlinearity at the Few Photon Level, Gerd Leuchs; Max-Planck-Inst. for the Science of Light and Inst. of Optics, Univ. Erlangen-Nuremberg, Germany.

1:30 PM, Spatial Light Modulators, a Tool for Measuring the Quantum Entanglement of Transverse Modes, Miles Padgett, Univ. of Glasgow, UK
2:00 PM, Gas-Phase Integrated-Photonics Quantum Technologies, Andrew White, Univ. of Queensland, Australia

13. Nanophotonics, Photonic Crystals and Structural Slow Light

Thursday, October 28, 2010

Invited Speakers:

10:30 AM, Cavity Quantum Electrodynamics with Quantum Dots, Antonio Badolato, Univ. of Rochester, USA

8:00 AM, Spontaneous and Stimulated Emission of Light into Surface Plasmon Modes, Pierre Berini, Univ. of Ottawa, Canada

8:30 AM, Enhancing Light-Matter Interactions in Nanophotonic Structures by Slow Light, Jesper Moerk, Technical Univ. of Denmark, Denmark

11:00 AM, Novel Light-Guiding Properties in Photonic Crystals, R. Hamam, I. Celanovic, Z. Wang, Y. Chong, J.d. Joannopoulos, Marin Soljacic; MIT, USA.

Special Symposia at Frontiers in Optics 2010/Laser Science XXVI

Check back often as speakers are still being confirmed and updated!

Arthur Ashkin Honorary Symposium
Industrial Physics Forum
Laser Science Symposium on Undergraduate Research
Symposium on Optical Communications

Arthur Ashkin Honorary Symposium

Symposium organizers: Mihaela Dinu¹, Mara Prentiss², Steve Rolston³; ¹Bell Labs, Alcatel-Lucent, USA; ²Harvard Univ., USA, ³Univ. of Maryland at College Park, USA

This symposium commemorates Arthur Ashkin's contributions to the understanding and use of light pressure forces on the 40th anniversary of his seminal paper "Acceleration and trapping of particles by radiation pressure.” Light pressure forces have served as the foundation for many cutting-edge research fields, such as work with optical tweezers, trapping of neutral particles and Bose-Einstein condensation. It is not an overstatement to say that the discovery and understanding of light pressure forces has led to a renaissance in atomic and molecular physics
as well as optical science. Several historical overviews as well as new research that rest upon Arthur Ashkin's foundational work will be presented. We invite all conference attendees to help us honor Art and gain a deeper understanding of the far-reaching impact of his work in light-matter interactions.

Read the [OPN article](https://www.osa.org/publications/opn/articles/2010/03/01/02) by McGloin and Reid (March 2010) about the 40th anniversary of Ashkin’s seminal paper “Acceleration and trapping of particles by radiation pressure.”

Invited Speakers include:

**Tuesday, October 26, 2010**

1:30 PM, Optical Trapping and Manipulation of Small Neutral Particles Using Lasers, Arthur Ashkin; *Alcatel-Lucent Bell Labs, USA*

1:55 PM, The Biophysics of Gene Regulation, Studied One Molecule at a Time, Steven M. Block; *Stanford Univ., USA*

2:20 PM, Title to Be Announced, James Gordon P.; *Consultant, Bell Labs, USA*

2:45 PM, Non-conservative Forces in Optical Tweezers, David G. Grier; *New York Univ., USA*

3:05 PM, Torsional Studies Of Single Biological Molecules, Michelle Wang; *Cornell Univ., USA*

4:00 PM, The Man and His Science, John Bjorkholm; *Consultant, USA*

4:25 PM, A Subjective History of Laser Cooling, Hal Metcalf; *Stony Brook Univ., USA*


5:15 PM, Laser Cooling and Trapping the Most Magnetic Atom, Dysprosium, Benjamin Lev, Mingwu Lu, Seo Ho Youn; *Univ. of Illinois at Urbana-Champaign, USA*

**Industrial Physics Forum**

*Symposium organizers: OSA and AIP Corporate Associates*
The Industrial Physics Forum (IPF) brings together invited speakers to address relevant and timely topics in the industrial sector. In celebration of LaserFest 2010, this 52nd IPF is themed "Applications of Laser Technology". Three themed sessions range in topic from biomedical applications to environmental applications to metrology. A special Frontiers in Physics session addresses the most exciting physics research going on today, regardless of field.

Invited Speakers Include:

**Monday, October 25, 2010**

*Biomedical Applications of Lasers*

1:30 PM, **Laser Refractive Cataract Surgery with the LenSx Laser**, Michael Karavitis, *Lens X, USA*

2:00 PM, **Applications of Table Top Lasers Developed from the FEL**, David Piston, *Vanderbilt Univ., USA*

2:30 PM, **From Photonics to Genomics: Lasers and Imaging Technology Enables Next-Generation DNA Sequencing**, Suzanne Wakelin; *Ilumina, USA*.

3:00 PM, **Biomedical Imaging with Optical Coherence Tomography**, James Fujimoto, *MIT, USA*

*Environment Applications of Lasers*

4:00 PM, **NASA’s Space Lidar Measurements of Earth and Planetary Surfaces**, Jim Abshire, *NASA Goddard Space Flight Ctr., USA*

4:30 PM, **The Physics and Technology of Quantum Cascade Lasers**, Federico Capasso, *Harvard Univ., USA*

5:00 PM, **Tunable Infrared Laser Measurements of Industrial Process and Product Emissions**, Charles Kolb, *Aerodyne Res., USA*

5:30 PM, **Laser Remote Sensing of the Earth: Calipso and beyond**, Carl Weimer, *Ball Aerospace, USA*

**Tuesday, October 26, 2010**

*Laser Applications in Metrology*

8:00 AM, **Use of Lasers in Time and Frequency Applications (or Metrology)**, Scott Diddams, *NIST, USA*

8:30 AM, **Laser Fuse Processing for Advanced Memory Designs**, Joohan Lee, *GSI Laser Systems, USA*
9:00 AM, Dynamic Interferometry for on-Machine Metrology, Michael North Morris, 4D Technology, USA

9:30 AM, The Electronic Kilogram and Lasers, Richard Steiner, NIST, USA

Frontiers in Physics

10:30 AM, Viewing the High-Energy Universe with the Fermi Gamma-ray Space Telescope, Peter Michelson, SLAC, USA

11:30 AM, Epitaxial Graphene: Designing a New Electronic Material, Walter de Heer, Georgia Tech, USA

12:00 PM, The Status of the CERN Large Hadron Collider (LHC), Dan Green, Fermilab, USA

11:00 AM, Quantum Entanglement and Information, Chris Monroe, Univ. of Maryland at College Park, USA

Laser Science Symposium on Undergraduate Research

Symposium organizer: Harold Metcalf, Stony Brook Univ., USA

This special DLS annual symposium is rapidly becoming one of the most successful DLS traditions (this year's is the 10th of a series that began at the Long Beach meeting in 2001). During the past several years the number of undergraduates presenting papers has grown from only 10 to more than 40, and the talks have been of outstanding quality, some absolutely stellar. Last year's posters were outstanding as well, and generated a great deal of lively interest and on-the-spot discussion. This year's symposium will consist of afternoon poster and oral sessions. The event provides an opportunity for some of the student members of our community, who are already among the finest young scientists to be found anywhere, to present their work before an audience of their peers as well as the larger optics community. All are invited and encouraged to attend the sessions.

Click here to view the complete Laser Science Symposium on Undergraduate Research.

Symposium on Optical Communications

Symposium organizers: Karl Koch¹, Colin McKinstrie²; ¹Corning Inc., USA, ²Bell Labs, Alcatel-Lucent, USA
In 2009, Charles Kuen Kao was awarded a Nobel Prize in Physics “for groundbreaking achievements concerning the transmission of light in fibers for optical communications.” (See http://nobelprize.org/nobel_prizes/physics/laureates/2009/press.html.)

In recognition of this honor, there will be a special symposium on optical communications. An illustrious collection of invited speakers will review the history and physics of optical fiber communication systems, from the first demonstration, in which a video signal was transmitted over 20 meters, to contemporary systems, which transmit information at rates of 10 gigabits per second and higher over distances of thousands of kilometers.

Invited Speakers include:

**Wednesday, October 27, 2010**

1:30 PM, **Historical Overview of Optical Communications**, Tingye Li; *AT&T Labs, USA*

2:00 PM, **Development of Low-Loss Fibers**, P. Schultz; *Corning, USA*

2:30 PM, **Title to Be Announced**, David Payne; *Univ. of Southampton, USA*

4:00 PM, **Development of Semiconductor DFB Lasers and Modulators**, T. Koch; *Lehigh Univ., USA*

4:30 PM, **Solitons, Nonlinearities and Noise in Long-Haul Optical Transmission Systems**, L. Mollenauer; *Bell Labs, USA*

5:00 PM, **Integrated Optics in Optical Communication Systems**, Hiroshi Takahashi; *NTT Photonics Labs, Japan*

5:30 PM, **Capabilities of the Undersea Telecommunications Industry**, Neal S. Bergano; *Tyco Telecommunications, USA*

**Short Courses**

**Register Now!**

Short Courses are designed to increase your knowledge of a specific subject while offering you the experience of experts in industry and academia. Top-quality instructors stay current on the subject matter required to advance your research and career goals. An added benefit of attending a Short Course is the availability of continuing education units (CEUs).

**Continuing Education Units (CEUs)**

Demonstrate your commitment to continuing education and advancement in the optical field by earning continuing education units (CEUs). The CEU is a nationally recognized unit of measure for continuing education and training programs that meet established criteria. Certificates
awarding CEUs are presented to all individuals who complete a Short Course, CEU form and course evaluation. Forms will be available on-site and certificates will be mailed to participants.

Registration

Each Short Course requires a separate fee. Paid registration includes admission to the course and one copy of the Short Course Notes. Advance registration is advisable. The number of seats in each course is limited, and on-site registration is not guaranteed.

**Free Offer to Student Members.** The FiO sponsoring organizations will offer student members of APS or OSA limited free Short Course registration. Free student member course registration will begin immediately after the pre-registration deadline of September 28, 2010. There will not be free student registration for sold-out courses, and on-site registration is not guaranteed. Register early to guarantee your seat at a Short Course.

2010 Courses

*Sunday, October 24, 2010, 9:00 a.m.-12:30 p.m.*

NEW **SC189.** Photonic Quantum-Enhanced Technologies, Ian Walmsley; *Univ. of Oxford, UK*

**SC306.** Exploring Optical Aberations, Virendra N. Mahajan \(^1,2\); \(^1\)Aerospace Corp., USA, \(^2\)College of Optical Sciences, Univ. of Arizona, USA

**SC321.** Principles of Far-Field Fluorescence Nanoscopy, Andreas Schoenle, Stefan Hell; Max Planck Inst. for Biophysical Chemistry, Germany

*Sunday, October 24, 2010, 1:30 p.m.–5:00 p.m.*

**SC323.** Latest Trends in Optical Manufacturing, Paul Dumas; *QED Technologies Inc., USA*

**SC324.** Plasmonics, Stefan Maier; Experimental Solid State Group, Dept. of Physics, Imperial College London, UK

NEW **SC354.** Compressive Sensing, Kevin Kelly; *Rice Univ., USA* - CANCELLED

NEW **SC355.** Attosecond Science, Paul Corkum; *Natl. Res. Council of Canada, Canada* - CANCELLED

2010 Exhibitor & Sponsor List

- 4D Technology Corporation
- ALPAO
- American Elements
Special Events

OSA Divisional and Technical Groups Meetings

What’s Hot in Optics Today?

FiO/LS Welcome Reception

Plenary Session and Awards Presentation

Industrial Physics Forum

VIP Industry Leaders Networking Event: Connecting OSA Corporate Members and Young Professionals

Joint FiO/LS Poster Sessions

OSA Fellow Members Lunch

Meet the Editors of the APS Journals

Industrial Physics Forum Corporate Reception

OSA Member, Family and Friends Special Events

Minorities and Women in OSA (MWOSA) Tea

Division of Laser Science Annual Business Meeting

OSA’s Annual Business Meeting
OSA Member LaserFest Reception

Industrial Physics Forum

Laser Science Banquet

Science Educators Day

FiO Postdeadline Session

Young Professionals and Student Activities

Omega Laser Facility tour at the Laboratory for Laser Energetics of the University of Rochester

Young Professional and Student Activities

OSA Member, Family, & Friends Program Events
OSA Divisional and Technical Groups Meetings
Network with peers, meet group leaders, and get involved in planning future group activities by attending technical group and/or division meetings during FiO. The division meetings will encompass the technical groups affiliated with the division. Should you have any suggestions for any of the technical group activities, contact the respective technical group chair with your input.

Saturday, October 23, 12:30 p.m. - 1:00 p.m.
Class of ’62 Auditorium, Univ. of Rochester
Vision and Color Division Business Meeting

Monday, October 25, 12:00 p.m. -1:30 p.m.
Grand Ballroom F/G, Hyatt Regency Rochester
Biomedical Optics Division Meeting

The chief topic of conversation will be requesting input on the design and implementation of an online community that links the new Biomedical Optics Express journal with the Biomedical Optics technical division. Please RSVP to Mindy Halpert at mhalpert@osa.org if you are interested in attending.

Tuesday, October 26, 7:00 p.m. – 8:00 p.m.
Grand Ballroom D, Hyatt Regency Rochester
Joint meeting of the OSA Fabrication, Design and Instrumentation Division and the Rochester OSA Local Section

Better Specification of Aspheric Shapes, Greg Forbes, QED Technologies, Inc., Australia
Modifying a widely used convention is a real challenge. This is especially so when it impacts on multiple groups, in our case, on optical designers, fabricators, and metrologists. Aspheric optics are an evolving technology that is currently burdened by the increasingly inadequate convention of expressing a rotationally symmetric asphere’s sag as the sum of a conic component and an additive polynomial. When more than just a few terms appear in the polynomial, this becomes problematic and ultimately unworkable. The associated coefficients are unintuitive and inefficient. This leads to error-prone communications and a lack of easy options to appreciate the difficulty of manufacturing any particular asphere. Thankfully, the design and manufacture of increasingly complex aspheres is facilitated by a modified representation that is also ideal for exploiting cost-effective shapes.
In particular, an orthogonalised representation gives a description that functions with fewer coefficients and fewer digits—typically using only one third the number of digits for current designs—and allows easy interpretations and sanity checks as well as more direct assessments of manufacturability. Examples are presented to motivate us to make this change sooner rather than later.

Greg Forbes was on the faculty of The Institute of Optics at the University of Rochester for about ten years until the mid 90’s. He returned to Australia as a Research Professor in Physics at Macquarie
University in Sydney. For the last ten years he has been Senior Scientist at QED Technologies. He lives in Sydney but regularly comes to visit and work with his colleagues and friends in Rochester.

What’s Hot in Optics Today?

Sunday, October 24, 4:00 p.m.–6:00 p.m.
Lilac Ballroom North and South, Rochester Riverside Convention Center

What’s hot in optics today? Find out what scientific and technical advances are being made over the entire field of optics. The division Chairs of OSA’s technical groups will be presenting recent advancements in their respective technical areas. The overviews highlight recent developments in optics and are designed to be informative and accessible even to the nontechnical attendee.

- **What’s Hot in Bio-Medical Optics**, Adam Wax; *Duke Univ., USA*
- **The Role of Optics in “Optical Communications”**, Juerg Leuthold; *Univ. of Karlsruhe, Germany*
- **Fabrication, Design and Instrumentation: Bio-Optical Design**, R. John Koshel; *Photon Engineering LLC and College of Optical Sciences/Univ. of Arizona, USA*
- **What’s Hot in Information Acquisition, Processing and Display**, David Brady; *Duke Univ., USA*
- **Fabrication, Design and Instrumentation: Bio-Optical Design**, R. John Koshel; *Photon Engineering LLC and College of Optical Sciences/Univ. of Arizona, USA*
- **What’s Hot in Information Acquisition, Processing and Display**, David Brady; *Duke Univ., USA*
- **Extreme Light Sources: From Artificial Sun to New Planets**, Irina Sorokina; *Norwegian Univ. of Science & Technology, Norway*
- **Vision and Color: Mapping the Visual Cortex**, Alex Wade; *Smith-Kettlewell Eye Res. Inst., USA*

Welcome Reception

Sunday, October 24, 6:00 p.m.–7:30 p.m.
Riverside Court and Galleria Lobby, Rochester Riverside Convention Center

Free to all Technical Conference Attendees: Get the FiO 2010/LS XXVI meeting off to a great start by attending the welcome reception! Meet with colleagues from around the world and enjoy light hors d’oeuvres.

Plenary Session and Awards Presentation

Monday, October 25, 8:00 a.m.–12:00 p.m.
Lilac Ballroom North and South, Rochester Riverside Convention Center

The 2010 Joint FiO/LS Awards Ceremony and Plenary Session will feature two world-renowned speakers. See the [plenary page](#) for detailed descriptions of the speakers and their presentations.

Industrial Physics Forum
Monday, October 25, 1:30 p.m. - 6:00 p.m.
Tuesday, October 26, 8:00 a.m. - 12:00 p.m.
*Highland J, Rochester Riverside Convention Center*

**Symposium organizers: OSA and AIP Corporate Associates**

The Industrial Physics Forum (IPF) brings together **invited speakers** to address relevant and timely topics in the industrial sector. In celebration of LaserFest 2010, this 52nd IPF is themed "Applications of Laser Technology". Three themed sessions range in topic from biomedical applications to environmental applications to metrology. A special Frontiers in Physics session addresses the most exciting physics research going on today, regardless of field.

**VIP Industry Leaders Networking Event: Connecting OSA Corporate Members and Young Professionals**

Tuesday, October 26, 8:00 a.m.–9:30 a.m. - **Free of Charge** and includes a Hot Buffet Breakfast
*Grand Ballroom E & F, Hyatt Regency Rochester*

Join OSA Corporate Members for an event that puts Young Professionals in contact with highly successful OSA members. After an informal networking session, each participant will have the opportunity for a brief visit with each corporate member to discuss careers, industry trends or any other topic. Corporate member participants include companies such as CVI Melles Griot and Toptica.

*Space is limited.* Members of OSA’s Young Professionals program will be given registration priority, but any recent graduate is welcome to RSVP.

To RSVP or to join the Young Professionals program, email April Zack at azack@osa.org.

**Joint FiO/LS Poster Sessions**

Tuesday, October 26, 12:00 p.m.–1:30 p.m.
Wednesday, October 27, 12:00 p.m.–1:30 p.m.
*Empire Hall, Rochester Riverside Convention Center*

Poster presentations offer an effective way to communicate new research findings and provide an opportunity for lively and detailed discussion between presenters and interested viewers. Please stop by the exhibit hall to enjoy the poster sessions.

**OSA Fellow Members Lunch**

Tuesday, October 26, 12:00 p.m. – 1:30 p.m.
*Grand Ballroom A & B, Hyatt Regency Rochester*

(Sponsored by the OSA Foundation)
All Fellow members are welcome, please RSVP via email at rsvp@osa.org by October 8, 2010. A RSVP is needed to reserve your space.

**Meet the Editors of the APS Journals**

Tuesday, October 26, 3:30 p.m.–5:00 p.m.  
*Riverside Court, Rochester Riverside Convention Center*

The Editors of the APS journals cordially invite you to join them for conversation and refreshments. Your questions, criticisms, compliments, and suggestions about the journals are welcome. We hope you will be able to join us.

**Industrial Physics Forum Corporate Reception**

Hosted by OSA and AIP Corporate Associates  
Tuesday, October 26, 4:00 pm – 5:00 pm  
*Empire Hall, Rochester Riverside Convention Center*

Join your colleagues for a special invitation only reception for conference and exhibit attendees in the corporate community. Exhibitors, OSA and AIP Corporate Members, Industrial Physics Forum attendees and others will have time to connect with company associates and meet new business partners during this hors d'oeuvre hour. RSVP required by October 8 to cam@osa.org.

**Minorities and Women in OSA (MWOSA) Tea**

Tuesday, October 26, 4:30 p.m. – 5:30 p.m.(Free of Charge)  
*Grand Ballroom E & F, Hyatt Regency Rochester*

Every year OSA features a speaker who discusses current issues and trends in the field. Everyone is welcome to attend; refreshments will be served! Check back soon for details. Questions? Email mwosa@osa.org.

**Division of Laser Science Annual Business Meeting**

Tuesday, October 26, 6:00 p.m.–7:00 p.m.  
*Highland H, Rochester Riverside Convention Center*

All members and interested parties are invited to attend the annual business meeting of the Division of Laser Science (DLS). The DLS officers will report on the activities of the past year and on plans for the future. Questions will be taken from the floor. This is your opportunity to help define the operations of the DLS and the LS Conference.
OSA’s Annual Business Meeting

Tuesday, October 26, 6:00 p.m.–7:00 p.m.
Highland A, Rochester Riverside Convention Center

Learn more about OSA and join the OSA Board of Directors for the Society’s annual business meeting. The 2009 activity reports will be presented and the results of the Board of Directors election will be announced. View the slate of candidates and vote.

OSA Member LaserFest Reception

Tuesday, October 26, 7:00 p.m. - 8:30 p.m.- Free Event for all OSA Members
Lilac Ballroom North and South, Rochester Riverside Convention Center

OSA Members are invited to a special reception recognizing LaserFest, the celebration of the 50th anniversary of the laser. This free event is a great opportunity to meet friends and have a relaxing good time. Beverages and delicious appetizers will be served; please bring your conference registration badge or OSA membership card. If you join OSA on-site, please bring your receipt.

Laser Science Banquet

Tuesday, October 26, 7:00 p.m.–10:00 p.m.
Grand Ballroom A & B, Hyatt Regency Rochester

Join your colleagues for the annual LS Banquet. Tickets are required for this event and can be purchased during registration for US $50. There is a limited quantity of tickets and tickets must be purchased by 12:00 p.m. on Monday, October 25.

FiO Postdeadline Papers

Wednesday, October 27, 7:00 p.m. – 8:30 p.m.
TBD, Rochester Riverside Convention Center

The FiO 2010 Technical Program Committee accepted a limited number of postdeadline papers for presentation. The purpose of postdeadline sessions is to give participants the opportunity to hear new and significant material in rapidly advancing areas. Only those papers judged to be truly excellent and compelling in their timeliness were accepted. More information, including the schedule and locations, will be posted in the weeks preceding the conference.

LaserFest: Celebrating 50 years of Laser Innovation
Tour the Omega Laser Facility at the Univ. of Rochester's Laboratory for Laser Energetics (LLE)

Friday, October 29, 9:00 a.m. – 10:30 a.m.
Free of Charge

Transportation provided:

Buses depart from Rochester Riverside Convention Center.
9:00 a.m.

Space is limited!

Duration of Tour:
The tour will take 1 ½ hours including travel time to and from Laboratory. Buses will return you to the Rochester Riverside Convention Center.

Registration Deadline:
Limited seats are available – Register on-site until October 26, 2010

All Frontiers in Optics (FiO) and Laser Science (LS) Conference attendees are invited to tour the internationally renowned Omega Laser Facility at the University of Rochester’s Laboratory for Laser Energetics (LLE).

About the facility: In a steady march toward thermonuclear ignition and achievement of energy gain, the Laboratory for Laser Energetics has conducted inertial confinement fusion experiments since the early 1970’s. Inertial confinement fusion involves heating and compressing fusion fuel that is exposed to intense laser or particle beams. A small spherical target containing fusion fuel is subjected to intense irradiation by high-power-energy sources that implode the target, compressing the fuel while heating the central core to thermonuclear temperatures. During the fall of 2009 and into the spring of 2010, LLE successfully developed and tested a technique to fill room-temperature, glass targets with deuterium–tritium (DT) fuel to 10 atm as is required for diagnostic purposes at the National Ignition Facility (NIF).

See the two lasers: OMEGA and OMEGA EP

- OMEGA stands 10 meters tall and is approximately 100 meters in length. This system delivers pulses of laser energy to targets in order to measure the resulting nuclear and fluid dynamic events. OMEGA’s 60 laser beams focus up to 40,000 joules of energy in approximately one billionth of a second onto a target that measures less than 1 millimeter in diameter.
- OMEGA EP (extended performance) is an addition to OMEGA and extends the performance and capabilities of the OMEGA Laser System. It provides pulses having multikilojoule energies, picosecond pulse widths, petawatt powers, and ultrahigh intensities exceeding 1020 W/cm2. These beams are delivered to targets within the OMEGA target chamber, as well as an
independent chamber within the OMEGA EP target area. The new laser supports a wide variety of target-irradiation conditions when coupled to OMEGA or operated in stand-alone mode.

- Please visit [LLE's website](http://www.llnl.gov) for more detailed information.
### Agenda of Sessions — Sunday, October 24

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 a.m.–4:00 p.m.</td>
<td><strong>OSA Student Chapter Leadership Meeting</strong>, Bausch, Carlson and Douglass, Radisson Hotel Rochester Riverside</td>
</tr>
<tr>
<td>7:00 a.m.–6:00 p.m.</td>
<td><strong>Registration</strong>, Galleria, Rochester Riverside Convention Center</td>
</tr>
<tr>
<td>9:00 a.m.–12:30 p.m.</td>
<td><strong>SC189. Photonic Quantum-Enhanced Technologies</strong>, Ian Walmsley; <strong>SC306. Exploring Optical Aberations</strong>, Virendra N. Mahajan; <strong>SC321. Principles of Far-Field Fluorescence Nanoscopy</strong>, Andreas Schoenle, Locations will be provided at registration</td>
</tr>
<tr>
<td>12:30 p.m.–1:30 p.m.</td>
<td>Lunch Break (on your own)</td>
</tr>
<tr>
<td>1:30 p.m.–5:00 p.m.</td>
<td><strong>SC323. Latest Trends in Optical Manufacturing</strong>, Paul Dumas; <strong>SC324. Plasmonics</strong>, Stefan Maier; <strong>SC354. Compressive Sensing</strong>, Kevin Kelly; <strong>SC355. Attosecond Science</strong>, Locations will be provided at registration</td>
</tr>
<tr>
<td>4:00 p.m.–6:00 p.m.</td>
<td><strong>What's Hot In Optics?</strong> Lilac Ballroom North and South, Rochester Riverside Convention Center</td>
</tr>
<tr>
<td>6:00 p.m.–7:30 p.m.</td>
<td><strong>FiO/LS Welcome Reception</strong>, Galleria Lobby/Riverside Court, Rochester Riverside Convention Center</td>
</tr>
<tr>
<td>7:30 p.m.–8:30 p.m.</td>
<td><strong>OSA Division and Technical Group Meetings</strong>, Exact times and locations are listed on the Update Sheet</td>
</tr>
</tbody>
</table>

### Key to Shading

- Frontiers in Optics
- Laser Science
- Joint
## Agenda of Sessions — Monday, October 25

<table>
<thead>
<tr>
<th>Time</th>
<th>Highland A</th>
<th>Highland B</th>
<th>Highland C</th>
<th>Highland D</th>
<th>Highland E</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 a.m.–6:00 p.m.</td>
<td>Registration, Galleria, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 a.m.–12:00 p.m.</td>
<td>2010 Joint FiO/LS Awards Ceremony and Plenary Session, Lilac Ballroom North and South, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.–10:30 a.m.</td>
<td>Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–2:00 p.m.</td>
<td>LSMA• Laser Science Symposium on Undergraduate Research Posters, Riverside Court, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>Lunch (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>FMA • Photonics and Energy I</td>
<td>LSMB • Laser Science Symposium on Undergraduate Research I</td>
<td>FMB • Structured Wavefields for Communications and Sensing I (ends at 3:15 p.m.)</td>
<td>FMC • Photonic Sensor I</td>
<td>FMD • Individualized Optical Correction of the Eye</td>
</tr>
<tr>
<td>3:30 p.m.–4:00 p.m.</td>
<td>Coffee Break, Highland Ballroom Foyer, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.–6:00 p.m.</td>
<td>FMH • Silicon Photonics</td>
<td>LSMC • Laser Science Symposium on Undergraduate Research II (ends at 6:30 p.m.)</td>
<td>FMI • Structured Wavefields for Communications and Sensing II</td>
<td>FMJ • Photonic Sensor II</td>
<td>FMK • Emerging in vivo Imaging Techniques for Retinal Imaging (ends at 5:30 p.m.)</td>
</tr>
<tr>
<td>6:30 p.m.–8:30 p.m.</td>
<td>OSA/SPS Student Member Welcome Reception, Temple Bar &amp; Grille, 109 East Avenue, Rochester, NY, Phone: 585.232.6000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Key to Shading
- Frontiers in Optics
- Laser Science
- Joint
<table>
<thead>
<tr>
<th>Highland F</th>
<th>Highland G</th>
<th>Highland H</th>
<th>Highland J</th>
<th>Highland K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration, Galleria, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010 Joint FiO/LS Awards Ceremony and Plenary Session, Lilac Ballroom North and South, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSMA • Laser Science Symposium on Undergraduate Research Posters, Riverside Court, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FME • Spectroscopy, Imaging and Detection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMF • Quantum Information and Communications I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMG • Non-Linear Imaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMB • IPF-Biomedical Applications of Lasers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMA • Photophysics of Nanostructured Materials I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee Break, Highland Ballroom Foyer, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FML • Microscopy I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMM • Quantum Information and Communications II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMN • Advances in High Energy Ultrafast Laser Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMD • IPF- Environment Applications of Lasers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMB • Novel Imaging, Spectroscopy and Manipulation in Microstructures I (ends at 5:30 p.m.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSA/SPS Student Member Welcome Reception, Temple Bar &amp; Grille, 109 East Avenue, Rochester, NY, Phone: 585.232.6000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Agenda of Sessions — Tuesday, October 26

<table>
<thead>
<tr>
<th>Time</th>
<th>Highland A</th>
<th>Highland B</th>
<th>Highland C</th>
<th>Highland D</th>
<th>Highland E</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 a.m.–5:30 p.m.</td>
<td>Registration, Galleria, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 a.m.–9:30 a.m.</td>
<td>VIP Industry Leaders Networking Event: Connecting OSA Corporate Members and Young Professionals, Grand Ballroom E and F, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>FTuA • Photonics and Energy II</td>
<td>FTuB • Adaptive Optics for the Eye</td>
<td>FTuC • Nonlinear Integrated Optics</td>
<td>FTuD • General Optics in Information Science (ends at 9:45 a.m.)</td>
<td>FTuE • General Optics</td>
</tr>
<tr>
<td>10:00 a.m.–12:00 p.m.</td>
<td>Students and Young Professionals Forum on Public Policy, Carlson and Douglass, Radisson Hotel Rochester Riverside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.–10:30 a.m.</td>
<td>Coffee Break, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.–4:00 p.m.</td>
<td>Exhibit Open, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td>FTuH • Novel Fiber Device</td>
<td>FTuI • Optical Design for Biomedical Systems I</td>
<td>FTuJ • Ultrafast Fiber Laser</td>
<td>FTuK • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing I</td>
<td>FTuL • Frequency Combs for Spectroscopy</td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>Exhibit Only Time, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>Lunch (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>OSA Fellow Member Lunch, Grand Ballroom A and B, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>JTuA • Joint FiO/LS Poster Session, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.–5:40 p.m.</td>
<td>STuC • Ashkin Symposium I, Grand Ballroom D, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>FTuO • General Wavefront Issues (ends at 3:15 p.m.)</td>
<td>FTuP • Novel Hybrid Integration I</td>
<td>FTuQ • Disorder In Integrated Optical Devices and Circuits I</td>
<td>FTuR • Dispersion in Ultrafast Laser Amplifiers</td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.–5:00 p.m.</td>
<td>Meet the Editors of APS Journals, Riverside Court, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.–4:00 p.m.</td>
<td>Coffee Break, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.–5:00 p.m.</td>
<td>Industrial Physics Forum Corporate Reception, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.–5:30 p.m.</td>
<td>FTuU • Astrophotonics I</td>
<td>FTuV • Optical Communication I</td>
<td>FTuW • Novel Fibers</td>
<td>FTuX • Attosecond Optics and Technology I</td>
<td></td>
</tr>
<tr>
<td>4:30 p.m.–5:30 p.m.</td>
<td>Minorities and Women in OSA (MWOSA) Tea, Grand Ballroom E and F, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:00 p.m.–7:00 p.m.</td>
<td>OSA Business Meeting, Highland A, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:00 p.m.–7:00 p.m.</td>
<td>LS Business Meeting, Highland H, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:00 p.m.–7:00 p.m.</td>
<td>OSA Graduation Party, Riverview Lounge, Radisson Hotel Rochester Riverside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:00 p.m.–8:30 p.m.</td>
<td>OSA LaserFest Member Reception, Lilac Ballroom North and South, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:00 p.m.–10:00 p.m.</td>
<td>LS Banquet, Grand Ballroom A and B, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 p.m.–11:00 p.m.</td>
<td>OSA Student Member Party, Tavern 58 at Gibbs, 58 University Avenue, Rochester, NY, Phone: 585.546.5800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key to Shading**

- [ ] Frontiers in Optics
- [ ] Laser Science
- [ ] Joint
### Agenda of Sessions

<table>
<thead>
<tr>
<th>Highland F</th>
<th>Highland G</th>
<th>Highland H</th>
<th>Highland J</th>
<th>Highland K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Registration</strong>, Galleria, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VIP Industry Leaders Networking Event: Connecting OSA Corporate Members and Young Professionals</strong>, Grand Ballroom E and F, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTuF • Microscopy II</td>
<td>FTuG • Quantum Information and Communications III</td>
<td>LTuA • Photophysics of Nanostructured Materials II</td>
<td>StuA • IPF-Laser Applications in Metrology</td>
<td>LTuB • Nonlinear Optics I</td>
</tr>
<tr>
<td>Students and Young Professionals Forum on Public Policy, Carlson and Douglass, Radisson Hotel Rochester Riverside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee Break, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhibit Open, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTuM • Trapping I</td>
<td>FTuN • Opto-Mechanics and Quantum Measurement I</td>
<td>LTuC • Photophysics of Nanostructured Materials III</td>
<td>StuB • IPF - Frontiers in Physics</td>
<td>LTuD • Novel Imaging, Spectroscopy and Manipulation in Microstructures II</td>
</tr>
<tr>
<td>Exhibit Only Time, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OSA Fellow Member Lunch</strong>, Grand Ballroom A and B, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JTuA • Joint FiO/LS Poster Session, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>StuC • Ashkin Symposium I, Grand Ballroom D, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTuS • Therapy</td>
<td>FTuT • Quantum Information and Communications IV</td>
<td>LTuE • Attosecond and Strong Field Physics I</td>
<td>LTuF • Optofluidics in the Near-Field I</td>
<td>LTuG • Nonlinear Optics II (ends at 3:15 p.m.)</td>
</tr>
<tr>
<td>Meet the Editors of APS Journals, Riverside Court, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee Break, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Physics Forum Corporate Reception, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTuY • Coherence Tomography</td>
<td>FTuZ • Opto-Mechanics and Quantum Measurement II (ends 5:15 p.m.)</td>
<td>LTuH • Frontiers in Ultracold Molecules I (ends at 5:15 p.m.)</td>
<td>LTuI • Optofluidics in the Near-Field II (ends at 5:15 p.m.)</td>
<td>LTuJ • Laser Cooling and Trapping (ends 4:45 p.m.)</td>
</tr>
<tr>
<td>Minorities and Women in OSA (MWOSA) Tea, Grand Ballroom E and F, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSA Business Meeting, Highland A, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS Business Meeting, Highland H, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSA Graduation Party, Riverview Lounge, Radisson Hotel Rochester Riverside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSA Fellows Luncheon, Highland A and B, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSA LaserFest Member Reception, Lilac Ballroom North and South, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS Banquet, Grand Ballroom A and B, Hyatt Regency Rochester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OSA Student Member Party</strong>, Tavern 58 at Gibbs, 58 University Avenue, Rochester, NY, Phone: 585.546.5800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**FiO/LS 2010 • October 24–28, 2010**
## Agenda of Sessions — Wednesday, October 27

<table>
<thead>
<tr>
<th>Time</th>
<th>Highland A</th>
<th>Highland B</th>
<th>Highland C</th>
<th>Highland D</th>
<th>Highland E</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 a.m.–5:00 p.m.</td>
<td>Registration, Galleria, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>FWA • Astrophotonics II (ends at 9:45 a.m.)</td>
<td>FWB • Biochemical Sensing</td>
<td>FWC • Optical Design with Unconventional Polarization I</td>
<td>FWD • Novel Hybrid Integration II</td>
<td>FWE • Attosecond Optics and Technology II</td>
</tr>
<tr>
<td>10:00 a.m.–10:30 a.m.</td>
<td>Coffee Break, Empire Hall, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.–2:00 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td>FWH • Sensing in Higher Dimensions — Theory and Hardware for Computational Imaging I (ends at 11:45 a.m.)</td>
<td>FWI • Optical Communication II</td>
<td>FWJ • Image-Based Wavefront Sensing I</td>
<td>FWK • Fiber Laser</td>
<td>FWO • Plasmonics and Metamaterials for Information Processing I</td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>SWA • Optical Communications Symposium I</td>
<td>FWO • Plasmonics and Metamaterials for Information Processing I</td>
<td>FWP • Optical Design with Unconventional Polarization II</td>
<td>FWQ • Photonic Bandgap and Slow Light</td>
<td>FWR • Laser Based Particle Acceleration II</td>
</tr>
<tr>
<td>3:30 p.m.–4:00 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.–5:30 p.m.</td>
<td>SWB • Optical Communications Symposium II</td>
<td>FWU • Plasmonics and Metamaterials for Information Processing IV</td>
<td>FWV • Image-Based Wavefront Sensing II</td>
<td>FWW • Nonlinear Fiber Optics</td>
<td>FWX • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing II</td>
</tr>
<tr>
<td>4:30 p.m.–8:00 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:00 p.m.–8:30 p.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Key to Shading
- Frontiers in Optics
- Laser Science
- Joint
<table>
<thead>
<tr>
<th>Highland F</th>
<th>Highland G</th>
<th>Highland H</th>
<th>Highland J</th>
<th>Highland K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Registration</strong>, <em>Galleria, Rochester Riverside Convention Center</em></td>
<td>FWF • Biosensing</td>
<td>LWA • Hybrid Quantum Systems I</td>
<td>LWB • Metrology and Precision Measurements I</td>
<td>LWC • Photophysics of Energy Conversion I (ends at 10:15 a.m.)</td>
</tr>
<tr>
<td>Coffee Break, <em>Empire Hall, Rochester Riverside Convention Center</em></td>
<td>FWG • Nonlinearities and Gain in Plasmonics and Metamaterials I</td>
<td>LWA • Hybrid Quantum Systems I (ends at 12:45 p.m.)</td>
<td>LWE • Quantum Enhanced Information Processing I (ends at 12:30 p.m.)</td>
<td>LWF • Single Molecule Approaches to Biology I</td>
</tr>
<tr>
<td><strong>Exhibit Open</strong>, <em>Empire Hall, Rochester Riverside Convention Center</em></td>
<td>FWM • Trapping II</td>
<td>LWD • Hybrid Quantum Systems II</td>
<td>LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy</td>
<td>LWI • Photophysics of Energy Conversion II</td>
</tr>
<tr>
<td><strong>Exhibit Only Time</strong>, <em>Empire Hall, Rochester Riverside Convention Center</em></td>
<td>FWN • Nonlinearities and Gain in Plasmonics and Metamaterials II</td>
<td>LWD • Hybrid Quantum Systems II</td>
<td>LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy</td>
<td>LWI • Photophysics of Energy Conversion II</td>
</tr>
<tr>
<td><strong>Lunch</strong> <em>(on your own)</em></td>
<td></td>
<td>LWD • Hybrid Quantum Systems II</td>
<td>LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy</td>
<td>LWI • Photophysics of Energy Conversion II</td>
</tr>
<tr>
<td><strong>JWA • FiO Poster Session</strong>, <em>Empire Hall, Rochester Riverside Convention Center</em></td>
<td>FWS • Nanopatterning and Meta-materials</td>
<td>LGW • General Laser Science</td>
<td>LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy</td>
<td>LWI • Photophysics of Energy Conversion II</td>
</tr>
<tr>
<td>Coffee Break, <em>Highland Ballroom Foyer Rochester Riverside Convention Center</em></td>
<td>FWT • Disorder In Integrated Optical Devices and Circuits II</td>
<td>LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy</td>
<td>LWI • Photophysics of Energy Conversion II</td>
<td>LWI • Photophysics of Energy Conversion II</td>
</tr>
<tr>
<td><strong>Science Educators’ Day</strong>, <em>Lilac Ballroom North and South, Rochester Riverside Convention Center</em></td>
<td>FWY • Optical Design for Biomedical Systems II</td>
<td>LWJ • Quantum Enhanced Information Processing II</td>
<td>LWK • Attosecond and Strong Field Physics II</td>
<td>LWL • Single Molecule Approaches to Biology II</td>
</tr>
<tr>
<td><strong>FiO Postdeadline Paper Sessions</strong>, <em>See the Postdeadline Papers Book in your registration bag for exact times and locations</em></td>
<td>FWZ • General Non-linear Optics</td>
<td>LWJ • Quantum Enhanced Information Processing II</td>
<td>LWK • Attosecond and Strong Field Physics II</td>
<td>LWL • Single Molecule Approaches to Biology II</td>
</tr>
</tbody>
</table>
## Agenda of Sessions — Thursday, October 28

<table>
<thead>
<tr>
<th>Time</th>
<th>Highland A</th>
<th>Highland B</th>
<th>Highland C</th>
<th>Highland D</th>
<th>Highland E</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 a.m. – 5:30 p.m.</td>
<td>Registration, Galleria, Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 a.m. – 10:00 a.m.</td>
<td>FThA • Nonlinear Optics in Micro/Nano-Optical Structures I</td>
<td>FThB • Plasmonics</td>
<td>FThC • Integrated Optics</td>
<td>FThD • Novel Measurement Techniques</td>
<td>FThE • Lasers for Fusion and Fast Ignition</td>
</tr>
<tr>
<td>10:00 a.m. – 10:30 a.m.</td>
<td>Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m. – 12:00 p.m.</td>
<td>FThH • Nonlinear Optics in Micro/Nano-Optical Structures II</td>
<td>FThl • Optical Signal Processing Device</td>
<td>FThJ • Photonic Crystal</td>
<td>FThK • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing III</td>
<td>FThL • Nonlinearities and Gain in Plasmonics and Metamaterials III (ends at 12:15 p.m.)</td>
</tr>
<tr>
<td>12:00 p.m. – 1:30 p.m.</td>
<td>Lunch Break (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m. – 3:30 p.m.</td>
<td>FThO • Nonlinear Optics in Micro/Nano-Optical Structures III</td>
<td>FThP • General Optical Instrumentation</td>
<td>FThQ • Micro Resonators</td>
<td>FThR • Plasmonics and Metamaterials for Information Processing II</td>
<td>FThS • Strong THz Fields and Applications</td>
</tr>
<tr>
<td>3:30 p.m. – 4:00 p.m.</td>
<td>Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m. – 6:00 p.m.</td>
<td>FThW • Three-Dimensional Meta-materials</td>
<td>FThX • Fabrication and Testing</td>
<td>FThY • Plasmonics and Metamaterials for Information Processing III</td>
<td>FThZ • THz Fields and Nonlinear Optics</td>
<td>FThAA • Optics in Micro/nano Devices</td>
</tr>
</tbody>
</table>

**Key to Shading**

- Frontiers in Optics
- Laser Science
- Joint
<table>
<thead>
<tr>
<th>Highland F</th>
<th>Highland G</th>
<th>Highland H</th>
<th>Highland J</th>
<th>Highland K</th>
</tr>
</thead>
<tbody>
<tr>
<td>FThF • Transformation Optics and Cloaking with Metamaterials</td>
<td>FThG • General Quantum Electronics I</td>
<td>LThA • Chemical Dynamics II: Multi-Dimensional Ultrafast Spectroscopy (ends at 9:45 a.m.)</td>
<td>LThB • Frontiers in Ultracold Molecules II</td>
<td>LThC • Nanophotonics, Photonic Crystals and Structural Slow Light I (ends at 9:45 a.m.)</td>
</tr>
<tr>
<td>Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FThM • Sensing in Higher Dimensions — Theory and Hardware for Computational Imaging II</td>
<td>FThN • General Quantum Electronics II</td>
<td>LThD • Single Molecule Approaches to Biology III</td>
<td>LThE • Quantum Enhanced Information Processing III</td>
<td>LThF • Nanophotonics, Photonic Crystals and Structural Slow Light II (ends at 11:45 a.m.)</td>
</tr>
<tr>
<td>Lunch Break (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FThT • Encoding Optical Information — Nano-photonics, Diffractive Optics and Refractive Optics for Shaping Optical Signals</td>
<td>FThU • Lens Design</td>
<td>LThG • Metrology and Precision Measurements II (ends at 3:45 p.m.)</td>
<td>LThH • Frontiers in Ultracold Molecules III (ends at 2:45 p.m.)</td>
<td>FThV • Diffractive and Holographic Optics I</td>
</tr>
<tr>
<td>Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FThBB • Diffractive and Holographic Optics II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monday, October 25

7:00 a.m.–6:00 p.m. Registration, Galleria, Rochester Riverside Convention Center

8:00 a.m.–12:00 p.m. 2010 Joint FiO/LS Awards Ceremony and Plenary Session, Lilac Ballroom North and South, Rochester Riverside Convention Center

10:00 a.m.–10:30 a.m. Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center

12:00 p.m.–2:00 p.m. LSMA: Laser Science Symposium on Undergraduate Research Posters, Riverside Court, Rochester Riverside Convention Center

12:00 p.m.–1:30 p.m. Lunch (on your own)

1:30 p.m.–3:30 p.m.
FMA • Photonics and Energy I
Sylvain G. Cloutier; Univ. of Delaware, USA, Presider

FMA1 • 1:30 p.m. Invited
Luminescent Solar Concentrators: From Optical Heat Pumps to Solar Pumped Lasers, C. Rotschild1, M. Tomes1, H. Mendoza1, T. Carmon1, M. Baldo1; 1MIT, USA, 2Univ. of Michigan, USA. Luminescent solar concentrators (LSCs) do not need to track the sun. We experimentally demonstrate non-resonant pumping of a high-quality factor lasers, with the promise of dramatic increases in the efficiency of LSCs.

FMB • Structured Wavefields for Communications and Sensing I
Kevin Thompson; Optical Res. Associates, USA, Presider

FMB1 • 1:30 p.m. Invited
Effects of Type of Incidence on the Second and Fourth Order Moment Parameters Evaluated in Turbulent Atmosphere, Yahya K. Baykal; Çankaya Univ., Turkey. Using a general type incidence, the second and fourth order moments are formulated in atmospheric turbulence. Received field and intensity correlations are evaluated and the behaviour of these correlations are compared for different beam types.

FMC • Photonic Sensor I
N. J. Tao; Arizona State Univ., USA, Presider

FMC1 • 1:30 p.m. Invited
Long-Term Monitoring of Local Temperature and Strain Changes in a Buried Fiber-Optic Cable Using Brillouin OTDR, Jonathan A. Nagel; AT&T Labs-Res., USA. Abstract not available.

FMD • Individualized Optical Correction of the Eye
Geun-Yoong Yoon; Univ. of Rochester, USA. Recent advances in adaptive optics enhanced our understanding of optics of the eye and its impact on visual performance. It was found with adaptive optics that long-term neural adaptation to their native higher order aberrations compensated for some of the detrimental impact of optical blur on visual performance in highly aberrated eyes.

FMD1 • 1:30 p.m. Invited
The Use of Adaptive Optics to Study Optical and Neural Impact on Visual Performance, Geun-Yoong Yoon; Univ. of Rochester, USA. Recent advances in adaptive optics enhanced our understanding of optics of the eye and its impact on visual performance. It was found with adaptive optics that long-term neural adaptation to their native higher order aberrations compensated for some of the detrimental impact of optical blur on visual performance in highly aberrated eyes.
Monday, October 25

7:00 a.m.–6:00 p.m.  Registration, Galleria, Rochester Riverside Convention Center

8:00 a.m.–12:00 p.m.  2010 Joint FiO/LS Awards Ceremony and Plenary Session, Lilac Ballroom North and South, Rochester Riverside Convention Center

10:00 a.m.–10:30 a.m.  Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center

12:00 p.m.–2:00 p.m.  LSMA: Laser Science Symposium on Undergraduate Research Posters, Riverside Court, Rochester Riverside Convention Center

12:00 p.m.–1:30 p.m.  Lunch (on your own)

1:30 p.m.–3:30 p.m.
FME • Spectroscopy, Imaging and Detection
Gregory R. Kilby; United States Military Acad., USA, Presider

FME1 • 1:30 p.m.  Invited Monitoring Breast Cancer Tumor Response at Different Timepoints During Pre-Surgical Chemotherapy with Diffuse Optical Spectroscopic Imaging, Albert Gerault1, Vaya W. Inamani2, Darren Roblyer2, Shigeto Ueda2, Amanda F. Durkin1, Rita S. Mietz1, David Huang2, John Butler2, Bruce J. Tromberg2; 1Beckman Laser Inst., USA, 2Chao Comprehensive Cancer Ctr., USA. Diffuse Optical Spectroscopic Imaging (DOSI) provides non-invasive functional biomarkers that correlate with final pathological response to pre-surgical (neoadjuvant) chemotherapy in breast cancer patients that are measured at various timepoints throughout the therapy

1:30 p.m.–3:15 p.m.
FMF • Quantum Information and Communications I
Luiz Davidovich; Univ. Federal do Rio de Janeiro, Brazil, Presider

FMF1 • 1:30 p.m.  Frequency Transcription of Single-Photon States by Four-Wave Mixing in a Photonic Crystal Fiber, Hayden J. McGuinness1, Michael G. Raymer1, Colin H. McKinstrie2, Stojan Radic3; 1Univ. of Oregon, USA, 2Bell Labs, USA, 3Univ. of California at San Diego, USA. Frequency transcription of single-photon states in optical fiber through use of the Bragg scattering four-wave mixing process is studied. We achieve 28 percent transcription and verify the nonclassical nature of the involved light.

FMF2 • 1:45 p.m.  Quantum Transduction of Telecommunications-band Single Photons from a Quantum Dot by Frequency Upconversion, Matthew T. Bakker1, Lijun Ma1, Oliver Statter2, Xiao Tang2, Kartik Srinivasan3; 1Univ. of Rochester, USA, 2Univ. of Nebraska, USA, 3Univ. of Delaware, USA. Photons from a quantum dot emitting at 1.3 μm are upconverted to 710 nm in a periodically-poled LiNbO 3 waveguide using a 1550 nm pump. The upconverted light exhibits photon anti-bunching with g(2)(0)=-0.165.

1:30 p.m.–3:30 p.m.
FMG • Non-Linear Imaging
Jason Fleischer, Princeton Univ., USA, Presider

FMG1 • 1:30 p.m.  Invited Non-Linear Imaging with Ultrashort Shaped Pulses, Dmitry Pestov, Yair Andegeko, Vadim V. Loezyo, Marcos Dutiae, Michigan State Univ., USA. Dispersion compensation of ultrashort pulses at the focal plane leads to significantly greater signal. Our presentation will focus on observed photobleaching and photoenhancement of two-photon fluorescent signal for long (200fs) and ultrashort (sub-15fs) pulses.

1:30 p.m.–3:30 p.m.
LMA • Photophysics of Nanostructured Materials I
Linda Peteanu; Carnegie Mellon Univ., USA, Presider

LMA1 • 1:30 p.m.  Invited Photophysical Consequences of Interactions Between Conjugated Chromophores, Lewis Rothberg1, S. Paquet2, J. Bühler3, D. McCormick4, D. Kirt5, M. Charet4, M. Galvin6, K. Kiick7; 1Univ. of Rochester, USA, 2Univ. of Delaware, USA. We study phenyl-ethynylene chromophore pairs whose spacing and orientation can be varied by coupling them to peptide backbones. Copious interchromophore excitations are observed and explain reduced fluorescence yields in conjugated polymer films relative to solutions.

1:30 p.m.–3:30 p.m.
SMA • IPF-Biomedical Applications of Lasers
Michael Stanley; Chroma Technology Corp., USA, Presider

SMA1 • 1:30 p.m.  Invited Laser Refractive Cataract Surgery with the LenSx Laser, Michael Karavitis; LenSx Lasers, Inc., USA. At LenSx Lasers, we have developed a femtosecond laser for cataract surgery. The high precision of ultrashort laser pulse photodisruption in tissue results in a safer procedure with enhanced visual outcomes over traditional cataract surgery.
The resulting 3-dimensional heterojunction exhibits quantum dots while addressing their shortcomings. This allows sorting of optical OAM components.

Aspheric IOLs induce negative spherical aberration in order to emulate young crystalline lenses. We present optical aberrations in pseudophakic eyes, the effect of misalignment on optical performance, using customized eye models, and new aspheric designs.

We probe stochastic fluctuations in Rayleigh backscattering with a photon-counting OTDR apparatus. Surprisingly, the statistics of these fluctuations can be captured by a simple empirical model. The temporal stability of the data is discussed.

The paper reviews the technology, developments in system performance and reliability distributed temperature sensing and discusses recent practical challenges and main applications of Raman microscopy C, C3 has been derived. It can be used to measure atmospheric turbulence strength, even in the strong turbulence regime.

We derive and measure self-similarly evolving fields under coherent diffusion, analogous to Gaussian modes of optical diffraction. We obtain a quasi-eigenmodes description of polariton dynamics in thermal vapor in the limit of dominating Gaussian diffusion.

The precision limit of fiber interferometric systems caused by structural damping is analyzed using a 1-D model based on the Fluctuation-Dissipation Theorem. The result provides a new perspective on the precision limit of fiber interferometric systems at low frequencies.

Using Transformation Optics to Measure Optical Orbital Angular Momentum, Johannes K. Courtial1, Martin F. J. Lavery2, Gregoryus C. G. Berkhout3, Tomáš Tyc3; 1Univ. of Glasgow, UK, 2Leiden Univ., Netherlands, 3Masaryk Univ., Czech Republic. Transformation optics is used to image two planes into each other and at the same time distort them such that orbital angular momentum (OAM) becomes transverse momentum. This allows sorting of optical OAM components.

Fiber thermal noise could it be used to identify individual fibers? Misha Brodsky1, Paz London1, Ofer Firstenberg1, Ratan Debnath1, Illan Kramer1, Rami Pugatch2, Moshe Shuker1, Martin P. J. Lavery1, Gregorius C. G. Berkhout2, Tomáš Tyc3; 1Univ. of Glasgow, UK, 2Leiden Univ., Netherlands, 3Masaryk Univ., Czech Republic. The temporal stability of the data is discussed.

Orbital Angular Momentum, Johannes Courtial1, Martin Lavery2, Gregoryus Berkhout3, Tomáš Tyc3; 1Univ. of Glasgow, UK, 2Leiden Univ., Netherlands, 3Masaryk Univ., Czech Republic. The precision limit of fiber interferometric systems at low frequencies.

Structural Damping-Induced Thermal Noise in Fiber Interferometric Systems, Lingze Duan1, Arthur Hartog1, Greg Gbur; Univ. of Alabama, Huntsville, USA. Fiber thermal noise caused by structural damping is analyzed using a 1-D model based on the Fluctuation-Dissipation Theorem. The result provides a new perspective on the precision limit of fiber interferometric systems at low frequencies.

Rayleigh Backscattering from Optical Fibers - Could it be Used to Identify Individual Fibers? Misha Brodsky1, Paz London1, Ofer Firstenberg1, Ratan Debnath1, Illan Kramer1, Rami Pugatch2, Moshe Shuker1, Martin P. J. Lavery1, Gregorius C. G. Berkhout2, Tomáš Tyc3; 1Univ. of Glasgow, UK, 2Leiden Univ., Netherlands, 3Masaryk Univ., Czech Republic. The temporal stability of the data is discussed.

Reading Distance of Multifocal Intraocular Lenses, Marrie van der Mooren, Henk Weeber, Patricia Piers; AMO Groningen BV, Netherlands. Diffusive Multifocal intraocular lenses are currently a viable option for presbyopia correction. This paper describes reading distance in relation with refractive error and location of diffractive profile in the data is discussed.

Using Transformation Optics to Measure Optical Orbital Angular Momentum, Johannes K. Courtial1, Martin F. J. Lavery2, Gregoryus C. G. Berkhout3, Tomáš Tyc3; 1Univ. of Glasgow, UK, 2Leiden Univ., Netherlands, 3Masaryk Univ., Czech Republic. Transformation optics is used to image two planes into each other and at the same time distort them such that orbital angular momentum (OAM) becomes transverse momentum. This allows sorting of optical OAM components.

Structural Damping-Induced Thermal Noise in Fiber Interferometric Systems, Lingze Duan1, Arthur Hartog1, Greg Gbur; Univ. of Alabama, Huntsville, USA. Fiber thermal noise caused by structural damping is analyzed using a 1-D model based on the Fluctuation-Dissipation Theorem. The result provides a new perspective on the precision limit of fiber interferometric systems at low frequencies.

Rayleigh Backscattering from Optical Fibers - Could it Be Used to Identify Individual Fibers? Misha Brodsky1, Paz London1, Ofer Firstenberg1, Ratan Debnath1, Illan Kramer1, Rami Pugatch2, Moshe Shuker1, Martin P. J. Lavery1, Gregorius C. G. Berkhout2, Tomáš Tyc3; 1Univ. of Glasgow, UK, 2Leiden Univ., Netherlands, 3Masaryk Univ., Czech Republic. The temporal stability of the data is discussed.

Structural Damping-Induced Thermal Noise in Fiber Interferometric Systems, Lingze Duan1, Arthur Hartog1, Greg Gbur; Univ. of Alabama, Huntsville, USA. Fiber thermal noise caused by structural damping is analyzed using a 1-D model based on the Fluctuation-Dissipation Theorem. The result provides a new perspective on the precision limit of fiber interferometric systems at low frequencies.
Pulsed THz Radiation in near-Field Domain: Enhanced Scattering and Exceeding Diffraction Limitations, Serge Popov, Srinivasan Iyer, Sergey Sergeev, Ari T. Friberg, 1Royal Inst. of Technology, Sweden. 2Waterford Inst. of Technology, Ireland, 3Aalto Univ., Finland. 4Univ. of Joensuu, Finland. The use of dynamic fixation targets in the Laser Scanning Digital Camera creates sufficient inter-frame image differences to rapidly remove central reflection artifacts in post-processing using Principal Component Analysis.

The Role of Pump Coherence in a Two-photon Interference Experiment, Junlin Liang, Scott M. Hendrickson, Todd B. Pittman, Univ. of Maryland Baltimore County, USA. We perform a parametric downconversion two-photon interference experiment using two unbalanced Mach-Zehnder interferometers and a short-coherence-length continuous-wave pump. The experiment explores the role of the pump coherence in two-photon interference.

Photon Pairs with Tailored Spectral Properties Generated from Photonic Crystal Fiber, Xiangying Li, Liang Cui, Ningbo Zhao; Tianjin Univ., China. Signal and idler photon pairs at about 0.8 and 1.4 μm, respectively, are generated from 1-meter-long photonic crystal fiber. By using pump pulses with different wavelengths, frequency positively correlated and de-correlated photon pairs are obtained.

Cluster State Generation Using Fibre Sources, Alex Clark, Bryn Bell, Jeremie Fuiron, Matthias M. Haldor, John G. Rusty, Mark S. Tame; Myungshik S. Kim; Univ. of Bristol, UK. By pumping a birefringent photonic crystal fibre in opposite directions we generate time-bandwidth limited entangled photon pairs. Performing a fusion gate on photons from two independent sources we create and characterize a four-qubit cluster state.
FMA • Photons and Energy I—Continued

Monday, October 25

FMA5 • 3:15 p.m. Nanostructured SiNPs-Er Codoped Al2O3 Films Showing High Potential for Amplification Under Low Photon Flux Conditions, Pablo Roque, Sara Nuñez-Sanchez, Rosalia Serna; Inst. of Optics, CSIC, Spain. Report an one-step preparation process of nanostructured films formed by Si nanoparticles and Er, followed by low temperature annealing, codoped films show low threshold efficient excitation of large fraction of indirectly excited Er ions (>50%) run.

FMA6 • 3:00 p.m. Quasi-1-D Bessel-Like Beam Generation Using Highly Directive Transmission through Sub-Wavelength Slit Embedded in Metallic Grooves, Sehun Kang, Kyoungbokn Oh, Yonsei Univ., Korea, Republic of. We report unique quasi-1-D Bessel-like beam formation from a sub-wavelength slit embedded in 1-D periodic metallic grooves. Finite-difference time-domain analyses and composite diffractive evanescent wave model provided a good explanation of the unique beam-shaping phenomena.

FMC • Photonic Sensor I—Continued

FMB • Structured Wavefields for Communications and Sensing I—Continued

FMB5 • 2:45 p.m. Sorting Optical Angular Momentum States Based on a Geometric Transformation, Gregorius C. G. Berkhout1, Martin F. J. Lavery, Johannes Courtial1, Marco W. Beijersbergen1, Miles J. Padgett; ‘Leiden Univ., Netherlands, ’cosine Science & Computing BV, Netherlands, ‘Univ. of Glasgow, UK. We present an efficient way to sort optical angular momentum states based on two custom optical components. Due to its straightforward design, this system could prove to be very useful in increased-bandwidth optical communication.

FMB6 • 3:00 p.m. Portable Fiber Sensors Based on Surface-enhanced Raman Scattering (SERS), Xuan Yang, Bin Chen, Shaowei Chen, Jin Z. Zhang, Claire Gu; ’Univ. of California at Santa Cruz, USA, ’NASA Ames Res. Ctr., USA. A portable molecular sensing system based on surface-enhanced Raman scattering is experimentally demonstrated using both a tip-coated multimode fiber and a liquid core photonic crystal fiber to achieve the high sensitivity.

FMD • Individualized Optical Correction of the Eye—Continued

FMD4 • 2:45 p.m. Tutorial The Role of the Eye’s Aberrations in Vision, Pablo Artal; Univ. de Murcia, Spain. Spatial vision is limited by the quality of the eye’s optics. However, optical, retinal and neural factors interact to produce the final visual performance. The main optical properties of the human eye and its relevance for vision will be revised.

Pablo Artal is a professor of Optics at the University of Murcia, Spain. An optical and Vision scientist with interest in Visual Optics, Optical Instrumentation, Adaptive Optics, Biomedical Optics & Photonics. He was elected fellow member of the Optical Society of America (OSA) in 1999 and a fellow member (inaugural) of ARVO in 2009. Prof. Artal received a number of national and international research awards. He is the founder and director of the Laboratorio de Optica at the University of Murcia and has published more than 150 reviewed papers that received more than 4000 citations, presented more than 150 invited talks in international meetings and around 150 seminars in research institutions around the world. Inventor of a number of technologies applied in Vision research and Ophthalmology and mentor of many graduate students and post-docs. He is currently editor of the Journal of the Optical Society of America A and the Journal of Vision.

3:30 p.m.–4:00 p.m. Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center
### Monday, October 25

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Session Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00 p.m.</td>
<td>Highland G</td>
<td><strong>FME</strong> • Spectroscopy, Imaging and Detection—Continued</td>
<td>Nonlinear Recovery of Diffused Images by Seeded Instability, Dmitry V. Dylov, Laura Waller, Jason W. Fleischer; Princeton Univ., USA. We develop a method to recover diffused and noise-hidden images by using spatial nonlinearity to seed instability. Optimal recovery depends on signal content, scattering statistics, and nonlinear coupling strength.</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>Highland H</td>
<td><strong>FMG</strong> • Non-Linear Imaging—Continued</td>
<td>Fiber OPO for Multimodal CARS Imaging, Yan-Hua Zhai, Christiane Poitot, Mikhail Slipschanka, Delong Zhang, Huajing Wu, Su Chen, Weiqun Tong, Xi-Fen Cheng, Jay E. Sharping; Univ. of California at Merced, USA, Purdue Univ., USA, 'Yangtze Optical Fibre and Cable Co., Ltd., China. We report multimodal coherent anti-Stokes Raman scattering imaging with a fiber optical parametric oscillator which is based on a compact fiber laser and a photonic crystal fiber.</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>Highland J</td>
<td><strong>SMA</strong> • IPF-Biomedical Applications of Lasers—Continued</td>
<td>Organic Materials for All-Optical Signal Processing and Optical Limiting, Joseph W. Perry, Joel M. Haloi, San-Hui Chi, Matteo Cazzullo, Thomas E. O. Screen, Harry L. Anderson, Jon Matichak, Stephen Barklow, Seth R. Marder; Georgia Tech, USA, 'Univ. of Oxford, UK. Third-order nonlinearities and optical switching and limiting figures of merit are reported for several conjugated organic materials. Polymethinins with large real to imaginary hyperpolarizability ratios and conjugated polymers with strong nonlinear absorption will be discussed.</td>
</tr>
<tr>
<td>3:15 p.m.</td>
<td>Highland F</td>
<td><strong>FME</strong> • Spectroscopy, Imaging and Detection</td>
<td>Steroid Induced Osteoporosis Detected by Raman Spectroscopy, Jason R. Maher, Masakazu Inoue, Masahiko Takahashi, Hani A. Awad, Andrew J. Berger; Inst. of Optics, Univ. of Rochester, USA, 'Ctr. for Musculoskeletal Res., Univ. of Rochester, USA. A Raman spectroscopy system has been constructed to study the chemical perturbations to cortical bone associated with steroid induced osteoporosis. Transcutaneous measurements of bone are also discussed.</td>
</tr>
<tr>
<td>3:15 p.m.</td>
<td>Highland G</td>
<td><strong>FMG</strong> • Non-Linear Imaging</td>
<td>Biomedical Imaging with Optical Coherence Tomography, Jim Fujimoto; MIT, USA. OCT generates high resolution, cross-sectional, and 3-D images of tissue pathology. It has become a standard diagnostic in ophthalmology and is making rapid advances in cardiovascular imaging. This presentation reviews the technology and its development.</td>
</tr>
<tr>
<td>3:15 p.m.</td>
<td>Highland H</td>
<td><strong>LMA</strong> • Photophysics of Nanostructured Materials I—Continued</td>
<td>Solvent and Baking Effect on Polymer Morphology and PLED Device Performance, Xin Jin, Yuan Yang, Zhe Xiong, Nai Rong Chen, Delong Zhang, Huajing Wu, Su Chen, Weiqun Tong, Xi-Fen Cheng, Jay E. Sharping; Univ. of California at Merced, USA, Purdue Univ., USA, ‘Yangtze Optical Fibre and Cable Co., Ltd., China. We report multimodal coherent anti-Stokes Raman scattering imaging with a fiber optical parametric oscillator which is based on a compact fiber laser and a photonic crystal fiber.</td>
</tr>
</tbody>
</table>

**3:30 p.m.–4:00 p.m. Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center**

---

**3:30 p.m.–4:00 p.m. Coffee Break, Lilac Ballroom Foyer, Rochester Riverside Convention Center**

---

**FiO/LS 2010 • October 24–28, 2010**
Monolithic Ge-on-Si Lasers, Jifeng Liu\(^1,2\), Xiaochen Sun\(^1\), Rodolfo Camacho-Aguil\(^1\), Yan Cai\(^1\), Lionel Kimerling\(^1\), Jurgen Michel\(^1\); MIT, USA, Dartmouth College, USA. We demonstrate monolithic Ge-on-Si lasers, band-engineered by tensile strain and n-type doping, that exhibit direct gap emission around 1600 nm at room temperature. Direct gap electroluminescence from heterojunction devices verifies the feasibility of electrical pumping.

Optical Coherence Microscopy Using Bessel Beam, Kye-Sung Lee, Sophie Vo, Jannick P. Rolland; Univ. of Rochester, USA. We demonstrate that the side lobes of a Bessel function generated by an axicon are suppressed by more than 20 dB over 5 mm depth of focus in a confocal imaging system using a fiber.

Compact Silicon Diffractive Sensor Performance, Jonathan S. Maikisch, Thomas K. Gaylord; Georgia Tech, USA. Simulation, fabrication, and experimental results for the compact silicon diffractive sensor platform are presented. This configuration is independent of interaction length and attenuation and capable of measuring refractive index changes of 10\(^{-8}\) without spectral measurement.

Structural and Optical Characterization of Germanium-Rich Islands on Silicon Grown by Molecular Beam Epitaxy, L. Nataraj\(^1\), N. Sustser\(^1\), M. Coppinger\(^2\), F. Greiner\(^1\), J. Kolodziej\(^1\), S. G. Cloutier\(^1,2\); Univ. of Delaware, USA, Delaware Biotechnology Inst., USA. We report on the structural and photo-emissive properties of Germanium-rich islands grown on Silicon by Molecular Beam Epitaxy and the improvement in their light-emission at optical-communication frequencies due to the effects of strain and doping.

Light Modulation in Collinear Acousto-Optic Filters of Resonance and Nonresonance Type, Alexander Yulaev, Yuri Zyryanov; Saratov State Technical Univ., Russian Federation. We report experimental results of light modulation observed in a lithium niobate crystal under the collinear anisotropic acousto-optic diffraction by a standing longitudinal elastic wave.

New Imaging and Sensing Techniques Based on Surface Plasmon Resonance, N. J. Tao; Arizona State Univ., USA. Methods to image local surface impedance and electrochemical current optically are developed. The principles of the new imaging techniques are based on the sensitive dependence of surface plasmon resonance (SPR) on local surface charge and current density. These imaging capabilities may be used as new detection platforms for DNA and protein microarrays, and new tools for imaging cells and tissues.

Multimodal Retinal Imaging, Hao Zhang\(^1,2\), Qing Wei\(^1\), Tan Liu\(^1\), Jing Wang\(^1\), Dennis F. Han\(^3\), Janice M. Burke\(^3\), Shuliang Jiao\(^4\); Univ. of Wisconsin at Milwaukee, USA, Northwestern Univ., USA, Medical College of Wisconsin, USA, Univ. of Southern California, USA. A multimodal retinal imaging system that combines the merits of photoacoustic ophthalmoscopy, optical coherence tomography, confocal laser scanning ophthalmoscopy, and autofluorescence imaging has been developed.
Improving 2-Photon Microscopy by Beam Multiplexing and Extended Excitation Bandwidth, Thomas Pingel, Volker Andreae, Heinrich Speckler; LaVision BioTec GmbH, Germany. We report technical improvements that increase frame rate, excitation bandwidth and penetration depth of 2-photon microscopes significantly by implementing a novel flat optics beam splitter and integrating an Optical Parametric Oscillator into the 2-photon microscope.

FMN1 • 4:00 p.m.
Interference of Photons from Remote Solid-State Sources, A. J. Bennett1, R. B. Patel2, J. Farrer1, C. A. Nicoll3, D. A. Ritchie4, Andrew Shield4,1, Toshiba Res. Europe Ltd., UK, 2Cavendish Lab, Cambridge Univ., UK. We report a device in which the emission energy of single quantum dots can be Starkshifted 25meV. We tune transitions in remote quantum dots to the same energy and observe two-photon interference with their emission.

FMN2 • 4:15 p.m.
Pulse Cleaning of Few-Cycle OPCPA Pulses by Cross-Polarized Wave Generation, Alexander Buck1,2, Karl Schmidt1, Raphael Taitz1, Julia Mikhailova1,1, Xin Gu1, Chris M. S. Sears1, Daniel Herrmann1,4, Ferenc Krausz1,2, Laszlo Vizi1,3, ‘Max-Planck-Inst. für Quantenoptik, Germany, 1Ludwig-Maximilians-Univers, München, Germany, 2LS für Photonik und Optoelektronik, Ludwig-Maximilians-Univers. München, Germany, 3L für BioMolekulare Optik, Ludwig-Maximilians-Univers. München, Germany. We present the successful implementation of cross-polarized wave generation into our few-cycle Terawatt laser system, Light Wave Synthesizer - 20 leading to a contrast improvement by more than four orders of magnitude.

FMN2 • 4:30 p.m.
Image Mapping Spectrometer (IMS) for Real Time Hyperspectral Fluorescence Microscopy, Liang Gao1,2, Amicia D. Elliott1, Robert T. Kester1, Noah Bedard1, Nathan Hogan1, David W. Petzol1, Tomasz S. Tkaczyk1,1, Rice Univ., USA, 2Vanderbilt Univ., USA. Image Mapping Spectrometer is a non-scanning hyperspectral imaging technique providing a complete spectral-spatial information simultaneously. IMS acquires, analyzes and displays data at 5-10 frame/sec rates. Imaging results for cells expressing GFP/YFP/CFP are presented.

FMN2 • 4:30 p.m.
Experimental Demonstration of Quantum Spatial Super-resolution by Optical Centroid Measurements, Heedeuk Shin, Kam Wai Clifford Chan, Hye Jeong Chang1, Robert W. Boyd1,2, University of Rochester, USA, 1Rochester Optical Manufacturing Co., USA, 3Korean Intellectual Property Office, Republic of Korea. We demonstrate experimentally quantum spatial super-resolution with two-photon NINO state by measuring the centroid positions of the entangled photons. The optical centroid measurement shows higher detection efficiency than the conventional scheme based on multiphoton absorption.

FMN3 • 4:30 p.m.
Temporal Contrast Improvement of Femtosecond Pulses by a Self-Diffraction Process in a Kerr Bulk Medium, Jun Liu1, Takayoshi Kobayashi2,1, University of Electro-Communications, Japan, 2JST, Japan, 3Foam, Chau Tong Univ., Taiwan, 4Osaka Univ., Japan, We improved the temporal contrast of a femtosecond pulse to the value higher than the cubic of that of its incident pulse in a 0.5-mm-thick glass plate. The energy transform efficiency is about 12%.

SMB1 • 4:00 p.m.
NASA’s Space Lidar Measurements of Earth and Planetary Surfaces, James B. Abshire; NASA Goddard Space Flight Ctr., USA. This presentation will give an overview of history, ongoing work, and plans for using space lidar for measurements of planetary surfaces.
Free-Standing Silicon-on-Insulator Strip Waveguides for Submilliwatt Thermo-Optic Switches, Peng Sun, Ronald M. Reano, Ohio State Univ., USA. A Mach-Zehnder interferometer thermo-optic switch using free-standing silicon-on-insulator strip waveguides is demonstrated. Measurements at 1550 nm result in a switching power of 340 microwatts, rise time of 141 microseconds, and extinction ratio of 25 dB.

Curved Waveguide Bragg Gratings on a Chip, Steve Zamek, Dawn T.H. Tan, Mercedes Khajavikhan, Maziar P. Nezhad, Yeshuahu Fainman; Univ. of California at San Diego, USA. We demonstrate curved waveguide Bragg gratings on an SOI chip. Our approach allows long Bragg gratings to be fabricated on an extremely small area, avoiding write-field stitching errors, typically introduced in the fabrication process.

All-optical Amplitude-based Broadband Modulation In Submicron Silicon Waveguide, Ilya Guykhman, Boris Desiatov, Uriel Levy; Hebrew Univ. of Jerusalem, Israel. We demonstrate an on-chip all-optical broadband modulation of light in submicron silicon waveguide based on linear free carriers absorption using side coupling configuration of a pump signal.
**FML3 • 4:45 p.m.**  
isoSTED - 3-D Optical Nanoscopy, Roman Schmidt, Alexander Eger, Stefan W. Hell, Max-Planck-Inst. for Biophysical Chemistry, Germany. We demonstrate the unique, non-invasive isoSTED imaging of sub-wavelength sized biological and manufactured nanostructures and report on recent advances in the field.

**FML4 • 5:00 p.m.**  
Single Emitter Switching Based Multicolor Nanoscopy, Andreas Schöler, Iliaria Testa, Christian Eggeling, Stefan W. Hell, Max-Planck-Inst. for Biophysical Chemistry, Germany. By switching conventional dyes into long-lived states we can record their fluorescence time-sequentially even if they are closely packed. This allows for simultaneous nanoscale imaging of up to four dye species with minimal cross-talk.

**FML5 • 5:15 p.m.**  
Computational Model of Photothermal Nanoscopy in Tissue, Jason M. Kellicker, Gregory J. Kowalski, Charles A. DeMarzio, Northeastern Univ., USA. This research, through a rigorous optical, thermal and mechanical computational analysis, demonstrates the use of Photothermal Microscopy to tag light from the focus, and thereby improve contrast and depth of imaging limited by out-of-plane scatter.

---

**FMM • Quantum Information and Communications II—Continued**

**FMM3 • 4:45 p.m.**  
Photonic Circuits for Quantum Information Processing in Two-Mode Integrated Diffused-Channel Waveguides, Mohammed F. Saleh1, Giovanni Di Giuseppe1, Bahaa E. A. Saleh2, Malvin C. Teich1; 1Boston Univ., USA, 2Univ. of Camerino, Italy, ‘Univ. of Central Florida, USA. We present designs of photonic circuits for the generation, separation, and manipulation of modal, polarization, and spectral photon qubits generated in two-mode diffused-channel Ti:LiNbO3 waveguides via spontaneous parametric downconversion.

**FMM4 • 5:00 p.m.**  
Experimental Comparison of the Signal to Noise Ratio (SNR) of Ghost Images for Entangled and Thermal Light, Barbara A. Capron1, Claudio G. Parazzoli1, Jeff C. Adam2; Boeing Res. & Technology, USA, SpectraNet, Inc., USA. We show SNR comparisons of 4th order ghost images from FDC and 2th order thermal images from single beams. Ghost imaging yields low background and shows improvement of the entangled light over thermal light SNR.

**FMM5 • 5:15 p.m.**  
Experimental Violation of a Non-local Leggett-garg Inequality Using Non-local Weak Measurements, Curtis J. Broadvent, Justin Dressel, Andrew N. Jordan, John C. Howell; Univ. of Rochester, USA. We experimentally demonstrate the violation of a non-local Leggett-Garg inequality using non-local weak measurements on polarization entangled biophotons. Due to measurement degeneracy, multiple strange weak values are required to infer violation of the Leggett-Garg inequality.

---

**FMN • Advances in High Energy Ultrafast Laser Systems—Continued**

**FMN3 • 4:45 p.m.**  
Advances in Energetic Short-Pulse Fiber Lasers, Michael E. Madsen1, Jay W. Dawson1, John E. Crane1, David J. Gibson2, Constantin Haefner2, Miroslav Y. Shverdin1, Henry H. Phan1, Craig W. Siders2, Christoper P. J. Barty1, Matthew A. Prantil1; 1Photon Science and Applications Program, Lawrence Livermore Natl. Lab, USA, 2Lawrence Berkeley Natl. Lab, USA. Energetic short-pulse fiber lasers feed or drive many applications at LLNL, including petawatt lasers and generation of standing waves within the fiber. We present challenges and advances in scaling fiber lasers to the millijoule range.

**FMN4 • 4:45 p.m.**  
Invited  
Experimental Violation of a Non-local Leggett-garg Inequality Using Non-local Weak Measurements, Curtis J. Broadvent, Justin Dressel, Andrew N. Jordan, John C. Howell; Univ. of Rochester, USA. We experimentally demonstrate the violation of a non-local Leggett-Garg inequality using non-local weak measurements on polarization entangled biophotons. Due to measurement degeneracy, multiple strange weak values are required to infer violation of the Leggett-Garg inequality.

---

**SMB3 • 5:00 p.m.**  

---

**LMB • Novel Imaging, Spectroscopy and Manipulation in Microstructures I—Continued**

**LMB3 • 5:00 p.m.**  
Optical Trapping and Manipulation of Micron-Sized Particles Using a Bright Tapered Optical Fiber, Mary Frawley1,2, Mark Daly1, Jonathan Ward2, Silke Nic Chormaic2; 1Univ. College Cork, Ireland, 2Tyndall Natl. Inst., Ireland. In our work we aim to investigate the trapping and moving of microparticles on an optical nanofiber. We will investigate the generation of standing waves within the fiber and exploit higher order mode interference.

**LMB4 • 5:15 p.m.**  
Optical Measurement of the Phase-Breaking Length in Graphene, Ryun Beans1, Luiz Gustavo Cançado2, Lukas Norivsky2; 1Univ. of Rochester, USA, 2Univ. Federal de Minas Gerais, Brazil. We present the first optical measurement of the phase-breaking length in graphene extracted from the Raman scattering originating at an edge in the lattice. The results are compared to electrical measurements.
Kerr and Carrier Based Nonlinearities in Hydrogenated Amorphous Silicon Waveguides, Karthik Narayanan, Stefan F. Preble; Rochester Institute of Technology, USA. We experimentally measure the optical nonlinearities in hydrogenated-amorphous silicon waveguides through the transmission of ultra-short pulses. Enhanced nonlinear coefficients are reported in submicron waveguides with a carrier lifetime of ~ 400 ps.

On-chip Tunable Micro-ring Resonator Based on Digital Microfluidics Platform, Yoav Zuta, Ilya Goykhman, Uriel Levy, Hebrew Univ., Israel. We demonstrate the tunability of a silicon nitride micro-resonator using the concept of Digital Microfluidics. Our system allows driving micro-droplets on-chip, enabling the control of the effective refractive index in the vicinity of the resonator.
FMM • Quantum Information and Communications II—Continued

FMM6 • 5:30 p.m.
Transport of OAM-based QuNits through Few-Mode Optical Fibers, J. P. (Han) Woerdman¹, Wolfgang Leofler², Eric Eliot², Tijmen Euser², Michael Scharrer², Philip St Russell²,¹Univ. Leiden, Netherlands, ²Max Planck Inst. for the Science of Light, Germany. We report how entangled photons carrying a superposition of orbital angular momentum (OAM) eigenstates suffer de-coherence when transported through a few-mode optical fiber. We find that hollow-core Kagome fibers show by far the least de-coherence.

FMM7 • 5:45 p.m.
Measuring and Modifying the Spiral Spectrum of Entangled Photon Pairs, Martin P. van Exter, Henrique Di Lorenzo Pires; Leiden Univ., Netherlands. We have measured the complete probability distribution of the orbital angular momentum modes that are generated in spontaneous parametric down conversion. We show how on-purpose phase mismatching increases the spiral bandwidth and flattens the modal distribution.

FMM • Advances in High Energy Ultrafast Laser Systems—Continued

FMM6 • 5:30 p.m. Invited
Grating Development for High-Peak-Power CPA Laser Systems, Terrance J. Kessler; Lab for Laser Energetics, Univ. of Rochester, USA. Diffraction gratings have competing performance requirements when used in high-peak-power CPA laser systems. Diffraction efficiency, wavefront quality, and laser damage threshold are interdependent criteria for MLD gratings. Critical fabrication related artifacts will be discussed.

SMB • IPF- Environmental Applications of Lasers—Continued

SMB4 • 5:30 p.m. Invited
Laser Remote Sensing of the Earth: CALIPSO and Beyond, Carl Weimer; Ball Aerospace, USA. The CALIPSO satellite has been characterizing aerosols and clouds in the Earth’s atmosphere using a dual wavelength lidar. Future missions will include lidars for measuring the Earth’s forests’ role in the carbon cycle.
8:00 a.m.–10:00 a.m. 
**FTuF • Microscopy II**
Adam Wax; Dept. of Biomedical Engineering, Duke Univ., USA, Presider

**FTuF1 • 8:00 a.m.**
Nonlinear Optical Tools for Studying Small-Stroke at Microscopic Scales. Naeemi Nishimura; Cornell Univ., USA. Nonlinear optical interactions enable observation and manipulation of biological tissues with cellular resolution in vivo. We use multiphoton microscopy and femtosecond laser ablation to study health and function of brain cells after disruption of microvessels.

**FTuF2 • 8:30 a.m.**
Enhancing Coherent Anti-Stokes Raman Scattering Background Suppression with Phase Cycled Structured Femtosecond Laser Pulses. Baolei Li, Warren S. Warren, Martin C. Fischer, Duke Univ., USA. We demonstrate a homodyne coherent anti-Stokes Raman scattering technique based on femtosecond laser pulse shaping (phase-cycling). This technique utilizes a self-generated non-resonant background as a local oscillator to retrieve phase information of the Raman signal.

8:00 a.m.–10:00 a.m.
**FTuG • Quantum Information and Communications III**
Paul Voss; Georgia Tech, USA, Presider

**FTuG1 • 8:00 a.m.**
What Determines How Bosonic a Cooper Pair Is? Entanglement. Seyed Mohammad Hashemi Rafsanjani; Univ. of Rochester, USA. By studying the algebra of creation and annihilation operators, we obtain theoretical evidence that emphasizes the role of entanglement in determining how “bosonic” a composite system of two fermions (distinguishable or identical) is.

**FTuG2 • 8:15 a.m.**
Quantum Discord, Quantum Entanglement, and Linear Entropy, and the Relationship Between Them. Asma Al-Qasimi, Daniel F. V. James; Dept. of Physics, Univ. of Toronto, Canada. We study the properties of a general quantum correlation known as quantum discord, which has recently been studied as a resource for quantum computation. We investigate the relations between discord, entanglement and entropy.

**FTuG3 • 8:30 a.m.**
Strong Spectral Entanglement in Spontaneous Parametric Down-Conversion. Warren Gricc, Ryan Bennett, Philip Evans, Travis Rumble, Raphaël Pooner, Jason Schuckes, Brian Williams; Oak Ridge Natl. Lab., USA, 1, Univ. of Tennessee, USA. Photon pairs with a high degree of spectral entanglement have a very large capacity for carrying information. We describe methods for generating this type of entanglement and discuss applications.

8:00 a.m.–10:00 a.m.
**LTuA • Photophysics of Nanostructured Materials II**
Lewis Rothberg; Univ. of Rochester, USA, Presider

**LTuA1 • 8:00 a.m.**
Excitonic Dynamics of Quantum Dots Monitored by Near-Infrared Transient Absorption. Emily Weis, Eric A. McArthur, Adam J. Morris Cohen, Kathryn E. Knowles; Northwestern Univ., USA. This talk describes a global regression analysis of near-infrared (NIR, 900 nm - 1300 nm) transient absorptions (TA) of colloidal CdSe quantum dots (QDs) photexcited to their first (1S, 1S) excitonic state.

**LTuA2 • 8:30 a.m.**
Use of Lasers in Time and Frequency Applications (or Metrology). Scott Diddams; NIST, USA. Abstract not available.

8:00 a.m.–10:00 a.m.
**LtUA • IPF-Laser Applications in Metrology**
Georg Nadorff; CVI Melles Griot, USA, Presider

**LtUA1 • 8:00 a.m.**
Strong Spectral Entanglement in Spontaneous Parametric Down-Conversion. Warren Grice, Ryan Bennett, Philip Evans, Travis Rumble, Raphaël Pooner, Jason Schuckes, Brian Williams; Oak Ridge Natl. Lab., USA, 1, Univ. of Tennessee, USA. Photon pairs with a high degree of spectral entanglement have a very large capacity for carrying information. We describe methods for generating this type of entanglement and discuss applications.

**LtUa2 • 8:30 a.m.**
Quantum Dot Electron Transfer Probed by Transient Photoluminescence, Marcus Jones; Univ. of North Carolina at Charlotte, USA. Opto-electronic applications of nanocrystals rely on generation and exploitation of mobile charge carriers. Understanding nanocrystal electron transfer processes is therefore important. Transient photoluminescence is a versatile technique that is helping to unravel this complex field.

8:00 a.m.–10:00 a.m.
**STuA • Laser Fusion Processing for Advanced Memory Designs**
Joohan Lee, James Cordingley; GSI Laser Systems, USA. Control of laser parameters such as wavelength, pulse-shape, polarization, multiple pulses and ultra-short pulses improves the laser cutting reliability of various fine pitch fuses that are used for modern circuit redundancies.

8:00 a.m.–10:00 a.m.
**STuA • Nonlinear Optics I**
Andrew G. White; Univ. of Queensland, Australia, Presider

**STuA1 • 8:00 a.m.**
Use of Lasers in Time and Frequency Applications (or Metrology). Scott Diddams; NIST, USA. Abstract not available.

**STuA2 • 8:30 a.m.**
Laser Fusion Processing for Advanced Memory Designs, Joohan Lee, James Cordingley; GSI Laser Systems, USA. Control of laser parameters such as wavelength, pulse-shape, polarization, multiple pulses and ultra-short pulses improves the laser cutting reliability of various fine pitch fuses that are used for modern circuit redundancies.

8:00 a.m.–10:00 a.m.
**LTuB • Self-Assembled Ultracold Atoms, Daniel Gauthier, Joel A. Greenberg; Duke Univ., USA.**
We observe spontaneous parametric oscillation in a laser-driven cloud of cold atoms. The threshold for this instability is lowered dramatically due to self-assembled atomic gratings that allow for self-phase matching of atom-field wave mixing processes.
FTuA • Photonics and Energy II—Continued

FTuB • Adaptive Optics for the Eye—Continued

FTuC • Nonlinear Integrated Optics—Continued

FTuD • General Optics in Information Science—Continued

FTuE • General Optics—Continued

FTuA3 • 9:00 a.m. • Invited
Photonics and Optics for Energy Efficiency and Sustainability - Is This Green Photonics? Michael Lebby, OIDA, USA. Abstract not available.

FTuB3 • 9:00 a.m. • Invited
Optical Design of Clinical Adaptive Optics Instruments for Retinal Imaging, Alfredo Dubra, A. Gomez-Vieyra, Y. Salat, Luis Diaz-Santana; Univ. of Rochester, USA. Simple design rules can be used to reduce astigmatism in off-axis reflective ophthalmic adaptive optics instruments. These rules will be illustrated by presenting the design of such devices with footprints smaller than a square foot.

FTuC3 • 8:45 a.m.
Mid-infrared Broadband Continuous-wave Parametric-mixing in Silicon Nanowaveguides, Ryan K. W. Lau1, Michael Ménard2, Yoshitomo Okawachi1, Mark A. Foster1, Amy C. Turner-Foster1,5, Reza Salimi1, Michal Lipson1, Alexander L. Gaeta1; 1School of Applied and Engineering Physics, Cornell Univ., USA, 2School of Electrical and Computer Engineering, Cornell Univ., USA, 3Picocar, USA, 4Kavli Inst. at Cornell for Nanoscale Science, Cornell Univ., USA. We demonstrate broadband continuous-wave frequency conversion to the mid-infrared region via four-wave mixing in silicon nanowaveguides. We measure a 3-dB conversion bandwidth of over 350 nm.

FTuD4 • 8:45 a.m.
Generation and Characterization of Broadband Similariton, Aram Zeytunyan1, Amush Maradjian1, Garegin Yesayan1, Levon Movsasian1, Frédéric Launay1, Alain Barthélémy1; 1Verevan State Univ., Armenia, 2XLIM Inst. de Recherche, Univ. de Limoges, France. We generate a 100 nm-bandwidth nonlinear-dispersive similariton in a passive fiber, and characterize it by means of its chirp measurement through the technique of frequency tuning and spectral compression in the sum-frequency generation process.

FTuA • Photonics and Energy II—Continued

FTuB • Adaptive Optics for the Eye—Continued

FTuC • Nonlinear Integrated Optics—Continued

FTuD • General Optics in Information Science—Continued

FTuE • General Optics—Continued

FTuE4 • 8:45 a.m.
Deflection Measurements with Weak Values, P. Ben Dixon, David J. Starling, Nathan S. Williams, Praveen K. Vyasraju, Andrew N. Jordan, John C. Howell; Univ. of Rochester, USA. We report an interferometric weak-value technique to amplify transverse beam deflections. The utility is quantified through an investigation of the signal to noise ratio along with the experimental results.

FTuD5 • 9:00 a.m.
Optical Design for Improving Matrix Condition-Experiment, Iftach Klapp, David Mendlovic; Tel Aviv Univ., Israel. We present preliminary experimental results of the “blurred trajectories” method. Results show improvement of the matrix condition and immunity to noise when using the proposed method.

FTuD6 • 9:15 a.m.
Shift and Rotation Invariant Double Random Phase Encoding Using Fingerprint Keys, Masa-fumi Takeda, Hiroyuki Suzuki, Masahiro Tamaguchi, Takashi Ohi, Nagaishi Ohyama; Tokyo Inst. of Technology, Japan. We propose a method to eliminate the tags from the plain image for the purpose of decrypting an encrypted image appropriately without detecting the shifted position and correcting the rotation angle of the fingerprint.

FTuE5 • 9:00 a.m.
Demonstration of a Slow-Light Laser Radar (SLIDAR), Zhimin Shi, Aaron Schweinsberg, Joseph E. Vornhein, Jr., Robert W. Boyd, Univ. of Rochester, USA. We propose a multi-aperture slow-light laser radar (SLIDAR) and demonstrate a proof-of-concept system. Two slow-light mechanisms are demonstrated to control the relative group delay among various apertures while the relative phases among apertures remain locked.

FTuE6 • 9:15 a.m.
Three-Dimensional Self-Focusing of Laser Pulses in SBS-Active Media, Sarah Mauger1, Luc Berg2, Stefan Skupin2; 1CEA-DAM, DIF, France, 2Max-Planck-Institut für die Physik of Complex Systems, Germany, 3Inst. of Condensed Matter Theory and Optics, Friedrich-Schiller-Univ., Germany. The coupling between Kerr filamentation and stimulated Brillouin scattering (SBS) is numerically investigated for nanosecond laser pulses in silica. In self-focusing regime, phase-modulated broadband pumps may not weaken backscattering, which appropriate amplitude modulations can achieve.
Nonlinear High-Resolution Imaging of Eumelanin and Pheomelanin Distributions in Normal Skin, Tissue and Melanoma, and Pheomelanin Distribution in Normal Skin Using Han, Edward Brown, Univ. of Rochester, USA. In this paper, we present a method to determine, for the first time, the SHG F/B ratio in vivo on the surface of intact tissue samples without any biopsy or tissue sectioning, using only epi-detection.

Antenna-Assisted Colocalization of Individual Ca2+-Pumps in the Plasma Membrane of Erythrocytes, Christine Höppener1,2, Zachary Lapin2, Lukas Byro2, Valeria Balogh-Nair 2; 1Physics Dept.,CUNY, USA, 2Chemistry Dept., CUNY, USA. We holographically characterized repeatability and precision under static and high-vibration conditions. The system employs a single-frame-phase sensor that permits acquisition in tens of microseconds to mitigate the effects of vibration or relative-motion with the test-part. The theory of operation is presented along with experimental test results, which characterize repeatability and precision under static and high-vibration conditions.

A Near-infrared Emitting Self-assembled Pbs-dendrimer Nanocomposite, Swapan K. Gayen1, Mohammad Abrabaine2, Floriy K. Wong2, Andrew H. Byer1, Valeria Balogh-Nair2; 1Physics Dept.,CUNY, USA, 2Chemistry Dept., CUNY, USA. Optical spectroscopy of a nanocomposite of PBS quantum dots and poly(amido amine) dendrimer exhibits a 750-nm band-edge absorption peak, partially-polarized 820-1150 nm fluorescence with peak at 940 nm, and a fluorescence lifetime of 785 ns.

The Transition between Superluminal and Subluminal for Multiple Gain-assisted Microspheric Resonators, Yundong Zhang, Jing Zhang, Jinfang Wang, Xuanan Zhang, Dan Wu, Fong Yuan; Harbin Inst. of Technology, China. We investigate the dispersion characteristics of coupled resonator induced transparency and absorption in the microspheres coupled with a fiber taper system. The switch between superluminal and subluminal could be realized by doping the gain.

Dynamic Interferometry for on-Machine Metrology, Michael North Morris; 4D Technology Corp., USA. A compact, vibration insensitive interferometer design that is well suited for measuring optics while mounted in situ on polishing equipment is presented. The system employs a single-frame-phase sensor to reveal abnormalities from the regular spatial distribution of specific membrane proteins.
Continued

Heterogeneously Integrated Silicon/III-V Evanescent Lasers with Micro-loop Mirror (MLM) Reflector, Yunan Zheng1, Xingyan Huang1, Tao Wang1, Yongqiang Wei1, Davis JG2, Chor Wei Lee1, Beryang Liu1, Yongming Tu1, Song Heng He1; 1Northwestern Univ., USA, 2Dept. of Electrical and Electronic Engineering, Univ. of Hong Kong, China. Chatic signal from an optically injected semiconductor laser is applied for power-over-fiber delivery. Stimulated Brillouin scattering is effectively suppressed by the broadband chaos such that transmission of 838 km through a 5-km single-mode fiber is demonstrated.

Improveing the Wavefront Boundary Condition for Adaptive Optics Retinal Imaging, Weiyao Zou, Stephen A. Burns; School of Optometry, Indiana Univ., USA. Accurate wavefront control requires carefully handling the boundary condition of wavefront measurement. With our dual deformable mirror Adaptive Optics Scanning Laser Ophthalmoscope, we have demonstrated improvement in imaging by reducing the adverse boundary effect.

Efficient Interband Four-Wave Mixing in Semiconductor Optical Amplifiers with Fast Gain Recovery, Prashant P. Baveja1, Drew N. Maywar2, Ankit Mohan1, Manuel M. Oliveira2, Ramesh Raskar1; 1MIT Media Lab, USA, 2Inst. de Informática, Univ. Federal do Rio Grande do Sul, Brazil. We describe an optical design that retrofits a cell phone display and an interactive software for assessing refraction properties of human eyes. User evaluation reveals an average error of ~0.5 diopters using currently available phones.

Efficient Interband Four-Wave Mixing in Semiconductor Optical Amplifiers: Theory and Experiment, Weiyao Zou1, Drew N. Maywar1, Ankit Mohan1, Manuel M. Oliveira1, Ramesh Raskar1; 1MIT Media Lab, USA. We observe efficient four-wave mixing in GaAs/AlGaAs, which demonstrates the potential of interband four-wave mixing (with net gain) in semiconductor optical amplifiers at low pump powers and signal detunings exceeding 6.5 nm. The potential applications include all-optical signal regeneration and wavelength conversion.
Biofilms as a model for dental plaque. This capability has been applied to the study of mixed bacteria species. Confocal Raman microscopy has been used to distinguish between biofilms of oral bacteria species Streptococcus sanguis and mutans. This capability has been applied to the study of mixed biofilms as a model for dental plaque.

Kimani Toussaint, Jr.

Structures, Harmonic Generation Imaging of Collagen-Based Structures. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Harmonic Generation Imaging of Collagen-Based Structures.

Kimani Toussaint, Jr.

Structures, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Confocal Raman Microspectroscopy of Streptococcus sanguis and mutans. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Confocal Raman Microspectroscopy of Streptococcus sanguis and mutans. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Development of Quantitative Metrics for Second-Harmonic Generation Imaging of Collagen-Based Structures. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Development of Quantitative Metrics for Second-Harmonic Generation Imaging of Collagen-Based Structures. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Development of Quantitative Metrics for Second-Harmonic Generation Imaging of Collagen-Based Structures. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.

Development of Quantitative Metrics for Second-Harmonic Generation Imaging of Collagen-Based Structures. Raghu Ambekar Ramachandra Rao, Highland F

We discuss the application of harmonic analysis in second-harmonic generation microscopy in developing useful quantitative metrics for assessing tissue morphology. A comparison between the information content in forward and backward SHG images is also presented.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuH</strong> • Novel Fiber Device</td>
<td>Lars Grüner-Nielsen; OFS Denmark, Denmark, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuL</strong>1 • Optical Design for Biomedical Systems I</td>
<td>Guoqiang Li; Univ. of Missouri at St. Louis, USA, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuL</strong>2 • Ultrasound fiber laser</td>
<td>Guifang Li; Univ. of Central Florida, USA, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuL</strong>2 • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing I</td>
<td>Kevin Thompson; Optical Res. Associates, USA, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuH</strong> • Novel Fiber Device</td>
<td>Lars Grüner-Nielsen; OFS Denmark, Denmark, Presider</td>
<td></td>
</tr>
<tr>
<td><strong>FTuL</strong>1 • Optical Design for Biomedical Systems I</td>
<td>Guoqiang Li; Univ. of Missouri at St. Louis, USA, Presider</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FTuL</strong>2 • Ultrasound fiber laser</td>
<td>Guifang Li; Univ. of Central Florida, USA, Presider</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FTuL</strong>2 • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing I</td>
<td>Kevin Thompson; Optical Res. Associates, USA, Presider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuH</strong> • Novel Fiber Device</td>
<td>Lars Grüner-Nielsen; OFS Denmark, Denmark, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuL</strong>1 • Optical Design for Biomedical Systems I</td>
<td>Guoqiang Li; Univ. of Missouri at St. Louis, USA, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuL</strong>2 • Ultrasound fiber laser</td>
<td>Guifang Li; Univ. of Central Florida, USA, Presider</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td><strong>FTuL</strong>2 • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing I</td>
<td>Kevin Thompson; Optical Res. Associates, USA, Presider</td>
<td></td>
</tr>
</tbody>
</table>

**FTuH2 • 11:00 a.m.**

Ultra-Wide Tunable Coupling in Fused Taper Fiber Coupler by Locally Applying Torsional Stress over the Waist, Hongyu Chen, Yunsun Song, Yunguang Oh; Yonsei Univ., Korea, Republic of. Ultra-wide tunable light coupling in a fused fiber coupler was experimentally achieved from 1000 nm to 1700 nm by applying torsion over the taper waist. Consistent spectral shifts in the transmission were analyzed for band rejection filter.

**FTuH3 • 11:15 a.m.**

Birefringence in Photonic Crystal Fibers: Cladding Lattice Shape Versus Unit-Cell Anisotropy, Arash Moti, Parisa Gandomkar Yarandi; Univ. of Wisconsin-Milwaukee, USA. We report on the birefringence caused by the anisotropy of the refractive index profile of a PCF single lattice unit in comparison to the birefringence caused by the underlying lattice shape and core shape asymmetries.

**FTuL2 • 11:00 a.m.**

Evidence of High-Order Vector Dissipative Soliton in a Fiber Laser, Xuan Xu, Dongguan Tang, Luming Zhao, Han Zhang, Randall J. Kneisz; School of Electrical and Electronic Engineering, Nanyang Technological Univ, Singapore. High-order vector dissipative solitons, consisting of two orthogonal polarization components, one of which is a single-hump pulse and the other has a double-humped structure, were observed in a normal-dispersion fiber laser for the first time.

**FTuL3 • 11:15 a.m.**

Phase And Amplitude Imaging from Noisy Intensity Measurements Using A Kalman Filter, Laura Waller, Mankei Tsang, Laura Barash, B. Kirrnan 2005; MIT, USA. We propose a method for complex-field retrieval from noisy intensity measurements in many planes, using an extended complex Kalman filter to model and predict light propagation.

**FTuL3 • 11:15 a.m.**

High-Resolution Mid-Infrared Frequency Comb Fourier Transform Spectrometer, Florian Adler, Pieter Maslowski 1, Aleksandra Foltynowicz, Kevin C. Cordt, Travis C. Briles, Jun Ye; JILA, NIST and Univ. of Colorado, USA; Instytut Fizyki, Uniwersytet Mikolaja Kopernika, Poland. We present a frequency-comb-based Fourier transform spectrometer operating in the ~2200-5700 cm⁻¹ range which allows rapid acquisition of broadband spectra with 0.01 cm⁻¹ resolution, detecting ppb-level concentrations of various gases in <1 minute of acquisition time.

Quantum Back Action in Tabletop Interferometers, Jack Harries1, Kyril Bartkiewicz1, Steven M. Gavrin1, Nathan Flowers-Jacob1, Benjamin M. Zwick1, Cheng Yang1; ‘Yale Univ., USA, ‘Yale Univ., Dept. of Applied Physics, USA. We present a scheme for measuring the shot noise of radiation pressure in a room temperature, table top interferometer, and discuss experimental progress towards this goal.

Optical Trapping and Cooling of Glass Microspheres in Air, Peng Zhang1, Simon Kheifets, David Medellin, Ricardo Jimenez-Montenegro, Lev Deych; Dept. of Physics, CUNY, USA. We show that the optical forces can capture the particle in quasi-stationary orbital motion around the length particle interacting with an optical whispering gallery mode resonator. We report optical trapping of glass microspheres in air and vacuum, and measurement of Brownian motion of single microspheres at different pressures. We are working on cooling the center-of-mass motion of a trapped microsphere.

Optomechanics of Unbound Nanoparticles Interacting with Whispering Gallery Modes of Microspheres, Joel Rubin, Lev Deych; Dept. of Physics, CUNY, USA. Dynamics of a free subwavelength particle interacting with an optical whispering gallery mode resonator are studied theoretically. We show that the optical forces can capture the particle in quasi-stationary orbital motion around the resonator.

Controlled Rotation of Micro-particles with Multi-Trap Rotating Tweezers Generated by Moiré Technique, Daniel Hernandez1, Peng Zhang, Simon Huang, Yi Hu1, Zhizhang Chen1; ‘San Francisco State Univ., USA, ‘TEDA Applied Physics School, Nanhai, China. We demonstrate controlled rotation of micro-particles with multi-trap rotating tweezers established with optical propelling beams. Such propelling beams contain rotating intensity blades generated by Moiré technique but with no mechanical movement or phase-sensitive interference.

Mixed Quantum Classical Simulations of Vibrational Excitations in Peptide Helices, Anne Goy1, Eric Butter1; ‘Univ. of Houston, USA. The theory of Davydov solitons largely has been largely studied using semi-classical techniques that invoke an adiabatic approximation. We test for the soliton formation under conditions that include important features of a true biological system: -300K temperature, a solvent, hydrogen bond breaking and reforming.
Continued

*FTuH* • Novel Fiber Device—Continued

*FTuH4* • 11:30 a.m.
Breaking the Two-fold Degeneracy in Eigen Modes of a Triangular-Core Hollow Optical Fiber. Sejin Lee*, Wooseung Ha*, Jenn Kabelve*, Kay Schuster*, S. Unger*, Kyunghwan Oh†; †Inst. of Physics and Applied Physics, Yonsei Univ., Korea, Republic of, 2Inst. of Photon Technology, Germany. A new micro-structured optical fiber is proposed and fabricated, which has a triangular core with a central air hole providing a unique 3-fold degeneracy of eigen-modes. The degeneracy evolution in the spectral domain was investigated.

*FTuH5* • 11:45 a.m.
Profilling of Changes in Optical Fiber Stress and Refractive Index Due to Carbon-Dioxide Laser Irradiation. Michael R. Hatted, Thomas K. Gaylord, Georgia Tech, USA. Independent measurements of the 2D refractive index and axial stress distributions in CO₂ laser-induced long-period fiber gratings are performed. Physical mechanisms of fabrication are evaluated for the first time by direct measurement.

---

*FTUl* • Optical Design for Biomedical Systems I—Continued

*FTUl3* • 11:30 a.m.
Characterization of Ultimate Sensing Capability of Optical Ring Resonator Biosensors. Hao Li†, Xudong Fan†; †Dept. of Biomedical Engineering, Univ. of Michigan, USA, 2Dept. of Optical Science and Engineering, School of Information Science and Engineering, Fudan Univ., China. The sensing capability of the optofluiddic ring resonator in bulk refractive index detection and labelfree small molecule detection is experimentally investigated near its detection limit. The results set the benchmark for ring resonator biosensors.

*FTUl4* • 11:45 a.m.
Photorefractive Two-Wave Mixing for Adaptive Coherence Domain Detections. Adam Drewery, Jeffrey LaCroix, Ping Yu, Univ. of Missouri, USA. Photorefractive two-wave mixing based on either diffraction or photovoltaic effects has been tested for a low superluminescent light emitting diode. We demonstrate potential applications of two-wave mixing in photorefractive quantum wells for coherence domain detections.

---

*FTuJ* • Ultrafast fiber laser—Continued

*FTuJ3* • 11:30 a.m.
Noise-Like and Gain-Guided Pulses from a Dual-Mode Femtosecond Fiber Ring Laser. Felipe Gerletti†, Sylvain G. Cloutier†; †Univ. of Delaware, USA. We report a mode-locked femtosecond erbium-doped fiber laser that can be tuned for stable operation in either the noise-like pulse generation mode or gain-guided soliton pulse generation regime. Detailed results and theory will be presented.

*FTuJ4* • 11:45 a.m.
Modeling of Ultrafast Fiber Optical Parametric Oscillators. Jay E. Sharping†, Wen Qi Zhang, University of Rochester, USA. The simulations reveal interesting pulse dynamics within these systems, and give insight into optimal design strategies.

---

*FTuK* • Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing I—Continued

*FTuK3* • 11:30 a.m.
Ambiguity Function and Phase Space Tomography for Nonparaxial Fields. Seongkeun Cho†, Miguel A. Alomar†, Univ. of Rochester, USA. We report a generalization of the ambiguity function that retains the complex signal is used to establish relationships context of coherent self-imaging. The periodicity of the complex signal is used to establish relationships for accurate and unique signal recovery.

*FTuK4* • 11:45 a.m.
Diagnostics and Sensing I—Continued

---

*FTuL* • Frequency Combs for Spectroscopy—Continued

*FTuL3* • 11:30 a.m.
Deterministic Phase Retrieval And The Fractional Talbot Effect. Markus E. Testorf†, Dartmouth College, USA. Phase-space tomography and related deterministic phase retrieval methods are investigated in the context of coherent self-imaging. The periodicity of the complex signal is used to establish relationships for accurate and unique signal recovery.

*FTuL4* • 11:45 a.m.
Delivery of Optical Frequency References through Atmosphere Using a Frequency Comb. Ravi P. Gollapalli, Lingze Duan; Univ. of Alabama at Huntsville, USA. Optical frequency references are transferred in the atmosphere over a 60-m round-trip propagation distance. Fractional instability ~10⁻¹³ at 1s is observed and large phase modulation caused by air fluctuation leads to sizeable linewidth broadening.
<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
<th>Speaker</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FiO M4</td>
<td>11:30 a.m.</td>
<td>Invited</td>
<td>Optical Sculpting: Changing the Shape of Micromanipulation, Kishan Dholakia, Janelle Shane, Michael Mazilu, Tomas Cizmar, Univ. of St. Andrews, UK. We explore how sculpting the phase and amplitude of light allows for optical trapping through turbid media using novel wavefront correction. Additionally, we explore the role of pulsed laser light in trapping.</td>
</tr>
<tr>
<td>LTuC3</td>
<td>11:45 a.m.</td>
<td></td>
<td>Realization of Stable p-type Zno Thin Films Using a Li-N Dual Acceptor Doping for Optoelectronic Applications, Talakonda Prasad Rao, M. C. Santhosh Kumar, Dept. of Physics, Natl. Inst. of Technology Tiruchirappalli, India. The p-type conductivity of (Li,N):ZnO is reproducible, stable, and with acceptable crystal quality. The optical properties were studied using photoluminescence.</td>
</tr>
<tr>
<td>LTuC4</td>
<td>11:45 a.m.</td>
<td></td>
<td>Scattering of a Focused Gaussian Beam by a Dielectric Spheroidal Particle with a Nonconcentric Spherical Core, Elsayed Esam M. Khaled, Medhat E. Aly, Assiut Univ., Egypt. Telecom Egypt Co., Egypt. Angular scattering intensities of a spheroidal particle with a nonconcentric core illuminated with a focused Gaussian beam are calculated using the T-matrix method. Effects of the core's offset are illustrated. Other particle shapes are applicable.</td>
</tr>
<tr>
<td>STuB4</td>
<td>12:00 p.m.</td>
<td>Invited</td>
<td>The Status of the CERN Large Hadron Collider (LHC), Dan Green, Fermilab, USA. The LHC is the highest energy particle accelerator in the world. The associated experiments are the largest and most complex scientific instruments ever built. Each detector is like a 100-megapixel camera which takes 40 million pictures per second.</td>
</tr>
</tbody>
</table>

**12:00 p.m.–1:30 p.m. Lunch (on your own)**

**12:00 p.m.–1:30 p.m. Exhibit Only Time, Empire Hall, Rochester Riverside Convention Center**

**12:00 p.m.–1:30 p.m. OSA Fellow Member Lunch, Grand Ballroom A and B, Hyatt**
JTuA02
Multiplexed Plasmonic Nanostructures for Wide-band Optical Filters, Buxang Zhang, Jingpeng Guo, Stuart Yin, University of Alabama in Huntsville, USA, Pennsylvania State Univ., USA. We investigated coupling effects of multiplexed plasmonic resonators in each unit cell of periodic structure metamaterial. Multiplexed periodic nanostructure metamaterial films have novel optical spectral properties which are quite different from simple periodic metallic structures.

JTuA03
Beam Steering in Anisotropic Metamaterials, Rajagopal Panchapakesan, Gayatri Venugopal, Robert R. Alfano; Physics Dept., CUNY, USA. We investigated tunable anisotropic metamaterials consisting of silver nanorods and dielectric medium for applications to beam steering and demultiplexing. The tunability is achieved by changing the fill fraction and the properties of the dielectric medium.

JTuA04
Geometric Phase and Poincare Sphere for Cylindrical Vector Beams, Giovanni Milione, 1, Youngjin Oh2, Wonju Lee2, Donghyun Kim 1,2; 1Inst. for Infocomm Res., Singapore, 2Inst. of Engineering and Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan. Optical measurement of the deformation of a high-speed rotational mirror is investigated. Numerical finite element analysis on the deformation of the mirror is performed for better theoretical understanding. Better mirror configuration design is also proposed.

JTuA05
Fabrication of Optical Active Polymeric Microstructures Connected with Silica Nanofibers, Vinicius Tribuzi, Rafael H. Pacheco, Daniel S. Correa, Marcus R. Cardona, Cleber R. Mendonça; Inst. de Fisica de San Carlos, Univ. de Sao Paulo, Brazil. We used femtosecond pulses to fabricate microscopic polymeric structures by using the two-photon absorption induced polymerization. By using doped samples we have fabricated optical active microstructures which were excited by external sources through silica nanofibers.

JTuA06
Implementation of a Diffusion Element Sensor in an Optical Analyzer in a Refractive Lenses, Eduardo Pérez-Careta1, J. J. Sánchez-Mondragoz1, M. Torres-Camero2; Univ. of Guanajuato, Mexico, 1Photons and Optical Physics Lab, INAOE, Mexico. The implementation of a Hasselblad material sensor in a TDLS Oxygen Analyzer is discussed in this paper. Porosity, corrosion and high temperature affects the measurements of the analyzer are reduced notably with Hasselblad sensors.

JTuA07
Imaging Based on Random Excitation of Fluorescence Localized by Metallic Nanosized, Kyungjun Kim, Youngjun Oh, Wonja Lee, Donghyun Kim2; 1Program for Nanomedical Science and Technology, Yonsei Univ., Korea, Republic of, 2School of Electrical and Electronic Engineering, Yonsei Univ., Korea, Republic of. We investigated localized surface plasma imaging to improve spatial resolution in total internal reflection microscopy. The resolution increment is based on excitation by hotspots between nanosized. The images were confirmed using fluorescent beads.

JTuA08
Silicon-Coated Deep Subwavelength Spooled Plasmonic Waveguides for THz Applications, Xiang Yang, Wangchi Zhao, Zhaolin Lu; Rochester Inst. of Technology, USA. We numerically studied the propagation of THz waves in spooled plasmonic devices, and show the possibility of using high-index top–coat material to further shrink the relative mode size for deep-subwavelength mode confinement.

JTuA09
Dual Gas Sensor Design Considering a Single Fabry-Perot Interferometer, Everardo Vargas-Rodriguez, Daniel May-Arrioja, Julián Estudillo-Ayala, Óscar Pérez-Careta, Roberto Rojas-Laguna, Monica Trigo-Durán; 1Univ. of Guanajuato, Mexico, 2Autonomous U. of Tampico, Mexico. In this work we analyze the design of a dual gas sensor based on correlation spectroscopy using a single Fabry-Perot Interferometer. Simulations and experimental results will be provided.

JTuA10
Interrogation Method of a Bragg Gratings Based Laser Sensor Using FFT, Oscar Méndez Zepeda, Severino Muñoz Aguirre, Georgina Beltrán Pérez, Ivan Castillo Micó, Benemérita U. Autónoma de Puebla, Mexico. Multipoint laser sensors based on Bragg gratings usually identify the acting gratings. However they cannot quantify the signal change. In this work the Fourier discrete transform was used to identify and quantify such signal variations.

JTuA11
Implementation of Phase-Shift Patterns with Sub-diffraction Limited Features by Use of Diffractive Optical Elements, Yu-Wen Chen, Wei-Feng Hsu, Dynasty S. Yang; 1Natl. Tsing Hua Univ., Taiwan, 2Natl. Taiwan Univ. of Technology, Taiwan. We present the results of three consecutive studies in which the complex 2-D sub-diffraction-limited images can be generated, and the methods to improve the image quality by decreasing the speckle noise.

JTuA12
Effect of Spherical Aberration on the Color Appearance of Small Red Dot, Huajing Guo, 1Eli Dobrostange, Alexander Gonzalez, 2Chrs Dainty; Natl. Univ. of Ireland, Galway, Ireland. We used adaptive optics (AO) system to study spherical aberration on the 4 mm pupil eye. A small red dot surrounded by a black ring and white background appeared to be whistful through the system.

JTuA13
Long Period Fiber Gratings to Detect Organic Vapor, Viterbo Epitacio Reyes, Georgia Beltran Perez, Severino Munoz Aguirre, Ivan Castillo Micostio, Benemérita U. Autónoma de Puebla, Mexico. An organic vapor sensor was fabricated by a PDSM film deposited on an LPG. The response was measured as the transmission spectrum change. The sensor sensitivity was related to the sample molecular weight.

JTuA14
Reference Free Absorptive Wavefront Measurement, Wenjiang Guo1,2, Lijie Zhao1, F. Ming Chen1; 1Singapore Inst. of Manufacturing Technology, Singapore, 2Nanyang Technological Univ., Singapore. A novel reference-free wavefront sensing method is proposed to measure absorptic wavefront. It is demonstrated and proved theoretically and simulation results show that the form of the absorptive wavefront can be correctly reconstructed.

JTuA15
New Spectroscopic Evidence that H2 Molecules Present in the Gaseous Atmospheres of OB Stars Displaying the 2175Å “Bump” are Coherently Photoreacted, Peter P. Sorokin; IBM Res. (Emiterruptus), USA. I explain why the (999A - 1013.4A) FUSE spectra of 2175Å “bump” stars invariably display intense sharp absorption bands at 1004.56Å, 1007.29Å, and 1011.53Å, while these three bands are always absent in “non bump” stars.

JTuA16
Dynamic Response of Optical Feedback in Orthogonally Polarized Microchip Nd:YAG Laser Based on Optical Feedback Rate Equation, Zhou Xiaoxue, Han Mingyoung, Ng Suan Huat, Michelle Love; 1Inst. for Infocomm Res., Singapore, 2Inst. of Materials Res. and Engineering. Singapore. Photoluminescence based auto-bossing system was invented for detecting the total protein in urine. The system was tested using protein samples, analyzing system, and security information system. The measurable protein concentration is low to 0.01mg/ml.

JTuA17
Dissipative Soliton Generation and Compression in a Compact All-Fiber Laser System, Leif Wang, Xuming Liu, Yongfang Gong, Dong Mao, Xuehai Li; Xi’an Inst. of Optics and Precision Mechanics, Chinese Acad. of Sciences, China. A compact all-fiber laser system is proposed to investigate the generation and compression of dissipative solitons. The original highly chirped picosecond pulses can be dechirped to femtosecond pulses by single-mode fiber with optimal lengths.

JTuA18
Secondary Processes Induced by Femtosecond Laser Plasma X-Ray and Corpuscular Emission in External Target, Gregory Golobor, D. Uryapina, R. Volkov, A. Savlev; Moscow State Univ., Russian Federation. Plasma created by the femtosecond laser pulse (1-100W/cm²) was used as a source of electrons and x-rays to excite 14.4 keV nuclear state of 57Fe. Conversion de-excitation of this state was observed.
JTuA23 Improved NIRBS Using a Novel Brush Optrode, Chester Wilder2, Duncan L MacFarlane1, Bilal Khan1, Fenghua Tian1, Hamli Liu1, Georgios Alexandrakis1; 2Univ of Texas at Dallas, USA, 1Univ of Texas at Arlington, USA. Functional Near Infrared Spectroscopy (NIRS) may be impaired by absorption from the subject’s hair. Improved sensitivity is achieved using a redesigned optrode with fiber tips designed to thread through the hair for better scalp contact.

JTuA24 Monitoring Photodynamic Therapy of Head and Neck Cancer with Optical Spectroscopy: Initial Results, Ulas Sunar, Daniel Bobrachter, Nestroy Riguval, Erin Tracy, Ken Kaymz, Michele T. Cooper, Henz Baumann, Barbara H. Henderson; Roswell Park Cancer Inst., USA. We present initial results obtained during photo-dynamic therapy (PDT) in a head and neck cancer patient. Our results showed PDT induced significant drug photochemical absorbed by nonimvasive diffuse optical methods.

JTuA25 Measuring Dispersion in Metamaterials, Dean P. Brown1, Augustine M. Urbas1, ‘UJS, Inc., USA, ‘AFRL, USA. We utilize a multiphoton intrapulse interference phase scan (MIEPS) technique to measure the group velocity dispersion (GVD) of metamaterials and find it to be four orders of magnitude larger than that of dispersive optical glasses.

JTuA26 Lensing Properties of Ultralow Light in Bose-Einstein Condensate, Devrim Tarhan2, Alphan Senmazoglu2, Ogueghi Mbaebuegh2; ‘Harman Univ., Turkey, ‘Rhopheader, 8386 Zurich, 5407 Switzerland. We have investigated lensing properties of ultralow light in an atomic Bose-Einstein condensate by using an off-resonant electromagnetically induced transparency scheme.

JTuA27 Implementation and Development on Color Inket High Density Data Storage Technology, Samuel 1 En Lin; Natl. Formosa Univ., Taiwan. A high density optical disk storage concept using microelectrochemical multilayered method was demonstrated. Simultaneous readout of multiple bits in a single storage pit is accomplished with a D/ROE head using a white light source.

JTuA28 On Convergence of Fourier Modal Methods Used for Computing Scattering from Metallic Binary Gratings, Krishna Mohan Ganana, Aradh Madhi; Univ. of Wisconsin-Milwaukee, USA. We show that the convergence problems in Fourier modal methods also arise from the square truncation of boundary matching conditions and that by seeking minimum least squared solution of rectangular truncation, convergence can be achieved.

JTuA29 Dynamic Gain Spectrum Equalizer for EDFAs in Reconfigurable Optical Networks, Vitor V. Nascimento1, ‘Julio C. R. F. Oliveira2, Vitor B. Ribeiro3, Aldo C. Bordonalli4; 2CiP&D Foundation, Brazil, 3UNICAMP, Brazil. A dynamic gain spectrum equalizer based on a cascade of anomalous optical fibers applied to EDFAs is demonstrated. A superior performance on power imbalance compensation and OSNR maintenance is obtained after different scenarios experimental evaluation.

JTuA30 Fast and Wide Wavelength-Swept Fiber Optical Parametric Oscillator Based on Dispersion Tuning, Yue Zhou, Kim K. Y. Cheung, Qin Li, Sheng Yang, P. C. Chui, Kenneth K. Y. Wong; Univ. of Hong Kong, Hong Kong. We demonstrate a fast and wide tuning wavelength-swept source based on a dispersion-tuned fiber optical parametric oscillator. We achieved the sweep rate of 40 kHz and the wavelength tuning range of 109 nm.

JTuA31 Wavelength Conversion Characterization of 2-14 GbPSK Channels Based on SOA-FWM Properties, Eduardo C. Magalhaes1, Evandro Conforti1, Aldarion C. Bordomalli2; 1Univ. of Campinas - UNICAMP, Brazil, 2Univ. of Campinas - UNICAMP, Brazil. An empirical characterization of wavelength conversion of phase modulated channels based on SOA-FWM is presented. For a 3-nm range around a modulated carrier, the first PWm product in negative detuning showed the best conversion performance.

JTuA32 Capacity Achieving Signal Constellation Diagram of Fiber-Optic Channel, Jianyang Zhang1, Ivan B. Djordjevic2, Hassam G. Batshour3, Shaosheng Jian4; 1Beijing Jiaotong Univ., Institute of Lightwave Technology, China, 2Univ. of Arizona, Dept. of Electrical and Computer Engineering, USA, 3Beijing Jiaotong Univ., Key Lab of All-optical Network & Advanced Telecommunication Network of EMC, China. We describe a method to determine the optimum signal constellation diagram of arbitrary fiber-optic channel. The numerical results indicate that the optimized signal constellation has discrete amplitude and non-circular phase.

JTuA33 Anomalous Propagation of Luminescence through Bulk n-InP, Serge Luryi, Oleg Semyonov, Arsen Sabuhov, Zhishen Chen; State Univ. of NY at Stony Brook, USA. Implementation of a semiconductor as a scintillator with a lattice-matched surface photo-diode for radiation detection requires efficient luminescence collection. Low and heavily doped bulk n-InP has been studied to optimize luminescence transmission via photon recycling.

JTuA34 50 km Ultralong Erbium Fiber Laser with Soluton Pulse Compression, Lucio A. M. Saito, Enoccles A. De Sousa; Univ. Presbiteriana Mackenzie, Brazil. We demonstrated a 50 km ultralong Erbium fiber laser actively mode locked with repetition rate varying from 1 to 10 GHz. The output pulse widths were determined by soliton regime at 1 and 2.5 GHz.

JTuA35 Surface Plasma Resonance (SPR) Based Indium Tin Oxide (ITO) Coated Tapered Optical Fiber Sensor for 1R Region, Rajneesh Verma, Banshi D. Gupta; Indian Inst. of Technology Delhi, India. SPR based TFO coated tapered optical fiber sensor for detection in infrared region of the spectrum is presented. Sensitivity enhancement of about 5 times as compared to conventional gold coated fiber optic sensor is reported.

JTuA36 Analysis of Graded-Index Segmented Channel Waveguides with Application to Femtosecond Laser Written Waveguides, Ruchi Garg, M R Sheny, K. Thyguraj, Indian Inst. of Technology Delhi, India. We present an analysis of graded-index segmented channel waveguides with z-dependent refractive index variation in the high-index segments, and explain the stability behavior of recently fabricated ‘pearl chain waveguides’ from femtosecond laser optical fiber. We present an analysis of graded-index segmented channel waveguides with application to femtosecond laser written waveguides.

JTuA37 Optical Packaging Design for Silicon Photonic Chips, Toichi Taira, Hitodoshi Numata; IBM, Japan. We evaluated packaging design options of silicon photonics chips with processors for achieving fan-out of the optical signal lines, maintaining mechanical robustness, and signal connection to the external signal paths like the conventional packaging.

JTuA38 Omnidirectional Band Gaps in a Ternary Metallo-Dielectric Stack, Adalberto Alejo-Molina1, Jose I. Sanchez-Mondragon2, Alvaro Zamudio-Laran1; 1Larner College of Medicine, USA, 2California Institute of Technology, USA. We present an analysis of graded-index segmented channel waveguides with application to femtosecond laser written waveguides. We demonstrate a coherent population trapping based scheme to attain sub-nanoscale resolution for microscopy via coherent population trapping.

JTuA39 Sub-nanoscale Resolution for Microscopy via Coherent Population Trapping, Kishor T. Kapale1, Girish S. Agarwal2; Western Illinois Univ., USA, ‘Ok-lahoma State Univ., USA. We present a coherent population trapping based scheme to attain sub-nanoscale resolution for microscopy using three-level atoms coupled to two optical fields—an amplitude modulated probe field and a spatially dependent coupling field.

JTuA40 Nonlinear Absorption in Multimode Waveguides, Armand Rosenberg, Steven R. Flom, Richard C. S. Peng, James S. Stirk; NRL, USA. The energy-dependent absorption of multimode waveguides with strongly nonlinear cores has been studied experimentally and numerically. The presence of a discrete set of waveguide modes is found to substantially lower the nonlinear threshold.

JTuA41 Tailoring the Beam Profile of an 808-nm Pump Laser Diode Using Lloyd’s Mirror Interference, Takehiro Fukushima, Koichiro Sakaguchi, Yasunori Tokuoka; Dept. of Communication Engineering, Okayama Prefectural Univ., Japan. We demonstrate a method for tailoring the beam profile of a commercial 808-nm pump laser diode. An almost circular output beam with a vertical divergence of approximately 7.2° was obtained using Lloyd’s mirror interference.

JTuA42 Sudden Death of Entanglement Between Coupled Quantum Dots in a Cavity, Arnab Mitra1, Hsu-chung Shian2, Reeta Vyas; 1Univ of Arkansas, USA, 2California State Polytechnic Univ., USA. We study generation and time evolution of entanglement between two coupled quantum dots inside a driven cavity. In the presence of dissipation the entanglement may remain stationary, decay asymptotically, or show sudden death.

JTuA43 Ultrafast Optics Used to Generate and Detect Lont Pulse Compression, Devrim Tarhan2, Alphan Senmazoglu2, Ogueghi Mbaebuegh2; ‘Harman Univ., Turkey, ‘Rhopheader, 8386 Zurich, 5407 Switzerland. Ultrafast optics was used to generate and detect long pulse compression.

JTuA44 Nonlinear Acoustic Phonons in High Quality Silicon on Glass Sample, Omar S. Magalhaes2, and 2Roman Szoboszlay, 1Jose L. Sanchez-Mondragon3, JTuA45 Tailoring the Beam Profile of an 808-nm Pump Laser Diode Using Lloyd’s Mirror Interference, Takehiro Fukushima, Koichiro Sakaguchi, Yasunori Tokuoka; Dept. of Communication Engineering, Okayama Prefectural Univ., Japan. We demonstrate a method for tailoring the beam profile of a commercial 808-nm pump laser diode. An almost circular output beam with a vertical divergence of approximately 7.2° was obtained using Lloyd’s mirror interference.

JTuA46 Nonlinear Absorption in Multimode Waveguides, Armand Rosenberg, Steven R. Flom, Richard C. S. Peng, James S. Stirk; NRL, USA. The energy-dependent absorption of multimode waveguides with strongly nonlinear cores has been studied experimentally and numerically. The presence of a discrete set of waveguide modes is found to substantially lower the nonlinear threshold.

JTuA47 Tailoring the Beam Profile of an 808-nm Pump Laser Diode Using Lloyd’s Mirror Interference, Takehiro Fukushima, Koichiro Sakaguchi, Yasunori Tokuoka; Dept. of Communication Engineering, Okayama Prefectural Univ., Japan. We demonstrate a method for tailoring the beam profile of a commercial 808-nm pump laser diode. An almost circular output beam with a vertical divergence of approximately 7.2° was obtained using Lloyd’s mirror interference.
**JTuA51** Using the RNS Time-frequency Structure for Multiple-image Optical Compression and Encryption, Ayman Alfaouri, Christian Brousseau, ISEN Brest, France. In this communication we show the good performance of a spectral criterion used for multiple-image optical compression and encryption even in the case where their spectra occupy same areas.

**JTuA52** Absolute Distance Measurement Using High-frequency Repetition Modes of a Mode-locked Fiber Laser, Narin Chanthawong, Satoru Takahashi, Kiyoshi Takamasa, Hironobu Matsumoto, Univ. of Tokyo, Japan. We develop a Fabry-Perot etalon to select high-frequency parts of repetition frequency modes of a short pulse. The modified optical pulses generated the interference signal between two pairs of pulse trains with different relative delays.

**JTuA53** Amplitude-modulated Magneto-Optical Rotation in Paraffin-coated Cells and Buffer Gas Cells, Byung Kyu Park, Afroz, Family, Scynzum Panichlyob, Victor A. Acosta, Dmitry Budker, Wojciech Gawlik, Joint Krakow-Berkeley Atomic Physics and Photons Lab, USA. We report on the measurement of pressure broadening and shifts of silver D1 line. In MHz per torr, we measure 5.2 and 5.8 broadening and -2.5 and +1.2 shifts, by nitrogen and helium respectively.

**JTuA54** Pressure Broadening and Shifts of Silver D1 Line by Nitrogen and Helium, Byung Kyu Park, Todor Karulynov, Alex O. Sukhov, Dmitry Budker, Univ. of California, Berkeley, USA. Dept. of Physics, Yale Univ., USA. We report on the measurement of pressure broadening and shifts of silver D1 line. In MHz per torr, we measure 5.2 and 5.8 broadening and -2.5 and +1.2 shifts, by nitrogen and helium respectively.

**JTuA55** Thermal Emission of Carbon Microparticles in Epoxy Resin under Pulsed Laser Excitation, Valentin Stadnytskiy, Victor Ganashchenko, Pra Shcherbennya Nats., Univ. of Kyiv, Ukraine. Laser-induced incandescence (LDI) of carbon microparticles in epoxy matrices is studied. Non-monotonic behaviour of LII from dose of laser irradiation is observed. The proposed model interprets the majority of the observed experimental data.

**JTuA56** Polarization Anisotropies in Individual Quantum Dots and Correlation with Defocused Emission Patterns, Austin Cyphersmith, A. Makson, J. Graham, Y. Wang, M. D. Barnes, Univ. of Massachusetts Amherst, USA. 2D and 2D+1D dipole models for predicting the optical properties of CuSe-Ni quantum dots are considered. Observed defocused interference patterns and linear polarization anisotropies in emission suggest the 2D model may not be sufficient.

**JTuA57** Spatiotemporal Measurement of Femtosecond Localized Plasmon by Spectral Interferometry Combined with NSOM for Adaptive Control, Kannari; Keio Univ., Japan. We investigate grating formation in Fe:LiNbO₃ crystals by 800 nm femtosecond laser pulses for application of two-wave mixing amplification of shaped femtosecond laser pulses. Gratings were recorded by two-photon absorption and two-step excitation process.

**JTuA58** Laser Frequency Modulation Technique for Power-broadening-Free Spectroscopy, Xinwei Xie, Fengzong Li, Xinhong Xue, Tsukuba Univ., China, Nanjing Univ. China, ‘Univ. of Arkansas, USA. We suggest a FM technique to achieve power-broadening-free resonance, and experimentally demonstrate it using a system of electromagnetically induced transparency. Theoretical model for a general approach to power-broadening-free resonance will also be presented.

**JTuA59** High-precision Small-angle Measurement Based on Laser Self-mixing Interferometry, Jingzhong Peng, Qian Chi, Chun Chen, Zhen Chen, Jinan Univ. China. A simple but effective method for high-precision small-angle measurement based on laser self-mixing interference is presented. This method can also achieve absolute angle measurement. The theory and experiment has proved the validity of this method.

**JTuA60** Simple GaAs and InP Colloidal Quantum Dots Synthesis Using Laser Ablation, Diego B. Almeida, Vinicius B. Pelegatti, Andre A. do. Thomasz, Carla L. Caron, UNICAMP Brazil. In this work we present a simple synthesis route for obtaining both GaAs and InP colloidal quantum dots using the same laser ablation assembly.

**JTuA61** Charge Dynamics Transfer in Donor-acceptor Bridge-acceptor Side-chain Polymers for Solar Cells, Felipe A. Vallejo, Paul D. Cunningham, L. Michael Hayden, ‘Hin-Lap To, Alex K. Y. Jen, ‘Univ. of Maryland Baltimore County, USA. ‘Univ. of Washington, USA. We report charge transfer dynamics as a function of decreasing HOMO-LUMO gap in donor-bridge-acceptor conjugated side-chain polymers PFTDCNQ, PFTDCN, and PFPTD blended with electron acceptor PC₆BM measured using optical-pump THz-probe spectroscopy.

**JTuA62** Field Fluctuations of the OPO in Wigner, Positive-P, and Q-representations, William Rawlinson, Harish G. Pali, Surendra Singh, Rento Vyas, Univ. of Arkansas, USA. Field quadrature and phase fluctuations of the optical parametric oscillators are studied using Wigner function and are compared with those in positive-P and Q-representation.

**JTuA63** Grating Formation With Shaped Femtosecond Laser Pulses in Fe:LiNBO₃, for Two-wave Mixing Amplification, Md. Manzul Kabir, Yu Osuki, Fumihiko Kannari, Keio Univ., Japan. We investigate grating formation in Fe:LiNBO₃ crystals by 800 nm femtosecond laser pulses for application of two-wave mixing amplification of shaped femtosecond laser pulses. Gratings were recorded by two-photon absorption and two-step excitation process.

**JTuA64** Laser Cooled Strontium Ion Source, Mary Lyon, James L. Archibald, Christopher J. Erickson, Dalim S. Darjee, Brigham Young Univ., USA. We present a cold strontium ion source consisting of a magneto-optical trap (MOT) modified to create a Low Velocity Intense Source (LVIS). The slow beam of atoms is photoluminescent to produce a velocity-tunable ion source.

**JTuA65** Simple Diode Laser Frequency Locking Based on Doppler-Free Magnetically Induced Dichroism, David C. Hall, Goucher College, USA. We present an optical system for frequency locking of a diode laser based on saturated absorption and magnetically induced dichroism in atomic vapor. The setup achieves stable locking and laser line width of ~300 kHz.
## J O I N T F i O / L S

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Title</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>Highland B</td>
<td>FtuO • General Wavefront Issues</td>
<td>Jannick P. Rolland; Inst. of Optics, USA, Presider</td>
</tr>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>Highland C</td>
<td>FtuP • Novel Hybrid Integration I</td>
<td>Inuk Kang; Bell Labs, Alcatel-Lucent, USA, Presider</td>
</tr>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>Highland D</td>
<td>FtuQ • Disorder in Integrated Optical Devices and Circuits I</td>
<td>Andrey A. Chabanov; Univ. of Texas at San Antonio, USA, Presider</td>
</tr>
<tr>
<td>1:30 p.m.–3:30 p.m.</td>
<td>Highland E</td>
<td>Ftur • Dispersion in Ultrafast Laser Amplifiers</td>
<td>Csaba Toth; Lawrence Berkeley Natl. Lab, USA, Presider</td>
</tr>
</tbody>
</table>

### Invited Talks

**FtuO1 • 1:30 p.m.**

Wavefront Correction through Suppression of Mirror-Based Aberration Modes. Feiling Wang, Christopher Spivey; Alethics LLC, USA. A technique is presented for the measurement and correction of optical wavefronts in a multi-resolution approach through successive suppression of aberration modes that are defined by deformable mirrors of either segmented or continuous-surface types.

**FtuO2 • 1:45 p.m.**

Experimental Detection of Optical Vortices Using a Shack-Hartmann Wavefront Sensor. Kevin Murphy; Daniel Burke, Nicholas Devaney, Chris Dauncey; Natl. Univ. of Ireland, Galway, Ireland. Laboratory experiments are carried out to detect optical vortices, in atmospheric turbulence conditions, using a Shack-Hartmann wavefront sensor and an adapted vortex potential method of detection. Experimental results of vortex detection are shown.

**FtuO3 • 2:00 p.m.**

Radial Polarization Interferometer. Gilad M. Lerman; Uriel Levy; Hebrew Univ. of Jerusalem, Israel. We demonstrate a new interferometer based on interference of radially and azimuthally polarized beams. The spatially varying intensity pattern provides spatial and phase information improving displacement and phase-change measurements compared with a conventional Michelson interferometer.

**FtuP1 • 1:30 p.m.**

Hybrid Integration of III-V and Si for Photonic Integrated Circuits. Geza Kuruczv, Siddarth Jain, Di Liang, Hui Wen Chen, Martin Hill, John Bomers; Univ. of California at Santa Barbara, USA. We review III-V on silicon-on-insulator (SOI) heterogeneous integration for the demonstration of lasers, suitable for inter-chip and intra-chip optical interconnects. A low temperature oxygen plasma enhanced bonding technology is used to realize the III-V/SOI integration. The realization of silicon AWG lasers, quantum well intermixed DFB lasers and micro ring lasers on the III-V/SOI material platform is discussed.

**FtuP2 • 2:00 p.m.**

Silicon/III-V Laser with Super-compact Grating for WDM Applications in Electronic-photonic Integrated Circuits. Yudong Wang, Yingyan Huang, Yongming Tu, Doris Ng, Chao Wei Lee; Yunan Zheng, Boyang Liu; Seng-Tiong Ho; Data Storage Inst., Singapore, Optoelectronics, USA. We demonstrate a heterogeneously integrated Si/III-V laser based on an ultra-large-angle super-compact curved diffraction grating suitable for WDM applications in EPICs. The lasing threshold is 150mA giving a maximum output power of 2.35mW.

**FtuQ1 • 1:30 p.m.**

Strong Localization by Disorder in Photonic Crystal Waveguides. Frank Vollmer; Harvard Univ., USA. Abstract not available.

**FtuQ2 • 2:00 p.m.**

Photonic Band Gaps in Amorphous Waveguide Lattices. Alexander Szameit, Michael C. Rycroft, Felix Drescher, Matthias Heinrich, Robert Kell; Stefan Nolte; Mordechai Segev; Solid State Inst., Israel, Courant Inst. of Mathematical Sciences, USA, Inst. of Applied Physics, Germany. We present, theoretically and experimentally, amorphous photonic lattices exhibiting band-gap and negative effective mass, yet lacking Bragg diffraction. Here, bands comprise of Anderson states, but defect states residing in the gap are always more localized.

### Tutorial Talks

**FtuR1 • 1:30 p.m.**

Dispersion in Ultrafast Systems, Catherine LeBlanc; Ecole Polytechnique, France. In this tutorial we will give an overview of different techniques for dispersion compensation in amplifiers. We will describe linear passive and active techniques and also non-linear techniques. Through different systems we will illustrate the advantages of these techniques and show several examples of high-intensity laser facilities that are using them.

**FtuR2 • 2:00 p.m.**

Optical Dispersion Management in Laser Amplifier Systems, Catherine LeBlanc; Ecole Polytechnique, France. In this tutorial we will give an overview of different techniques for dispersion compensation in amplifiers. We will describe linear passive and active techniques and also non-linear techniques. Through different systems we will illustrate the advantages of these techniques and show several examples of high-intensity laser facilities that are using them.

Catherine Le Blanc was born in 1966 in Versailles, France. She graduated from the Université de Paris Sud Orsay. She received her Ph.D. in laser Physics in 1993, in laser Physics, building one of the first Terawatt Ti: Sapphire laser systems, at the Laboratoire d’Optique Appliquée (LOA). After her Ph.D. she joined LOA as a Research scientist and worked on several ultrashort laser sources such as kHz, TW systems, OPAs, and 10-Hz, 100-TW Ti:S amplifiers. She also spent some time in the University of California at San Diego in the Kent Wilson group, working with Chris Barry on pulse shaping in Ti: Sapphire amplifiers. In 1999 Catherine LE BLANC joined the LULI with a CNRS position and was the project leader of a PW class laser in Nd:Glass amplifiers and she worked on new gratings techniques for high energy compressors. Currently she works on the ILE project and is responsible for the stretcher and compressor part of the project and the associated diagnostics. She is also a consultant for Thales Laser Systems.
The force exerted on an optical object can be harnessed to drive all-optical machines, and also has a surprising influence on the thermodynamics of optically trapped objects.

**Invited**

**A Geometric Optics Description of Airy Beams**

Sophie Ye, Kyle Fuehnschlob, Kevin Thompson, Miguel Alonso, Janneick Rolland, Inst. of Optics, Univ. of Rochester, USA. A geometric optics description of the non-diffracting Airy beam: we unveil their exact relation to rays and geometrical wavefront aberrations and study their intensity shift and invariance through propagation with their 3-D caustic.

**Active-Passive Photonic Integration with an Eye toward Large Scale Integration**, James Jaquex, LG Innovations, LLC, USA. Half-tone, a passive device that refractions (change the direction) of light rays. Here we describe the structure of a METATOY that rotates the direction of light rays through an arbitrary angle around an arbitrary axis.

**FTuQ5 • 2:30 p.m.**

**Wave Optics of METATOYs**, Johannes K. Courtial, Alasdair C. Hamilton, Univ. of Glasgow, UK. METATOYs are transparent sheets that “refract” (change the direction of) light rays. Here we describe the structure of a METATOY that rotates the direction of light rays through an arbitrary angle around an arbitrary axis.

**FTuP3 • 2:15 p.m.**

**Heterogeneously Integrated Laser with High-reflectivity Right-Angled-wedge Retro-Reflector**

Yongming Tu, Yunan Zheng, Yingyan Huang, Yadong Wang, Dixin Nig, Yongjia Wei, Cheewei Lee, Boyang Liu, Seng Tong He, Northwestern Univ., USA. Data Storage Inst., Singapore. Retro-reflectors are devices that reflect light rays off an arbitrary angle. Here we report the design and experimental results of an electrically pumped Silicon/AlGaInAs evanescent laser with right-angled-wedge reflector defined in the silicon layer. A continuous-wave laser with a lasing threshold current density of 2.8kA/cm² is achieved.

**FTuQ4 • 2:30 p.m.**

**Frequency Correlation between Eigenmodes of Disordered Waveguides**, Ben Payne, Alexey G. Yamalov, Missouri Univ. of Science and Technology, USA. Using numerical simulations we study the frequency bandwidth over which the transmission through a random medium can be optimized with the wave-front shaping technique.

**FTuQ5 • 2:30 p.m.**

**Fabrication and Characterization of Controlled Disorder in the Core of the Optical Fibers**, N. P. Puente, Elena Chakhmak, Samuda Hernit, Alexey G. Yamalov, Facultad Ingenieria-Ensenada, Univ. Autonoma de Baja California, Mexico. Div. de Fisica Aplicada, Ctr. de Investigacion Cientifica y de Educacion Superior de Ensenada, Mexico. Missouri Univ. of Science and Technology, USA. Experimental and theoretical study of light transmission through optical fiber with controlled disorder is presented. The technique provides an easy way to fabricate different disorder configurations and is suitable for random fiber lasers applications.

**FTuR3 • 2:30 p.m.**

**Description of Second Harmonic Generation of Nonlinear Elements (DOE’s)**

Carolina Romero, Rocío Borrego-Variillas, Javier R. Vázquez de Aldama, Cruz Méndez, Benjamin Alonso, Gladys Mínguez-Vega, Osnel Mendes-Yero, Luis Reuss. Univ. de Palmas, Spain. Ctr. de Luzores Pulsados, Spain. Univ. Jaume I, Spain. A study of second harmonic generation of femtosecond pulses focused with diffractive lenses is presented; the central wavelength of the SH can be tuned by changing the relative distance between the lens and the crystal.

**FTuR4 • 2:45 p.m.**

**New Method for the Measurement of the Pulse-Front Distortion**, Junlei Zuo, Meinfeng Li, China. Acad. of Engineering Physics, China. A new method based on spectral interferometry is presented. Three types of pulse-front distortion in a typical large-aperture short-pulse laser are measured by the method. Experimental results are in agreement with the theoretical calculation.

**FTuR1 • 2:45 p.m.**

**Dispersion in Ultrafast Laser Amplifiers—Continued**

Yanlei Zuo, Carolina Romero, Rod Serf, Joaquin Yaghub, Kai Xiao, Jianhua Zuo, Junlei Zuo, Rocio Borrego-Variillas, Jose M. Martinez, Gladys Mínguez-Vega, Osnel Mendes-Yero, Luis Reuss. Univ. de Palmas, Spain. Ctr. de Luzores Pulsados, Spain. Univ. Jaume I, Spain. A study of second harmonic generation of femtosecond pulses focused with diffractive lenses is presented; the central wavelength of the SH can be tuned by changing the relative distance between the lens and the crystal.
A New Monte Carlo Model of Cylindrical Diffusing Fibers, Timothy M. Baran, Thomas H. Foster, Univ. of Rochester, USA. We present a new Monte Carlo model of cylindrical diffusing fiber sources in tissue. Differences are shown between our model and simpler schemes, and the predictive ability of the model is demonstrated.

Compact Low Energy Fiber Laser Femtosecond Deactivation of Viral Species, Vitor M. Schneider, Florentz Verrier, Meenal P. Soni, Shawn M. O'Malley; Corning, Inc., USA. A compact 1550 nm low pulse energy erbium doped femtosecond fiber laser is used to inactivate viruses via Impulse Stimulated Raman Scattering (ISRS). Inactivation using this method was selective to the virus and not cells.

Design of a Lightpipe Device for Photodynamic Therapy of the Oral Cavity, Cristina Canavesi1, Florentz Verrier2, Thomas H. Foster1, Janneck P. Rolland2; 1Inst. of Optics, Univ. of Rochester, USA, 2Univ. of Central Florida, USA. The non-imaging methodology developed to design an efficient and compact lightpipe-based device for superficial photodynamic therapy of the oral cavity is reported, together with a study of the fabrication feasibility of the device.

Quantum Correlations in Two-Dimensional Waveguide Arrays and Their Classical Simulation, Robert Keil1, Felix Dreisow1, Matthias Heinrich1, Andreas Tünnermann1, Stefan Nolte1, Alexander Szameit2; 1Inst. of Applied Physics, Friedrich-Schiller-Univ. Jena, Germany, 2Physics Dept. and Solid State Inst., Technion, Israel. We theoretically analyze the propagation of photon pairs in two-dimensional photonic lattices by calculating their photon number correlation and perform classical intensity correlation experiments acting as a quantum simulator for the photon number correlation.

Optical Nanofiber Cavity: a Novel Workbench for Attosecond Science, Caterina Vezzoli, M. Negro1, F. Calogero, F. Frusciante, M. Nisoli1, L. Poletto2, G. Sansone1, P. Villaresi, S. De Silvestri2, S. Stagira1, Politecnico di Milano, Italy, 2Univ. di Padova, Italy. We exploited a few-cycle, carrier-envelope-phase-stabilized IR parametric source for spectral extension of high-harmonics emission. We studied HOMO-related structures in HHG form impulsively aligned CO2. We generated broadband continua above 150 eV in a two-color scheme.

Using a classical ensemble method, we predict that nonsequential double ionization (NSDI) probability can be much higher than one would expect from the recollision model [1] for highly elliptical and circular polarization.

We theoretically analyse the propagation of photon pairs in two-dimensional photonic lattices by calculating their photon number correlation and perform classical intensity correlation experiments acting as a quantum simulator for the photon number correlation.
FTuO • General Wavefront Issues—Continued

FTu07 • 3:00 p.m. Invited
Reconstructing Sub-Wavelength Features from the Optical Far-Field of Sparse Images, Alexander Szameit1, Yoav Shechtman1, Sini Gaziti1, Youmna C. Eldar1, Mordechai Segev1; 1Solid State Inst., Israel, 2Dept. of Electrical Engineering, Technion - Israel Inst. of Technology, Israel. We use compressed sensing to demonstrate the reconstruction of sub-wavelength features from the measured optical far-field of sparse images. The methods can be applied to non-optical microscopes, provided the information is sparse.

FTuP • Novel Hybrid Integration I—Continued

FTuP5 • 3:00 p.m. Invited
Hybrid Chalcogenide/Lithium Niobate Waveguides, Christi Madsen, Wee Chong Tan; Texas A&M Univ., USA. We review recent work on a hybrid integrated optic platform consisting of lithium-niobate waveguides vertically coupled to high-index-contrast chalcogenide waveguides. This combination provides electro-optic control and tight bend radii needed for ring resonators.

FTuQ • Disorder in Integrated Optical Devices and Circuits I—Continued

FTuQ6 • 3:00 p.m. Invited
Disorder-Induced Multiple Scattering and Light Localization in Photonic Crystal Waveguides, M. Patterson1, S. Combrié2, G. Demand1, A. De Rossi2, Stephen Hughes1; 1Queen’s Univ., Canada, 2Thales Res. and Technology, France. We describe our theory and analysis of disorder-induced multiple scattering in photonic crystal waveguides. We directly model experiments of light transmission and frequency-delay propagation maps, highlighting regimes of multiple coherent scattering and light localization.

FTuR • Dispersion in Ultrafast Laser Amplifiers—Continued

FTuR5 • 3:00 p.m. Invited
Development and Operation of Large-Aperture Tiled-Grating Compressors for High-Energy, Petawatt-Class Laser Systems, Jie Qiao1, A. Kalb1, T. Nguyen1, D. Canning1, J. Price1,2; 1Lab for Laser Energetics, Univ. of Rochester, USA, 2Helicos BioSciences Corp., USA. Two 1.5-m grating compressors, each consisting of four tiled-grating assemblies (TGA’s), have been developed and deployed for the OMEGA EP petawatt-class laser system. The tiling methods and results on high-energy shots will be presented.

3:30 p.m.–4:00 p.m. Coffee Break, Empire Hall, Rochester Riverside Convention Center

3:30 p.m.–5:30 p.m. Meet the Editors of the APS Journals, Riverside Court, Rochester Riverside Convention Center

NOTES
<table>
<thead>
<tr>
<th>Location</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highland F</td>
<td><strong>FTuS</strong> • Therapy—Continued</td>
</tr>
<tr>
<td>Highland G</td>
<td><strong>FTuT</strong> • Quantum Information and Communications IV—Continued</td>
</tr>
<tr>
<td>Highland H</td>
<td><strong>LTuE</strong> • Attosecond and Strong Field Physics I—Continued</td>
</tr>
<tr>
<td>Highland J</td>
<td><strong>LTuF</strong> • Optofluidics in the Near-Field I—Continued</td>
</tr>
<tr>
<td>Highland K</td>
<td><strong>LTuG</strong> • Nonlinear Optics II—Continued</td>
</tr>
</tbody>
</table>

**FTuS6 • 3:00 p.m.** Selective Near-UV Laser Ablation of Subgingival Dental Calculus at a 20° Irradiation Angle, Joshua E. Schoenly1,2, Wolf Seka1,3, Peter Rechmann3; 1Inst. of Optics, Univ. of Rochester, USA, 2Lab for Laser Energetics, Univ. of Rochester, USA, 3Dept. of Preventive and Restorative Dental Sciences, Univ. of California at San Francisco, USA. The average removal rates of subgingival dental calculus ablated at 400 nm and 20° are 11±6 μm/pulse and 2.4±0.8×10⁴ μm³/pulse. Large error bars on removal rate reflect biological and mechanical variability of the calculus.

**FTuS7 • 3:15 p.m.** Tensile Strength Analysis of Laser Skin Welding Performed with Thulium Laser System, Temel Bilici1, Nermin Topaloglu1, Ozgur Tabakoglu1, Hamit Kalaycioglu1, Adnan Kurt1, Alphan Sennaroglu1; 1Biomedical Engineering Inst., Boğaziçi Univ., Turkey, 2Dept. of Physics, Koc Univ., Turkey, 3Teknofil Ltd. Şti., Turkey. Laser skin welding was performed with a thulium laser system (35 W/cm²). Tensile strength analysis shows that the thulium laser system at 1980 nm provided stronger welds than the closure by suture technique.

**FTuT6 • 3:00 p.m.** Optimal Quantum Memory with Hot Rb Atoms, Nathaniel B. Phillips, Irina Novikova; College of William & Mary, USA. We present an analysis of pulse propagation under conditions of electromagnetically induced transparency and four-wave mixing in hot Rb vapor. We experimentally and theoretically investigate the prospect of dual-mode light storage.

**FTuT7 • 3:15 p.m.** Electron-Spin Single-Photon Interface in a Quantum Dot, Selman Tunc Yilmaz1, P. Fallahi1, A. Imamoglu1; Inst. of Quantum Electronics, ETH Zurich, Switzerland. Using resonance fluorescence from a single-electron charged quantum dot with 0.1% collection efficiency, we realize a single spin-photon interface where the detection of a scattered photon projects the electron spin to a definite spin eigenstate.

**LTuF4 • 3:00 p.m.** Optofluidic Ring Resonator Lasers, Xudong (Sherman) Fan, Yizue Sun, Jonathan D. Sater, Chung-Shih Wu, Wensuk Lee; Univ. of Michigan, USA. Various optofluidic ring resonator lasers will be overviewed and their performance will be compared with other optofluidic lasers. Direct and indirect excitation schemes will be discussed, followed by possible applications and future research directions.

**LTuE5 • 3:15 p.m.** Double Ionization And Dissociation Of CO2 Molecule, Limsen Pei1, Chunlei Guo2; Inst. of Optics, USA. Double ionization and dissociation of CO2 is studied in this work. Studies show that the electronic structure plays a key role for nonsequential double ionization of triatomic molecule, CO2, similar as the diatomic molecules.
A Subjective History of Laser Cooling. Harold Metcalf; Stony Brook Univ., USA. Although the notion of optical forces comes from Maxwell, the modern era of cooling began with the advent of tunable lasers. After a brief introduction, I will present a personal view beginning in the 1980s.

FTuU1 • 4:00 p.m.  Invited  
Fibers are Looking Up: Optical Fiber Transition Structures in Astrophotonics. Tim Birks1, Antonio Diaz2, Jose L. Cruz3, Sergio G. Leon-Saval4,5, Dominic I. Murphy6; 1Univ. of Bath, UK, 2Univ. of Valencia, Spain, 3Univ. of Sydney, Australia, 4Univ. of Adelaide, Australia. Recent developments in the astrophotonic applications of optical fibre taper transitions are discussed. For example, transitions between single multi-mode and multiple single-mode cores can help suppress the atmospheric OH emission that hampers ground-based IR astronomy.

FTuU2 • 4:30 p.m.  Invited  
Processing in Next Generation Telescope Arrays: Coherent Signal Combining. Pierre Kern, Le Courrier d’Etienne, Lab d’Astrophysique de Grenoble, Observatoire de Grenoble, France. Astrophotonics brings a new way to think instruments to combine the beams delivered by a network of telescopes. In addition to suitable multiplexing, it brings a convenient toolbox of powerful functions.

FTuV1 • 4:00 p.m.  Invited  

FTuV2 • 4:30 p.m.  Invited  
Digital Compensation of Fiber Nonlinearities. Gui-Jung Li; Univ. of Central Florida, USA. Recent progress in nonlinearity compensation using coherent detection and digital signal processing will be presented. Efficient algorithms toward real-time implementation and polarization effects for polarization-multiplexed WDM transmission will be emphasized in this presentation.

FTuW1 • 4:00 p.m.  Invited  
Semiconductor Core Optical Fibers. John Ballato1, Thomas Hawkins1, Paul Fay2, Colin McMillen1, Laura Burke1, Stephanie Morris1, Roger Stolen2, Robert Rice3; 1Clemson Univ., USA, 2Univ. of North Carolina at Chapel Hill, USA, 3Univ. of Adelaide, Australia. This paper will review progress in the nascent field of glass-clad semiconductor core optical fibers. This new class of optical fibers may significantly advance the fields of nonlinear fiber optics and infrared power delivery.

FTuW2 • 4:30 p.m.  Invited  
Solid Core Photonic Crystal Fiber with Ultra-wide Bandgap. Martijn de Sterke; Thomas Grujic, Boris T. Kuhlmey, Alexander Argyros; Univ. of Sydney, Australia. Using a simple model we argue that solid core microstructured optical fibers with high-index, ring-shaped, inclusions can have an uninterrupted ring of an octave. We confirm this experimentally using a polymer optical fiber.

Jean-Claude Diels, Ph.D., is Professor in the Department of Physics at the University of New Mexico (UNM) and staff member at the Center for High Technology Materials. He served as research scientist at UC Berkeley (Professor E.L.Hahn), and Research Associate Professor at USC, Los Angeles, scientific staff at Phillips Research Laboratories in Eindhoven, Netherlands, and at Max Planck Institute in Gottingen, Germany. Before joining UNM, Dr. Diels was Professor of Physics at the University of North Texas in Denton, Texas. He has 90 invited publications, 260 refereed papers, 14 patents, 5 book chapters, one textbook (Ultrashort Pulse Phenomena) and mentored 50 PhD students. Dr. Diels is the recipient of the 2011 Annual Research Lecture Award of the University of New Mexico, and the recipient of the 2006 Excellence in Engineering Award of the Optical Society of America. He is Fellow of the Optical Society of America.
Fluoride and Fast Swept Source for Phase Conjugate Optical Coherence Tomography

Power Enhanced and Fast Swept Source for Phase Conjugate Optical Coherence Tomography, Rui Zhu1, Kyle H. Y. Cheng2, Edmund Y. Lam1, Franco N. C. Wong1, Kenneth K. Y. Wong1; 1Dept. of Electrical and Electronic Engineering, Univ. of Hong Kong, Hong Kong, Hong Kong, 2Lab of Electronics, MIT, USA. We have developed a wavelength-swept source based on fiber parametric amplification and Fourier domain mode locking with increased power and speed to take full advantage of 2x resolution enhancement and dispersion cancellation of phase-conjugate OCT.

Substance Identification in Spectroscopic Optical Coherence Tomography Using Pattern Recognition

Varinder Singh, Volker Jaedicke1,2, Christoph Kaseck1, Nils C. Gerhardt3, Hubert Welp1, Martin Hofmann1; 1Ruhr-Universität Bochum, Germany, 2Georg Agricola Univ. of Applied Sciences, Germany. We use a windowed Fourier transform in the spatial regime to calculate depth resolved spectra from multilayer absorbing samples. Depth resolved substance identification is performed based on a pattern recognition algorithm using spectral features.

Variable Velocity Dynamic Range Doppler Optical Coherence Tomography

Panomsak Meemon1,2, Janis L. Rolland1,2; 1CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, 2Inst of Optics, Univ. of Rochester, USA. We present a modified algorithm for phase-resolved DOCT that will extend the lower limit of the velocity dynamic range while maintaining the maximum detectable velocity, and hence increase the overall detectable velocity dynamic range.

Dipolar Effects in an Ultracold Gas of LiCs Molecules

Yingfang Li1,2, Matthew Stiebe1,2, Jon P. Davis1,2, Bingyan Li1,2; 1Naval Air Systems Command, USA, 2AMPAC, USA, 3Inst. for Quantum Science and Engineering and Dept. of Physics and Astronomy, USA. We present recent results on the photodissociation and optical trapping of an ultracold gas of LiCs molecules in low vibrational states. Inelastic atom-molecule collisions are analyzed, and state redistribution by vibrational relaxation is observed.

Dipolar Effects in an Ultracold Gas of LiCs Molecules

Xingyu Zhang1, Matthew Tomes1,2, Felix Carmon1,2, Univ. of Michigan, USA. We suggest the use of gyroscopic optical forces, originating from the angular momentum of circularly polarized light propagating inside a bent nano-waveguide, to facilitate mechanical deformation. Right-handed and left-handed circular polarizations induce opposite displacements.

The Enigma of Optical Momentum

Stephen M. Barnett1,2,1; 1Dept. of Physics, Univ. of British Columbia, Canada, 2Centre for Quantum Technologies, National University of Singapore, Singapore. We consider collective excitations of internal energy in ordered arrays of ultracold polar molecules trapped in an optical lattice. We demonstrate that an external dc electric field can be used to modify the dynamics of rotational excitons in an ensemble of closed-shell molecules and magnetic excitons in an ensemble of open-shell molecules in optical lattices. The systems presented here may thus be used for time-domain quantum simulation of localization phenomena and spin excitation transfer in disordered media.

Invited: Tunable Excitons in Ordered Arrays of Ultracold Molecules

Eric Hudson1,2,3; 1Dept. of Electrical Engineering and Computer Science, MIT, USA, 2UCLA, USA, 3Presider. We demonstrate the storage and retrieval of optical information in a spinor condensate using a two-photon Raman technique. The stored information is read out by reapplying one of the two Raman beams.

Spinor Bose-Einstein Condensate

Transfer and Storage of Optical Information in a Spinor Bose-Einstein Condensate, Azure Hansen1,2, L. Suzanne Leslie1, Mishkatul Bhattacharya1, Nicholas P. Bigelow1,2, Kenneth L. David1,2; 1Naval Research Laboratory, USA, 2University of Rochester, USA. We present recent results on the photoassociation and optical trapping of a spinor condensate using a two-photon Raman technique. The stored information is read out by reapplying one of the two Raman beams.

Invited: Plasmonic for Optical Manipulation and Enhanced Spectroscopy

L. Suzanne Leslie, Mishkatul Bhattacharya, Nicholas P. Bigelow; Univ. of Rochester, USA. We demonstrate the transfer and storage of optical information in a spinor condensate using a two-photon Raman technique. The stored information is read out by reapplying one of the two Raman beams.

Invited: Dipolar Effects in an Ultracold Gas of LiCs Molecules

Shaya Y. Fatum1,2, L. Pang1, B. Slatsky1, I. Passinski1, L. Feng1, M. Chen2; 1Univ. of California at San Diego, USA, 2Univ. of California at Berkeley, USA. We explore metal-dielectric nano-plasmonic structures for localization and resonant transmission of optical fields, investigate fabrication and integration of optofluidic nano-plasmonic systems and explore their applications for biochemical sensing.
In a MOT with the laser beams along z replaced with beams coupling two excited states, we demonstrate efficient 3-D cooling and trapping.

We report the first laser cooling and trapping of $5 \times 10^8$ Dysprosium, Ho Youn; Univ. of Illinois at Urbana-Champaign, USA.

We propose a new version of high angular resolution imaging, D. Cava, S. Brudfiedt, L. Del Rio, A. Tonello, L. Delage, François Reynaud; XLIM Dept. Photonique, UMR CNRS 6172, France. We propose a new version of high angular resolution instrument taking advantage of the frequency conversion of astronomical light by SFG.

We carry out a multi-photon laser cooling experiment using light beams coupling two excited states, we demonstrate scattering between electronically excited atomic states. We explore laser cooling using light. Saijun Wu, Roger Brown, W. P. Phillips; NIST Res. Library, USA.

Multi-Photon Laser Cooling, James (Trey) Porto, Saijun Wu, Roger Brown, W. P. Phillips; NIST Res. Library, USA. We explore laser cooling using light scattering between electronically excited atomic states. In a MOT with the laser beams along z replaced with beams coupling two excited states, we demonstrate efficient 3-D cooling and trapping.

We report the first laser cooling and trapping of $5 \times 10^8$ Dysprosium, Ho Youn; Univ. of Illinois at Urbana-Champaign, USA.

We propose a new version of high angular resolution imaging, D. Cava, S. Brudfiedt, L. Del Rio, A. Tonello, L. Delage, François Reynaud; XLIM Dept. Photonique, UMR CNRS 6172, France. We propose a new version of high angular resolution instrument taking advantage of the frequency conversion of astronomical light by SFG.
FTuY4 • 4:45 p.m.  Tutorial  
Coherence Imaging, Adam Wax, Dept. of Biomedical Engineering, Duke Univ., USA. This tutorial reviews coherence imaging approaches for biomedical applications. Subjects will include digital holography and optical coherence tomography modalities with an emphasis on basis of image formation, functional extensions and biological applications.

Adam Wax received dual B.S. degrees in 1993, one in electrical engineering from Rensselaer Polytechnic Institute, Troy, NY and one in physics from the State University of New York at Albany, and the Ph.D. degree in physics from Duke University, Durham, NC in 1999. He joined the George R. Harrison Spectroscopy Laboratory at the Massachusetts Institute of Technology, as a postdoctoral fellow of the National Institutes of Health immediately after his doctorate. Dr. Wax joined the faculty of the Department of Biomedical Engineering at Duke University in the fall of 2002 and currently is appointed as an associate professor. His research interests are in the use of light scattering and interferometry to probe the biophysical properties of cells for both diagnosis of disease and fundamental cell biology studies.

FTuZ3 • 4:45 p.m.  Invited  
Testing Macroscopic Quantum Superpositions, Dirk Bouwmeester, Univ. of California at Santa Barbara, USA. Abstract not available.

LTuH3 • 5:00 p.m.  
Luminorefrigeration Of NaCs, Amy E. Wakim, Patrick Zabawa, Amanda Neukirch, Nicholas P. Bigelow, Univ. of Rochester, USA. We will report on an optical pumping method designed to transfer ultracold polar NaCs molecules from an initial distribution of deeply bound molecules in the X1Σ+ to enhance the ν=0 population.

LTuH3 • 5:00 p.m.  

4:30 p.m.–5:30 p.m.  Minorities and Women in OSA (MWOSA) Tea, Grand Ballroom E and F, Hyatt Regency Rochester

6:00 p.m.–7:00 p.m.  OSA Annual Business Meeting, Highland A, Rochester Riverside Convention Center

6:00 p.m.–7:00 p.m.  DLS Annual Business Meeting, Highland H, Rochester Riverside Convention Center

6:30 p.m.–8:00 p.m.  OSA LaserFest Member Reception, Lilac Ballroom North and South, Rochester Riverside Convention Center

7:00 p.m.–10:00 p.m.  LS Banquet, Grand Ballroom A and B, Hyatt Regency Rochester
Joss Bland-Hawthorn is a Federation Fellow at the University of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

Joss is a recipient of the 2008 Muhlmann Award was featured in the Focus Issue of Optics Express.

FWA • Astrophotonics II
Tim Birks; Univ. of Bath, UK, Presider

8:00 a.m.–9:45 a.m.
FWA • Astrophotonics II
Tim Birks; Univ. of Bath, UK, Presider

Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.

FWB1 • 8:00 a.m. Tutorial
Astrophotonic: A New Generation of Astronomical Instruments, Joss Bland-Hawthorn; Univ. of Sydney, Australia. Astrophotonics—which lies at the interface of photonics and astronomy—will revolutionize astronomical instrumentation in the coming decade. Recent developments include the PIMMS multimode photonic spectrograph which is arguably the most radical development in spectroscopy in almost a century.
The devices are fabricated resonant nanocavities coupled to photonic crystal waveguides for biosensing. Preliminary results demonstrate successful detection of human IgG molecules and refractive etching. We have investigated resonant nanocavities coupled to photonic crystal waveguides for biosensing. The devices are fabricated using electron beam lithography and reactive-ion-etching. Preliminary results demonstrate successful detection of human IgG molecules and refractive index sensing.

Optical Quantification of Label-Free DNA, Kyu-wan Lee, Joseph Irudayaraj; Purdue Univ., USA. The designed gold nanoparticle dimer is employed to quantify label-free DNA. By using hyperspectral dark field spectroscopy, the measurement of characteristic spectra shows versatile quantification of label-free DNA up to atto molar concentration.

Demonstration of Microcantilever-Based Biological Sensor Array with in-Plane Photonic Transduction Mechanism, Gregory P. Nordin, Seunghyun Kim, Gregory Scholes, Brigham Young Univ., USA. We demonstrate biological molecule detection with photonic microcantilever array and in-plane photonic detection using the biotin-streptavidin material system and integrated polydimethylsiloxane (PDMS)-based microfluidics.

We report studies of ultrafast exciton dissociation dynamics in CdSe quantum dots (generated by multiple photon absorption) can be dissociated. We report studies of ultrafast exciton dissociation dynamics in quantum dots by electron transfer to adsorbed molecular acceptors. Up to three excitons per CdSe quantum dots (generated by multiple photon absorption) can be dissociated.

Analysis of Nonlinear Electromagnetic Metamaterials, Ekaterina Poudrina, Du Huang, David R. Smith; Duke Univ., USA. We derive the expressions for the effective nonlinear susceptibilities of a metacystal formed from resonant elements that couple strongly to the magnetic field. We experimentally illustrate the accuracy and validity of our theoretical framework.

8:00 a.m.–10:00 a.m.
FWF • Nonlinearities and Gain in Plasmonics and Metamaterials
Stefan Linden; Univ. Karlsruhe, Germany, Presider
FWG1 • 8:00 a.m. Invited
Metamaterials and Symmetry, Xiang Zhang; Univ. of California at Berkeley, USA. I will discuss recent experimental demonstrations of intriguing phenomena associated with Metamaterials and plasmonics. These include new symmetries in metamaterials, negative refraction and Negative-index, cloaking at optical frequencies and sub-wavelength plasmonic lasers.

FWG2 • 8:30 a.m. Invited
Optical Manipulation and Detection of the Collective Motion and Spin of an Ultracold Atomic Gas, Dan Stumper-Karn; Univ. of California at Berkeley, USA. We will discuss the latest development of an accurate optical atomic clock using ultracold Sr atoms confined in a magic wavelength optical lattice, focusing on the progress in the control of collisional frequency shift.
FWA • Astrophotonics II—Continued

for experimental astronomy, and a recipient of the inaugural 2008 Group Achievement Award from the Royal Astronomical Society. In 2010, he is the Leverhulme Visiting Professor to Oxford and the Meriton College Fellow.

FWA2 • 8:45 a.m.
Future Detectors for Astrophotonics, Donald F. Figer; Rochester Inst. of Technology, USA. Quantum-limited detectors extract all available information from each incoming photon. In this talk, I will summarize the state of the field and future prospects for using these detectors for Astrophotographic applications.

FWA3 • 9:00 a.m.
Invited

FWA4 • 9:00 a.m.
Invited
Nanoparticle Detection in Water by Mode Splitting in An Optical Microresonator, Woosung Kim, Sahin Kaya Ozdemir, Jiangang Zhu, Lina He, Lan Yang; Washington university at St. Louis, USA. We demonstrated detection of polystyrene nanoparticles with radius of 50 nm in water using mode splitting in a microresonator in water. We observed different evolution of mode splitting spectra corresponding to different particle solution concentrations.

FWA5 • 9:15 a.m.
On-chip Plasmonic Nano-slits Array to Alleviate the Mass Transport Limitation in Microfluidic Biosensors, Xin Zhuo, Zhong Cheng, Wei Li, Jingsong Zhu, Tao Zhuo, Jiangtao Cheng; 1Beihang Univ., China, 2Nat. Ctr. for Nanoscience and Technology of China, China, 3New Jersey Inst. of Technology, USA, 4Pennsylvania State Univ., USA. We propose on-chip plasmonic nano-slits array structures that can change the mass transport in a surface microfluidic biosensing system by providing additional optical gradient forces to targeted analytes. Both optical and fluidic effects are investigated.

FWB • Biochemical Sensing—Continued

FWB2 • 8:45 a.m.
Metallized Ultrathin Porous Membranes for Biological and Chemical Sensing, Krishunu Shome, David Z. Jiang, Philippe M. Fauchet; Univ. of Rochester, USA. Metallized ultrathin porous silicon and oxidized silicon membranes provide a free standing platform for sensing using transmission mode SPR. Simulation results are supported by transmission experiments. SPR excitation is measured and used in sensing.

FWB3 • 8:45 a.m.
Unconventional Polarization States Applied to Projection Imaging, Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA. Abstract not available.

FWB4 • 9:00 a.m.
Optimized Nonlinear Optical Molecules for Silicon-Organic-Hybrid Systems, M. L. Scimeca1, B. Breiten1, F. Chizzolini2, Ivan Biggi2; Leibigh Univ., USA, ‘Lab für Organische Chemie, Switzerland. Small organic molecules with large third-order nonlinearity compared to their structural and dynamical properties. In N2, advanced characterization of the attosecond emission from small aligned molecules (CO2, N2) gives access to their structural and dynamical properties. In N2, tomographic reconstruction of the bound electronic-wavepacket is performed with Ångström-spatial and attosecond-temporal resolution.

FWB5 • 9:15 a.m.
Full Poincaré Beams, Amber M. Beckley1, Thomas G. Brown1, Miguel A. Alonso1; 1Inst. of Optics, Univ. of Rochester, USA, Dept. of Applied Physics, Aalto Univ., Finland. We describe theoretically a family of beams whose polarizations span the entire Poincare sphere. The experimental production of these beams through the use of a stressed window is also discussed.

FWC • Optical Design with Unconventional Polarization I—Continued

FWC2 • 8:45 a.m.
Unconventional Polarization Imaging, Y. Shih, Tao Zhou 3, Jiangtao Cheng 4; 1Beihang Univ., China, 2Natl. Ctr. for Nanoscience and Technology of China, China, 3New Jersey Inst. of Technology, USA, 4Pennsylvania State Univ., USA.

FWC3 • 9:15 a.m.
Silicon-Organic-Hybrid Systems, Ivan Biaggio1, Thomas G. Brown1,2; 1Inst. of Optics, Univ. of Rochester, USA, 2Dept. of Applied Physics, Aalto Univ., Finland. We propose to amplify the absorption to the silicon photonics platform.

FWC4 • 9:00 a.m.
Attosecond Pulses: Producing Spatio-Spectral X-Rays Airy Beams, Ofer Kfir, Maxim Kozlov, Arner Fleischer, Oren Cohen, Technion - Israel Inst. of Technology, Israel. We propose to amplify the photon-energy of attosecond pulses to keV through wave-mixing with a mid-IR field. The generated X-ray emission exhibits intrigue characteristics, including attosecond square pulses, spatio-spectral Airy beams and focusing attosecond pulses.

FWC5 • 9:15 a.m.
Frequency Up-Conversion of Extreme Ultraviolet Attosecond Pulses: Producing Spatio-Spectral X-Rays Airy Beams, Ofer Kfir, Maxim Kozlov, Arner Fleischer, Oren Cohen, Technion - Israel Inst. of Technology, Israel. We propose to amplify the photon-energy of attosecond pulses to keV through wave-mixing with a mid-IR field. The generated X-ray emission exhibits intrigue characteristics, including attosecond square pulses, spatio-spectral Airy beams and focusing attosecond pulses.

FWD • Novel Hybrid Integration II—Continued

FWD2 • 8:45 a.m.
Microstructured Channel Waveguide Lasers in KY(WO4)2:Gd3+, Lu3+, Yb3+, Dimitri Gedikas, Shan-mugum Anavashy, Christos Garios, Kerstin Wörhoff, Markus Pollnau; Univ. of Twente, Netherlands. Laser operation was achieved in microstructured channel waveguides of KY(WO4)2:Gd3+, Lu3+, Yb3+, resulting in a threshold of only 5 mW, a slope efficiency of 62% versus launched pump power, and 76 mW output power.

FWD3 • 8:45 a.m.
Microstructured Channel Waveguide Lasers In KY(WO4)2:Gd3+, Lu3+, Yb3+, Dimitri Gedikas, Shan-mugum Anavashy, Christos Garios, Kerstin Wörhoff, Markus Pollnau; Univ. of Twente, Netherlands. Laser operation was achieved in microstructured channel waveguides of KY(WO4)2:Gd3+, Lu3+, Yb3+, resulting in a threshold of only 5 mW, a slope efficiency of 62% versus launched pump power, and 76 mW output power.

FWD4 • 9:00 a.m.
Optical Design with Unconventional Polarization II—Continued

FWE • Attosecond Optics and Technology II—Continued

FWE2 • 8:45 a.m.
Quantum-driven Excitation Imaging, Christine Ruchon1, T. Auguste1, P. Breger1, C. Glorieux2, S. Haessler 1, Z. Diveki 1, J. Chicharro1, R. Tai1,2, P. Salières1; 1Inst. du CEA Saclay, France, 2Lab de Chimie Physique-Matière et Rayonnement, UPMA Univ., France, ‘CNRS, France. Advanced characterization of the attosecond emission from small aligned molecules (CO2, N2) gives access to their structural and dynamical properties. In N2, tomographic reconstruction of the bound electronic-wavepacket is performed with Ångström-spatial and attosecond-temporal resolution.
A Pyro-Electrohydrodynamic Nanodispenser for Biochemical Applications, Sara Coppola, Veronica Vezzini, Melatina Furti, Simona Grilli, Pietro Ferrari, CNR Inst. Nazionale di Ottica, Unit of Napoli, Italy. A new and simple method is presented here for dispensing liquid nano- and pico-droplets through a non-invasive electrode-less configuration using the electric field generated by the pyroelectric effect into a dielectric crystal.

FWG3 • 8:45 a.m.
Spontaneous Emission Near Hyperbolic Metamaterials, B. Young Kim, Zuhon Jacob, Guru V. Nair, Evgenii E. Narimanov, Alexander Bollasseva, Vladimir M. Shalaev; Electrical and Computer Engineering/Purdue University, USA. We present a hyperbolic metamaterial substrate for radiative decay engineering. The spontaneous emission lifetime of molecules is reduced due to near-field interaction with the metamaterial. This opens the route for metamaterial-based fluorescence sensing and detection.

FWG4 • 9:00 a.m.
Optical Microspherical Resonators for Biomedical Applications, Simone Bernaldi, Francesco Baldim, Franco Casti, Maurizio Ferrari, Giada Nucci Casti, Stefano Perri, Silvia Soria, Giancarlo C. Righini, IFAC CNR, Italy, Cnr Studi e Ricerche Enrico Fermi, Italy, IEN CNR, Italy. Microoptical devices based on Whispering Gallery Modes exhibit peculiar properties, the most notable being a very high quality factor. Here results are presented on the development of an immunosensor based on a microspherical glass resonator.

FWG5 • 9:15 a.m.
Asymmetric Positive-Negative Index Nonlinear Waveguide Couplers, Gyautri Venugopal, Natalia M. Litchinitser, Unv at Buffalo, USA. We discuss wave propagation in asymmetric coupled structures consisting of positive and negative index channels with different nonlinear coefficients. We find the dispersion relations, constants of motion and various regimes of wave interactions in such structures.

Light and Memory.

LWA3 • 9:00 a.m.
Tunable Broadband White-Light Cavity Using Anomalous Dispersion in Cold Atoms, Jiepeng Zhang, Xiaogang Wei, Gesler Hernandez, Yifei Zhu, Physics Dir., Los Alamos Natl. Lab, USA, Dept. of Physics, Florida Intl. Univ., USA. We report the demonstration of a broadband white-light cavity scheme based on a cavity QED system that consists of multiple cold atoms confined in an optical cavity and coherently driven by a free-space laser field.

LWB3 • 9:00 a.m.
Precision Metrology with a Strontium Ion Interferometer, Christopher Erickson, James L. Archibald, Mary Lyon, Dallin S. Durfee, Brigham Young Univ., USA. We present a strontium ion interferometer for use as an electromagnetic field sensor with unprecedented sensitivity. Applications include measurements of fringing fields, studies of image charge scattering in superconductors, and ultra-precise tests of electromagnetism.

LWC3 • 9:00 a.m.
Transmittance and Absorption of Charge Photogeneration in Organic and Dye Sensitized Solar Cells, James R. Durrant; Imperial College London, UK. My talk will address the use of transient optical techniques, primarily on the nano- to millisecond timescales, to interrogate photoinduced charge separation in dye sensitized and organic thin films and photovoltaic devices.
FWA • Astrophotonics II—Continued

FWA4 • 9:30 a.m. Mode Evolution in Photonic Lanterns, Sergio G. Leon-Saval, Alexander Argyros, Joss Bland-Hawthorn, Univ. of Sydney, Australia. The “photonic lantern” allows for a single-mode photonic function to take place within a multimode fibre. We study its modal behaviour for achieving low-loss between a multimode fibre and a “near-diffraction limited” single-mode system.

FWB • Biochemical Sensing—Continued

FWB6 • 9:30 a.m. Ultra-thin Silicon Nitride Microring Resonator for Biophotonic Applications at 970nm Wavelength, Ilya Guykhman, Boris Destaive, Uriel Levy, Hebrew Univ. of Jerusalem, Israel. We experimentally demonstrate an ultra-thin silicon nitride microring resonator operating at wavelength of 970nm that is favorable for large variety of biophotonic applications. Optimization parameters for improved sensitivity and light-matter interaction are presented.

FWC • Optical Design with Unconventional Polarization I—Continued

FWC4 • 9:30 a.m. Cylindrical Vector Beam Transformations and Hybrid Vector Beams, Giovanni Milione, Robert R. Alfano; Physics Dept., CUNY, USA. Transformations of the spin and orbital parts of cylindrical vector beams through conventional optical elements is analyzed with Jones calculus and experimentally measured by Stokes polarimetry. Generation of unique hybrid vector beams is discussed.

FWD • Novel Hybrid Integration II—Continued

FWD5 • 9:30 a.m. High Fiber-coupled Output Power from Continuous-wave Photonic Crystal Band-edge Laser, Sungwhan Kim, Jonghyun Lee, Hyeon Ju Jeon, Seoul Natl. Univ., Korea, Republic of. We demonstrate continuous-wave operation of surface-emitting photonic crystal band-edge laser wafer-bonded onto a substrate of efficient thermal dissipation. Using a butt-end fiber coupling scheme, high laser output power of ~200 μW is achieved.

FWE • Attosecond Optics and Technology II—Continued

FWE5 • 9:30 a.m. Light Waveform Control of Synthesized Atto-second Pulse Train by Multi-Colored Laser Fields, Wei-Jun Chen, Chao-Kuei Lee, Ci-Ling Pan; Dept. of Physics, N. Sun Yat-Sen Univ., Taiwan, Dept. of Photonics, Natl. Tsing Hua Univ., Taiwan. We demonstrate the potential to dominate the temperature dependence of the laser threshold current.

FWC5 • 9:45 a.m. Integrated Nano-hole Array Plasmon Resonance Biochemical Sensor, Junpeng Guo, Hai-Sheng Leong 1, Robert G. Lindquist 1,2, David J. Brady1; Univ. of Alabama in Huntsville, USA, 2Duke Univ., USA. We have demonstrated a super-periodic metallic nano-hole array surface plasmon device for integrated biochemical sensing. The super-periodic nano-hole array device combines functions of sensing and surface plasmon resonance spectral analysis on a single device.

FWC7 • 9:45 a.m. Polarization Aspects of Near-Field Radiation from Nanoscale Subwavelength Apertures, Erdem Öğüt, Kürşat Şendur; Sabanci Univ., Turkey. It is demonstrated that a square nanoperture can mediate polarized diffraction-limited radiation into nanoscale optical spots with the same polarization. A rectangular nanoperture can convert linearly-polarized diffraction-limited radiation into circularly and elliptically-polarized nanoscale optical spots.

FWD6 • 9:45 a.m. On the Temperature Dependence of Monolithically Integrated Ga(NAsP)/(BGa)P/Si QW Lasers, Nadir Hossain1, 2, Junpeng Guo 1, 2, Stephen J. Sweeney1, 2, 3Advanced Technology Inst., Univ. of Surrey, UK, 2Mater. Sciences Ctr. and Faculty of Physics, Philippus-Univ., Germany, 3NASP III/V GmbH, Germany. Laser operation up to 120K is reported in novel direct band gap Ga(NAsP)/(BGa)P lasers grown monolithically on a silicon substrate. A carrier leakage process is found to dominate the temperature dependence of the laser threshold current.

FWF • Astrophotonics—Continued

FWF5 • 9:30 a.m. Light Waveform Control of Synthesized Atto-second Pulse Train by Multi-Colored Laser Fields, Wei-Jun Chen, Chao-Kuei Lee, Ci-Ling Pan; Dept. of Physics, Natl. Tsing Hua Univ., Taiwan, Dept. of Photonics, Natl. Sun Yat-Sen Univ., Taiwan. We demonstrate the potential to dominate the temperature dependence of the laser threshold current.

FWF6 • 9:45 a.m. Light Waveform Control of Synthesized Atto-second Pulse Train by Multi-Colored Laser Fields, Wei-Jun Chen, Chao-Kuei Lee, Ci-Ling Pan; Dept. of Physics, Natl. Tsing Hua Univ., Taiwan, Dept. of Photonics, Natl. Sun Yat-Sen Univ., Taiwan. We demonstrate the potential to dominate the temperature dependence of the laser threshold current.

FWF7 • 9:45 a.m. Integrated Nano-hole Array Plasmon Resonance Biochemical Sensor, Junpeng Guo, Hai-Sheng Leong 1, Robert G. Lindquist 1,2, David J. Brady1; Univ. of Alabama in Huntsville, USA, 2Duke Univ., USA. We have demonstrated a super-periodic metallic nano-hole array surface plasmon device for integrated biochemical sensing. The super-periodic nano-hole array device combines functions of sensing and surface plasmon resonance spectral analysis on a single device.

FWF8 • 9:45 a.m. Integrated Nano-hole Array Plasmon Resonance Biochemical Sensor, Junpeng Guo, Hai-Sheng Leong 1, Robert G. Lindquist 1,2, David J. Brady1; Univ. of Alabama in Huntsville, USA, 2Duke Univ., USA. We have demonstrated a super-periodic metallic nano-hole array surface plasmon device for integrated biochemical sensing. The super-periodic nano-hole array device combines functions of sensing and surface plasmon resonance spectral analysis on a single device.

10:00 a.m.–10:30 a.m. Coffee Break, Empire Hall, Rochester Riverside Convention Center
FWF • Biosensing—Continued

FWF7 • 9:30 a.m.
Time-Lapsed Integrated Raman- and Angular-Scattering Microscopy of Immune Cells, Dustin W. Shipp, Andrew J. Berger; Univ. of Rochester, USA. Integrated Raman- and Angular-scattering Microscopy (IRAM) uses chemical and morphological data to differentiate between activated and resting immune cells. IRAM can now monitor these changes over time to study the immune cell activation process.

FWF8 • 9:45 a.m.
Analysis of Raman Spectral Evolution of HeLa Cells under Deep-Ultraviolet Exposure, Yasuaki Kumamoto1,2, Atsushi Taguchi 2, Satoshi Kawata2; Osaka Univ., Japan, RIKEN, Japan. We analyzed deep-ultraviolet Raman spectral evolution of HeLa cells at varied exposure duration and excitation wavelengths of deep-ultraviolet light. We found that 244 and 257 nm can be better for probing DNA and protein, respectively.

FWG • Nonlinearities and Gain in Plasmonics and Metamaterials I—Continued

FWG6 • 9:30 a.m. Invited
Switchable and Nonlinear Metamaterials: Controlling Light on the Nanoscale, Nikolay Zheludev; Univ. of Southampton, UK. We overview our recent results in nanostructured photonic metamaterials containing nonlinear and active media such as switchable chalcogenide glass, carbon nanotubes, graphene, semiconductor quantum dots and report on superconducting plasmonic metamaterials.

FWG6 • 9:30 a.m.
Analysis of Raman Spectral Evolution of HeLa Cells under Deep-Ultraviolet Exposure, Yasuaki Kumamoto1,2, Atsushi Taguchi 2, Satoshi Kawata2; Osaka Univ., Japan, RIKEN, Japan. We analyzed deep-ultraviolet Raman spectral evolution of HeLa cells at varied exposure duration and excitation wavelengths of deep-ultraviolet light. We found that 244 and 257 nm can be better for probing DNA and protein, respectively.

LWA • Hybrid Quantum Systems I—Continued

LWA5 • 9:30 a.m. Invited
Measurement of Nanomechanical Motion with Precision Sufficient to Detect Zero-Point Motion, K. W. Lehnert1, J. D. Teufel2, T. Donner1, J. W. Harlow1, D. Li2, R. W. Simmonds2; 1JILA, NIST, Univ. of Colorado, USA, 2NIST, USA. We detect the motion of a suspended micro- and nano- mechanical elements, whose fundamental mode of motion has been cooled to within a few 10s of quanta of the ground-state using an ultra-low temperature cryostat.

LWB • Metrology and Precision Measurements I—Continued

LWB5 • 9:45 a.m.
Ultra-sensitive Sensing with A Superluminal Ring Laser, Hamam Yam, Joshua Yablon, Yi Wang, Selim M. Shahrira; Northwestern Univ., USA. We show, theoretically and experimentally, how a ring laser can be tuned to a regime where the group velocity of light far exceeds the vacuum velocity, realizing a superluminal laser, with high sensitivity to perturbations.

LWC • Photophysics of Energy Conversion I—Continued

LWC5 • 9:45 a.m. Invited
Exciton Diffusion and Interfacial Charge Separation in Photovoltaic Materials Studied by Microwave Conductivity, Tom J. Savenije; Delft Univ. of Technology, Netherlands. We show how the laser-induced Time-Resolved Microwave Conductivity Technique can be used to determine the singlet or triplet exciton diffusion length in organic dye layers, as well as the efficiency for electron injection into a semiconductor. Knowledge of these processes is of prime importance for optimization of (nanostructured) hybrid photovoltaics.
Computational Photography in 4-D, 6-D and 8-D
Markus Testorf, Dartmouth College, USA, Presider

A Spatial Projection Analysis of Light Field Capture
Zhimin Xu, Edmund Y. Lam; Dept. of Electrical and Electronic Engineering, Univ. of Hong Kong, Hong Kong. By modeling the light field acquisition as a linear integration process, we derive an accurate projection relationship of the light field capture with light-transport camera as an example and demonstrate its generality in computational imaging.

FWI1 • 10:30 a.m.
Optical Communication II
Xiang Liu; Alcatel-Lucent, USA, Presider

FWI2 • 11:00 a.m.
Tapered Optical Fiber Quadruples Bandwidth of Multimode Silica Fibers Using Same Wavelength, Syed H. Murshid, Abhijit Chakravarty; Florida Inst. of Technology, USA. Four co-propagating optical channels of same wavelength have been spatially multiplexed and de-multiplexed over a step index multimode silica fiber to quadruple the bandwidth. This presents experimental setup and results for such a system.

FWI • Sensing in Higher Dimensions–Theory and Hardware for Computational Imaging I
Ramesh Raskar, MIT, USA. Geometric-dimensions of light transport can be up to 8-D. They can be sensed, analyzed and synthesized using modern tools. Talk describes novel 4-D cameras, 6-D displays and 8-D fibers are also treated.

FWI1 • 10:30 a.m.
Invited
Promising Technologies for Capacity Growth in Future Optical Networks, René-Jean Essiambre; Bell Labs, Alcatel-Lucent USA. We present an analysis showing possible limitations imposed by fiber Kerr nonlinearity on the quantity of information that optical fibers can carry. We discuss advanced technologies that can be used to approach such limits.

Invited
Measurement-Diverse Wavefront Sensing, Richard Paxman; General Dynamics Corp., USA. Phase diversity has been shown to be an effective image-based wavefront sensor. We examine other measurement-diverse mechanisms for wavefront sensing, including wavelength diversity, perspective diversity and diversity in polarization.

FWJ • Image-based Wavefront Sensing I
Bruce Dean; NASA Goddard Space Flight Ctr., USA, Presider

FWJ2 • 11:00 a.m.
Rays and Waves in Wavefront Sensing, James R. Fienup, Alden S. Jurling, Samuel T. Thurman; 1 Inst. of Optics, Univ. of Rochester, USA; 2 Lockheed Martin Coherent Technologies, USA. Image-based wavefront sensing using ray and wave optics are compared. Marriage of a new ray-based technique with phase retrieval combines speed, robustness, and accuracy.

Invited
Multiwavelength Short Pulsed Fiber Lasers, Lars Grünén-Nielsen, Kim G. Jespersen, Martin E. V. Pedersen, Bera Pálsson; DFS Denmark, Denmark. All fiber devices with anomalous dispersion based on propagation in a higher order mode are described. Stretcher fibers with dispersion matching compressor gratings for use in chirped pulse amplifiers are also treated.

FWK • Fiber Laser
John Ballato; Clemson Univ., USA, Presider

FWK1 • 10:30 a.m.
Er-doped Fiber Laser with High-Birefringence PCF, Chung; Gwangju Inst. of Science and Technology, Republic of Korea. Experimentally demonstrate a high-performance, tunable, single-longitudinal-mode Er-doped fiber laser with high-birefringence PCF. Stable SLM oscillation with side-mode suppression ratio up to 57 dB is achieved.

Invited
A Wavelength Tunable Single-Longitudinal-Mode Er-doped Fiber Laser with High-Birefringence PCh, Jooeun Im, BongKyun Kim, Chan Lyong, Youngjin Chang, Guangyu Inst. of Science and Technology, Republic of Korea. We experimentally demonstrate a high-performance, tunable, single-longitudinal-mode Er-doped fiber ring laser with high-birefringence PCF. Stable SLM oscillation with side-mode suppression ratio up to 57 dB is achieved.

FWK2 • 11:00 a.m.
A Wavelength Tunable Single-Longitudinal-Mode Er-doped Fiber Laser with High-Birefringence PCF, Jooeun Im, BongKyun Kim, Chan Lyong, Youngjin Chang, Guangyu Inst. of Science and Technology, Republic of Korea. We experimentally demonstrate a high-performance, tunable, single-longitudinal-mode Er-doped fiber ring laser with high-birefringence PCF. Stable SLM oscillation with side-mode suppression ratio up to 57 dB is achieved.

FWL • Laser Based Particle Acceleration I
Csaba Toth; Lawrence Berkeley Natl. Lab, USA, Presider

FWL1 • 10:30 a.m.
Tutorial
Dr. Leemans is a senior scientist, the Head of the LOASIS Program at LBNL, research physicist at UC Berkeley and an adjunct professor at the University of Nevada, Reno. He obtained an electrical engineering (EE) degree from the “Vrije Universiteit Brussel”, Belgium in 1985, and a Ph.D. in EE from UCLA in 1991 and joined LBNL in 1991. His current research interests are in laser plasma based accelerator science and hyperspectral radiation sources. He received several awards, including the ’92 American Physical Society Simon Ramo award for outstanding doctoral thesis research work in plasma physics, the 1996 Klaus Halbach Award for X-ray Instrumentation, the 2005 United States Particle Accelerator School Prize for Achievement in Accelerator Physics and Technology, and the 2009 E.O. Lawrence Award. He is an APS and IEEE Fellow. He has been research advisor for many PhD graduate students, including three that have received outstanding dissertation awards.
10:30 a.m.–12:00 p.m.  
**FWM • Trapping II**  
**Highland F**  
Nicole Moore; Univ. of Rochester, USA, Presider

10:30 a.m.–12:00 p.m.  
**FWM • Nonlinearities and Gain in Plasmonics and Metamaterials II**  
**Highland G**  
Mikhail Noginov; Norfolk State Univ., USA, Presider

10:30 a.m.–12:15 p.m.  
**FWN • Hybrid Quantum Systems II**  
**Highland H**  
Jack Harris; Yale Univ., USA, Presider

10:30 a.m.–12:00 p.m.  
**LWE • Quantum Enhanced Information Processing I**  
**Highland J**  
Mark Saffman; Univ. of Wisconsin at Madison, USA, Presider

10:30 a.m.–12:00 p.m.  
**LWF • Single Molecule Approaches to Biology I**  
**Highland K**  
Haw Yang; Univ. of California at Berkeley, USA, Presider

---

**FWM1 • 10:30 a.m.**  
High-Speed Holographic Tweezers and Imaging, Miles Padgett1, Richard Bowman1, Daryl Price2, Aran Court3, Graham Gibson4, David Carberry4, Mervyn Miles4; 1Univ. of Glasgow, UK, 2Univ. of Sydney, Australia, 3Dept. of Physics, Univ. of Bristol, UK. Holographic optical tweezers, using the latest spatial light modulators and graphics-cards calculate holograms at 200Hz, fast enough to compensate the Brownian motion. Coupled with high-speed imaging of multiple particles, various new system configurations are possible.

**FWM2 • 11:00 a.m.**  
3-D Optical Trapping Inside a Hollow-Core Microstructured Optical Fiber, Tiffany C. Y. Tang1, Sergio G. Leon-Saval2, Maryanne C. J. Large3, Alexander Aegerter4, Peter J. Reeve4; 1Univ. of New South Wales, Australia, 2Univ. of Sydney, Australia. We report the first demonstration of 3-D optical trapping of microparticles inside a hollow-core microstructured polymer optical fiber with an external tweezers beam. We map the trapping properties to determine the influence of the microstructure.

**FWN1 • 10:30 a.m.**  
Broadband Enhancement of Two-Photon Emission from Semiconductors by Plasmonic Nano-Antennas, Amir Naveh1, Nikolay Berkovitch1, Alex Hayat1, Pawel Ginsburg2, Shai Ginzbuch2, Ofir Soria2, Meir Orenstein2, Technion, Israel. We demonstrate experimentally and theoretically a broadband enhancement of the spontaneous two-photon emission from AlGaAs by plasmonic nano-antennas. Plasmonic structures with inherently low-quality factors but very small effective volumes are shown to be optimal.

**FWN2 • 10:45 a.m.**  
KHz-driven High Harmonic Generation From Overdense Plasmas, Arnaud Malvache1, Xuewen Chen2, Denis Douillet1, Grégory Laquenelle2, Patrick Audrét1, Jean-Paul Geindre1, Gérard Meunier1, Rodrigo Lopez-Martens1; 1ENSTA ParisTech-Ecole Polytechnique CNRS, France, 2Inst. de la Lumière Extrême, CNRS, Ecole Polytechnique, ENSTA ParisTech, Inst. d’Optique, Univ. Paris-Sud, France. ‘La boul pour l’Utilisation des Lasers Intenses, Ecole Polytechnique-CNRS, France, ‘Myhalong, Portugal. We report high-harmonic generation from overdense plasmas driven at 1kHz repetition rate by millijoule laser pulses at intensities <1018 W/cm2. We observe characteristic coherent wake emission spectra with reproducible CEP-dependent features in the few-cycle regime.

**FWN3 • 11:00 a.m.**  
Better Than Gold: Plasmonic Materials for Telecom Wavelengths, M. A. Noginov1, Lei Gu1, J. E. Livenere1, G. Zhu1, A. K. Pradhan1, R. Mandle1, M. Bahoura1, Yu. A. Barnakov1, V. A. Podol'skiy2; 1Norfolk State Univ., USA, 2Univ. of Massachusetts Lowell, USA. Surface plasmon polaritons (SPPs) at telecom wavelengths have much better confinement in degenerate wide-gap semiconductors than in silver or gold. For the same confinement, the SPP loss in semiconductors is lower than that in gold.

**FWD1 • 11:00 a.m.**  
Nonlinear Optomechanical Couplings: Tools for Dealing with Solid Mechanical Objects in the Quantum Regime, Jack Sankey1, Cheng Yang1, Benjamin M. Zwickl1, Andrew M. Jayich2, Jack G. E. Harris2; 1Yale Univ., USA, 2McGill Univ., Canada. We demonstrate several different forms of the optomechanical coupling (linear, quadratic, and quartic) realized at avoided crossings in the spectrum of an optical cavity containing a flexible dielectric membrane. Each coupling is tunable in situ.

**FWD2 • 11:00 a.m.**  
Benchmarks and Benchmarking Quantum Information Processing Devices, Raymond Laflamme1, Aashish Clerk2; 1Univ. of Waterloo, Canada, 2Perimeter Institute, Waterloo, Canada. We will describe benchmarks of quantum information processors in the light of quantum error correction and the accuracy threshold theorem which says that if noise sufficiently low it is still possible to quantum compute efficiently.

We distinguish between two approaches: 1) image reconstruction that infers high resolution details, 2) imaging process that indirectly captures information about the fine details.

**Image Refocus in Geometrical Optical Phase Space, Aaron C. W. Chan, Edmund Y. Lam; Univ. of Hong Kong, Hong Kong.** We introduce matrix optics and phase space methods as general modeling methods to analyze problems involving 4-D light field imaging systems. Specifically, we demonstrate the use of these methods for analyzing the image refocus process.

**Spatial Diversity Measurements in a Multiple-Transmitter Terrestrial FSO Link, Jaime A. Anguita, Jaime E. Cisternas, Univ. of the Andes, Chile.** We experimentally analyze the performance of a laser communication link using spatial diversity. For various system settings, we quantify the cross-correlation between received signals and establish key elements in the design of efficient multiple-transmitter links.

**An Analytic Expression for the Field Dependence of Zernike Coefficients in Optical Systems without Symmetry, Kevin P. Thompson, James R. Fienup; 1NASA Goddard Space Flight Ctr., USA, 2Inst. of Optics, Univ. of Rochester, USA.** The sampling factor (Q) determines the scale relationship between the pupil and image plane. Knowledge of this quantity is essential for obtaining accurate retrieval results. We present a method for determining Q from image data.

**The Stability of the Active Mode-Locked Erbium-Doped Fiber Lasers, Richard S. Quimby1, Roman Shubochkin2, Theodore E. More1; 1Worcester Polytechnic Inst., USA, 2Boston Univ., USA.** Numerical simulations are used to study the effect of mode intensity nulls on power extraction efficiency in Yb and Er-HOM fiber lasers. The efficiency approaches the quantum defect limit at kW power levels.

**The Marcuse equivalent index model that is rotationally symmetric, but contains optical surfaces are rotationally symmetric.** The relation between model and measurement is 3.4%.

**The so-called “self-guided” regime of laser wakefield acceleration has been experimentally explored.** It is shown that short but intense laser pulses can be self-guided by the wake-over tens of Rayleigh length by creating a bubble-like wakefield-structure.

**Creating a Bubble-Like Wakefield Structure, Alexander Buck1, Tautz1,2, Daniel Herrmann1, Michael Geissler1, Ferenc Krausz1,2, Lucio Vegz1, Max-Planck-Institut of Quantum Optics, Germany, 1Ludwig Maximilians-Univ. Muenchen, Germany, 2Queen's Univ. Belfast, UK.** We present a novel method of controlled electron injection from the background plasma into a laser driven plasma wave using a μm-scale density transition. Substantial quality improvements on the monoenergetic electron beam are demonstrated.
The generation of Bessel beam based on all-fiber device and its optical trapping of dielectric particles, Sung Rae Lee*, Jongki Kim*, Jun Ki Kim*, Kyungwon Oh*, *Sungkyunkwan Univ., Korea, Republic of,
1Helmholtz Ctr. for Photonmedicine, Harvard Medical School, Massachusetts General Hospital, USA. The generated Bessel beam from all-fiber structure composed of single mode fiber, coreless silica fiber, and micro-lens formed on the fiber facet showed a good performance for optical trapping confirming its non-diffracting and self-reconstructing nature.

Third harmonic generation using surface plasmon polaritons at nonlinear interfaces, Jan Guo, Miriam Deutsch, Univ. of Oregon, USA. We show that a third harmonic electromagnetic wave is generated by surface plasmons propagating at a nonlinear metal-dielectric interface. The angular- and intensity dependence of the generated wave are calculated and analyzed.

1Technion, Israel, 2Hebrew Univ., Israel.

JWA01
Singular Optics and Structurally Stable Beam, Rahul Mandal.

JWA02
Computer-Generated Volume Holograms in the TLs, Wei-Ren Ng, Andrew Pyzdek, Ziran Wu, Hao Xin, Michael E. Gehm; Univ. of Arizona, USA. Recent advances in rapid prototyping provide the promise of direct, rapid fabrication of volumetric optical components in the terahertz. We are investigating use of this new technology for fabrication of a Bragg-selective computer-generated volume hologram.

JWA03
Stable Optical Lift, Timothy J. Peterson, Alexandra Arturoian-Glispke, Grover A. Swantekar; Rochester Inst. of Technology, USA. When placed in a uniform stream of light, an airfoil shaped refractive object may experience a transverse lift force having a large lift angle with respect to the forward scattering force.

JWA04
Measurement of the Optical Properties of Nanorose, Tianyi Wang, Li L. Ma, Jinze Qiu, Xiankai Li, Keith J. Huber, Mark D. Feldman; Texas A & M University, USA. Nanorose is used to target macrophages in atherosclerotic plaques. Experimental measurement and simulation of nanorose absorption (σ_a) and scattering (σ_s) cross-sections give, respectively, σ_a = (3.1±0.5)×10^−14 m^2 and σ_s/σ_a = 10.5.

JWA05
Optical Sensing of Bacteria by Means of Light Diffraction, Igor Bazalevich, Halina Podbielska; Inst. of Applied Optics, Poland. The novel sensor based on Fourier transform optical system with converging spherical wave illumination is proposed for bacteria species characterization. Examination of the individual bacteria colony diffraction pattern can be used to distinguish bacteria species.

JWA06
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA07
IR Spectral Analysis of Spectral Shifts in Stochastic Beams Propagating through Media with Arbitrary Refractive Properties, Zhihong Tang, Olgar Korotkova; Inst. of Applied Optics, Russia. We demonstrate a far-field spectral shift in the paraxial region does not depend either on the degree of coherence of the source or on its spatial extent, or on the refractive index.

JWA08
Manipulating IR Surface Plasmon Polaritons on Graphene, Ashkan Yafar, Nader Emami; Dept. of Optics, Pennsylvania State University, USA. Exploiting the dependence of graphene conductivity on the electric bias field, we theoretically investigate the manipulation, routing, waveguiding and scattering of surface-plasmon polaritons along graphene at IR wavelengths, proposing a "flatland" paradigm for optical metamaterials.

JWA09
Irregular Surface Plasmon Polaritons on Graphene, Ashkan Yafar, Nader Emami; Inst. of Applied Optics, Pennsylvania State University, USA. We demonstrate a far-field spectral shift in the paraxial region does not depend either on the degree of coherence of the source or on its spatial extent, or on the refractive index.

JWA10
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA11
Stable Optical Lift, Timothy J. Peterson, Alexandra Arturoian-Glispke, Grover A. Swantekar; Rochester Inst. of Technology, USA. When placed in a uniform stream of light, an airfoil shaped refractive object may experience a transverse lift force having a large lift angle with respect to the forward scattering force.

JWA12
Optical Sensing of Bacteria by Means of Light Diffraction, Igor Bazalevich, Halina Podbielska; Inst. of Applied Optics, Poland. The novel sensor based on Fourier transform optical system with converging spherical wave illumination is proposed for bacteria species characterization. Examination of the individual bacteria colony diffraction pattern can be used to distinguish bacteria species.

JWA13
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA14
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA15
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA16
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA17
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA18
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA19
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA20
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA21
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA22
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA23
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA24
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA25
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.

JWA26
Laser-Induced Magnetization Precession in Thin Films of Fe/MgO and Py/Sl, Douglas L. P. Lacerda, Carlos A. Bussa, A. Azevedo, Lúcio H. Acioli; Univ. Federal de Pernambuco, Brazil. We study the role of the anisotropy field in the laser-induced magnetization dynamics on thin films of Fe/MgO and Py/Sl. We also characterize the local anisotropy and the Gilbert damping constant.
Detection of Subsurface Objects and Coherence Analysis, Markus Tester. Dartmouth College, USA. The cross-Wigner distribution function is introduced as a measure for the mutual coherence of electromagnetic signals. The averaged cross-Wigner distribution function is applied to the detection of subsurface objects with radar.

Optodigital Protocol To Avoid An External Refer- ence Beam In A Jtc Encrypting Processor, Carlos A. Rios1, Edgar Rueda1, John F. Barrera1, Rodrigo Hlema1, Roberto Terzhebi1,2; Grupo de Optica y Fotonica, Inst. de Fisica, Univ. de Antonio, Colombia, 3CIR de Invest- igaciones Opticas (CONICET-UC), Argentina, 4Ud OPTIMO, Facultad de Ingenieria, Univ. Nacional de la Plata, Argentina. We use a JTC-optodigital approach, but avoiding an external reference beam to record the encoded information. We only encode a master key in a Mach-Zehnder arrangement, leading to a cor- responding simpler encrypting procedure.

Microscope Multifocus Image Fusion based on a Zernike Moment Algorithm, Alfonso Padilla- Vivanco, Karina Tapia-Quint, Univ. Politecnica de Tulancingo, Mexico. A novel technique of microscope multifocus image fusion using Zernike moments is presented. The test images are obtained by both bright field and DIC techniques. Numerical and experimental results are presented.

Discrete Solitons in Novel Two Dimensional Wave- guide Arrays, Angel Virgara Betancourt, Erwin A. Marti Panamato, Gregorio Mendez Gonzalez, Luc del Carmen Gomez Pavin, Benemerita Univ. Autonoma de Puebla, Mexico. Based on the numerical experi- ment techniques we demonstrate the existence of bi-dimensional discrete solitons in novel waveguide arrays, for which the required generation energies lower than in the honeycomb array.

Active and Passive Photodetectors Devices Produced by Direct Writing with Femtosecond Laser Pulses in Novel Transparent Materials, Thibou B. N. Lemors, Davinson M. Silve, Luciana P. K. Kasabaw, Anderson S. L. Gomez1,2; UFPPE, Brazil, 3Dept. of Electronic Systems Engineering, Brazil, 4Facsity of Technology of Sao Paulo (FATEC-SP), Brazil. Active and passive waveguides fabricated in tellurium and GeO2-P2O5-Ga2O3 (GPG) glasses using direct femtosecond laser (at 800 nm, 1 kHz, 130 fJ) writing is demonstrated. Internal gain of 2.78 B/cm is obtained at 1535 nm.
JWA49 Image-Plane Reflection-Type Alcove Multiplex Hologram, Yih-Shyang Cheng, Zen-Yuan Lei, Chih-Hung Chen; Dept. of Optics and Photonics, Natl. Central Univ., Taiwan. A three-step holographic process, which enables the incorporation of the image-plane technique in the fabrication of the reflection alcove multiplex hologram, is described. Experimental result demonstrating the feasibility of this method is presented.

JWA50 Characterization of a Low Voltage Micro-Electron-Column for Scan Field Size and Visibility of Current Image, Won K. Jang1, Jun Ho Park1, Ho Seob Kim1, Hanseo Univ., Korea, Republic of; 2Summum Univ., Korea, Republic of. The optical technology for focusing and manipulating electron beam was applied for the optimal operation for many applications such as large area scanning LCD panel and aberration compensated beam shaping for fine scanning communication devices.

JWA51 Observation of Soliton-based Image Transmission Through Self-Defocusing Photonic Lattices, Yi Hu1,2, Peng Zhang1, Masami Yoshitaka1, Jianke Jia1, Zhiqiang Chen1; 1San Francisco State Univ., USA, 2Nankai Univ., China, ‘Univ. of Vermont, USA. We demonstrate that self-defocusing photonic lattices support various shapes of soliton clusters (such as Y-shape and H-shape) which remain robust during propagation. We propose soliton-based image transmission through photonic structures induced in bulk materials.

JWA52 Ultrafast Optics Used to Study Carrier Dynamics of High Quality Silicon on Glass Sample, Omar S. Moghimi-Loozati1, Roman Sobolevskii1, Jose J. Sanchez-Mondragon1, Carlos Kooik-Williams1, Je Zhang1; 1Natl. Inst. for Astrophysics Optics and Electronics, Mexico, 2Univ. of Rochester, USA, ‘Corning Inc, USA. We study, experimentally and theoretically, the carrier dynamics in high quality silicon on glass sample by a model that relates the reflectance time dependence with the carrier dynamics.

JWA53 Role of Nonlinearity and Transverse Localization of Light in a Disordered Coupled Optical Waveguide Lattice, Somnath Ghode1, Bishnu P. Pal2, E. K. Vrtovec1, Gorivd P. Agrawal3; 1Indian Inst. of Technology Delhi, India, ‘Inst. of Optics, USA. We report a numerical investigation on the transverse localization of light in a lattice of disordered coupled waveguides. The interplay of disorder with medium’s nonlinearity in localization from application point of view is studied.

JWA54 Temperature Dependence Of Closed Mode Q-Factor In Terahertz Metamaterial Superlattice, J. H. Woo1,2, E. S. Kim1, Byoung Kang1, Y. Y. Choi1, Hyun-Hee Lee1, J. Kim1, Y. U. Lee1, Tae Y. Hong1, Jae H. Kim1, J. W. Wu2; 1Ewha Womans Univ., Korea, Republic of; 2Yonsei Univ., Korea, Republic of. Terahertz metamaterial superlattice is fabricated with double-split ring resonators oriented alternately. By cooling down to cryogenic temperature 4K, changes in Q-factor of closed mode resonator originating from coherent coupling in metamaterial superlattice is investigated.

JWA55 Versatile 780-nm Pump Source for High-Repetition Rate Entanglement Generation, Jemellie Galang1, Fabrice van Veen, Paul van der Wel, Joshua C. Bienfang, Charles W. Clark; 1NIST, USA. A Mach-Zehnder interferometer is proposed with a thin film on one of its arms, the sample can be rotated, measuring the pattern fringes for each incidence angle, sample thickness and refraction index are calculated.

JWA56 Modal Gain Analysis of GaNAsP Heterostructures on Silicon, Nelttario Kokourakis1, Dominic A. Funk1, Nils G. Gerhardt2, Martin R. Hofmann2, Bernardette Kauer1, Ivo Liebl1, S. Zinkmann1, M. Zimpfer3, A. Beyer3, S. Chatterjee3, C. Backers3, S. W. Koch3, K. Völ3, W. Staltek3; 1Ruhr-Univ. Bochum, Germany, 2Natl. Laser Ctr., South Africa, 3Philipps-Univ. Marburg, Germany. We present modal gain measurements of GaNAsP multiple quantum well structures grown lattice-matched on silicon using the stripe-length method. High modal gain values of up to 80 cm-1 are observed at room temperature.

JWA57 Capabilities of Trapping in Single Gratings and Switching in Double-Sided Gratings for Normal Incident Light, Hideo Izuka1, Nader Engheta2, Hayashi Fujikawa3, Kazuo Sato1, Yasuhiko Takekai3; 1Toyota Res. Inst., USA, ‘Univ. of Pennsylvania, USA, 2Inst. of Applied Physics, Friedrich-Schiller-Universität, Germany, 3PROFACTOR GMBH, Austria. We present spectroscopic ellipsometry measurements of a metamaterial, taken under different incidence-angles and compared with calculations based on the RCWA method. We find that resonances for (Pi, Delta) do not disappear changing the incidence angle.

JWA58 Wavefront Sensing, Melniques Soto Garcia, Fermin A. Granados, Alejandro R. Carojo; 1INAOE, Mexico, 2NATIONAL LABS, Mexico. Wavefront. The irradiance transport equations express the relation between wavefront and its intensity. We propose to solve the ITT using the approximation of derivatives by finite differences instead to get the wavefront for optical testing.

JWA59 Spectroscopic Ellipsometry Study of a Swiss Cross Metamaterial, M.L. Miranda- Medina1, B. Dastmalchi2, H. Schmidt2, E.-B. Kley2, J. Bergmair2, K. Hinger2, J. Sanchez-Mondragon1; 1INADE, Mexico, 2Johannes Kepler Univ., Austria. We present spectroscopic ellipsometry measurements of a metamaterial, taken under different incidence-angles and compared with calculations based on the RCWA method. We find that resonances for (Pi, Delta) do not disappear changing the incidence angle.

JWA60 Directional Etching Methods for Realizing Woodpile Photonic Crystal with Different Crystal Orientations, Liling Ting, Shu-Yu Su, Ozlem Senlik, Tomoyuki Yoshio; Duke Univ., USA. High precision three-dimensional woodpile photonic crystal and high-quality-factor nanocavities in various crystal orientations are fabricated with two types of directional etching methods in a simple two-pattern process.

JWA61 Interferometric Measurement of Thickness and Refraction Index on Transparent Thin Films, Carlos A. Vargas1, Edwin Tangarife1; 1Inst. of Physics, Univ. de Antioquia, Colombia, ‘Facultad de Ingenieria, Univ. Católica de Oriente, Colombia. A Mach-Zender interferometer is proposed with a thin film on one of its arms, the sample can be rotated, measuring the pattern fringes for each incidence angle, sample thickness and refraction index are calculated.

JWA63 Phase Diversity Selection Using Spatial Light Modulator, Norihide Miyamura; Univ. of Tokyo, Japan. We used a spatial light modulator to generate phase diversities (PD). The laboratory experimental results show that the estimation accuracy of the wavefront aberration is improved using the optimal PD instead of conventional deconvolus PD. Please add.

JWA64 Physics of Light and Optics: A Free Online Textbook, Justin Peatross, Michael Ware; Dept. of Physics and Astronomy, Brigham Young Univ., USA. We highlight an electronic textbook available free of charge in PDF format at optics.byu.edu. The target audience is upper-division physics undergraduates.

JWA65 Radiation Scattering by Localized Electron Wave Packets, John P. Carthan, Michael Ware, Scott Glassow, Justin Peatross; Brigham Young Univ., USA. We examine the role of wave-packet localization in the dynamics of radiation scattering by free electrons. The applicability of classical field assumptions is discussed.
<table>
<thead>
<tr>
<th>Highland A</th>
<th>Highland B</th>
<th>Highland C</th>
<th>Highland D</th>
<th>Highland E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1:30 p.m.–3:30 p.m.</strong>&lt;br&gt;SWA • Optical Communications Symposium I</td>
<td><strong>1:30 p.m.–3:30 p.m.</strong>&lt;br&gt;FWO • Plasmonics and Metamaterials for Information Processing I</td>
<td><strong>1:30 p.m.–3:30 p.m.</strong>&lt;br&gt;FWP • Optical Design with Unconventional Polarization II</td>
<td><strong>1:30 p.m.–3:30 p.m.</strong>&lt;br&gt;FWQ • Photonic Bandgap and Slow Light</td>
<td><strong>1:30 p.m.–3:30 p.m.</strong>&lt;br&gt;FWR • Laser Based Particle Acceleration II</td>
</tr>
<tr>
<td>Herwig Kagelni; Lucent Technologies, USA, Presider</td>
<td>Presider to Be Announced</td>
<td>Thomas G. Brown, Inst. of Optics, Univ. of Rochester, USA, Presider</td>
<td>Balthram Jalali; Univ. of California at Los Angeles, USA, Presider</td>
<td>Chan Joshi; Univ. of California at Los Angeles, USA, Presider</td>
</tr>
<tr>
<td><strong>FWO1 • 1:30 p.m.</strong>&lt;br&gt;Invited&lt;br&gt;Historical Overview of Optical Communications, Tingye Li; AT&amp;T Labs, USA, Abstract not available.</td>
<td><strong>FWO2 • 2:00 p.m.</strong>&lt;br&gt;Invited&lt;br&gt;Mid-Infrared Direct Coupling of Surface-Plasmon Polariotons, Adel Bousseksou1, Jean-Philippe Triëmme2, Danièle Castantini1, Raffaele Colombelli1, Arthur Babu3, Inaun Malhovick-Deyere4, Yannick De Wilde5, Grégoire Beaudoin6, Isabelle Sagnes2; 1Inst. d’Electronique Fondamentale, Univ. Paris Sud, France, 2Inst. Langevin, ESPCI ParisTech, France, 3Lab de Photonique et de Nanosciences, France. We demonstrate a compact device for surface plasmon(SP) generation. A SP mode is directly excited on a metal/air interface using a dry etched facet of a mid-infrared quantum-cascade laser. We probe the SSP via mid-infrared imaging.</td>
<td><strong>FWP1 • 1:30 p.m.</strong>&lt;br&gt;Invited&lt;br&gt;Polarization and the Focusing of Light, Colin Shepperd; Div. of Bioengineering, Univ. of Southern California, Los Angeles, USA. We demonstrate a compact device for surface plasmon(SP) generation. A SP mode is directly excited on a metal/air interface using a dry etched facet of a mid-infrared quantum-cascade laser. We probe the SSP via mid-infrared imaging.</td>
<td><strong>FWQ1 • 1:30 p.m.</strong>&lt;br&gt;Fiber-coupled Suspended GaAs Waveguides for Efficient Broadband Spectroscopy of Single InAs Quantum Dots, Marco E. Davarzani1, Matthew T. Rakher1, Antonio Badolato1, Kartik Sripannan2; 1CNST - NIST, USA, 2Maryland Nanocenter, USA. Fiber-coupled waveguides are realized for broadband spectroscopy of InAs quantum dots. Above-band and p-shell excitation of individual dots is performed, with fluorescence collection into the fiber exceeding free-space collection by one order of magnitude.</td>
<td><strong>FWR1 • 1:30 p.m.</strong>&lt;br&gt;Recent Advances in Proton Acceleration and Beam Shaping, Markus Roth1, V. Bugnoud1, V. Burris1, S. Bussel1, T. Cowan1, O. Dopperti1, M. Greiner1, D. P. Grothe1, K. Harri1, G. Hofmeister1, G. Logan1, F. Nürnberg1, G. Schumacher1, M. Schollmeier1, D. Schumacher1; 1Technische Univ. Darmstadt, Germany, 2Helmholtz Zentrum für Schwerionenforschung, Germany, 3Forschungszentrum Dresden-Rossendorf, Germany, 4Sandia Natl. Labs, USA, 5Lawrence Berkeley Natl. Lab, USA, 6Lawrence Livermore Natl. Lab, USA. A report on recent-developments will be given with focus on experiments to control and combine laser-accelerated ion-beams with beam-transport structures and new targets and results using geometries for ion-driven fast-ignition and the generation of warm-dense-matter.</td>
</tr>
</tbody>
</table>

---

**Important Notes:**
- SWA1 • 1:30 p.m. • Invited<br>Swedish Optical Communications Symposium I, presided by Herwig Kagelni, Lucent Technologies, USA.
- SWA2 • 2:00 p.m. • Invited<br>Development of Low-Loss Fibers, P. Schultz; Corning, USA. Abstract not available.
- SWA3 • 3:00 p.m. • Invited<br>Introduction to the Symposium on Photonic Bandgap and Slow Light, presided by Balthram Jalali, Univ. of California at Los Angeles, USA.
- SWB1 • 1:30 p.m. • Invited<br>Historical Overview of Optical Communications, Tingye Li; AT&T Labs, USA. Abstract not available.
- SWB2 • 2:00 p.m. • Invited<br>Mid-Infrared Direct Coupling of Surface-Plasmon Polariotons, Adel Bousseksou1, Jean-Philippe Triëmme2, Danièle Castantini1, Raffaele Colombelli1, Arthur Babu3, Inaun Malhovick-Deyere4, Yannick De Wilde5, Grégoire Beaudoin6, Isabelle Sagnes2; 1Inst. d’Electronique Fondamentale, Univ. Paris Sud, France, 2Inst. Langevin, ESPCI ParisTech, France, 3Lab de Photonique et de Nanosciences, France. We demonstrate a compact device for surface plasmon(SP) generation. A SP mode is directly excited on a metal/air interface using a dry etched facet of a mid-infrared quantum-cascade laser. We probe the SSP via mid-infrared imaging.
Highland F

1:30 p.m.–3:30 p.m.
FWS • Nanopatterning and metamaterials
Zhaolin Lu; Univ. of Delaware, USA, Presider

FWS1 • 1:30 p.m.  Invited
Active and Passive Nanophotonics for Information Systems Applications, Shay Y. Fainman, A. Sionis, O. Bondarenko, B. Slutsky, A. Mizrahi, M. P. Nezhad, Univ. of California at San Diego, USA. We present new nanophotonic paradigms using a combination of dielectric, metal, and semiconductor composite nanostructures and devices for optical communications, information and signal processing, and sensing.

Highland G

1:30 p.m.–3:30 p.m.
FWT • Disorder In Integrated Optical Devices and Circuits II
Presider to Be Announced

FWT1 • 1:30 p.m.  Invited
Evolution of Photonic Band-Gap and Lasing from Polycrystalline to Amorphous Photonic Structures, Hui Cao, Jin-Rye Yang, Heseo Noh, Seung-Yeol Lee, Carl Schneek, Corey O’Herron; Yale Univ., USA. We map out a transition in the gap of photonic density of states from polycrystalline to amorphous structures. Lasing has been realized in both polycrystalline and amorphous photonic structures with distinct characteristic.

FWT2 • 2:00 p.m.  Invited
Anderson Surface Waves in Disordered Photonic Lattices, Alexander Szameit1, Varadaraj V. Kallath2, Peter Zell3, Felix Dreisow1, Matthias Heinrich1, Robert Kell1, Stefan Nolte1, Andreas Tünnermann3, Victor A. Vysloukh1, Lluis Torner1; Solid State Inst., Israel, 1ICFO, Spain, 2Inst. of Applied Physics, Germany, 3Dept. de Física y Matemáticas, Mexico. We experimentally demonstrate disorder-induced localization near a boundary of truncated one-dimensional disordered photonic lattices and uncover that localization near the boundary requires a higher disorder level than in bulk lattices.

Highland H

1:30 p.m.–3:00 p.m.
LWG • General Laser Science
Francesco A. Narducci; Naval Air Systems Command, USA, Presider

LWG1 • 1:30 p.m.  Phase Locking a Fiber Laser Array Via Diffractive Coupling, Eitan Ronen, Amiel A. Ishaya2, Ben Gurion Univ., Israel. We demonstrate phase locking in a linear array of seven fiber lasers via diffractive coupling. Fringe contrast of 82% was measured at the far field for anti-phase locking with very high efficiencies.

LWG2 • 1:45 p.m.
Multiplexed Reflective Volume Bragg Grating for Passive Coherent Beam Combining, Sergiy Mokhov1, Apurva Jain1, Christine Spiegelberg2, Vadam Simonov2, Oleksiy Andrusyak1, George Venus1, Boris Zeldovich1, Leonid Gorbun1; CCREL, The College of Optics and Photonics, USA. ‘OptiGrate Corp., USA. Multiplexed Bragg grating recorded in photo-thero-refractive glass can be efficient combiner for coherent locking at high-power lasers. Spectral properties of two-channel combiner are studied theoretically and experimentally. Multi-channel scaling of this approach is discussed.

LWG3 • 2:00 p.m.
Phase Locked Clusters in Laser Arrays and a Novel Method For Detecting Them, Eitan Ronen, Amiel A. Ishaya2, Ben Gurion Univ., Israel. We investigate phase locked clusters in a diffractively coupled linear fiber laser array. We experimentally observe distinct phase locked laser clusters and demonstrate a novel method for measuring the spatial coherence of the array.

Highland J

1:30 p.m.–3:45 p.m.
LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy
Jennifer P. Ogilvie; Univ. of Michigan, USA, Presider

LWH1 • 1:30 p.m.  Advances in Ultrafast 2-D Spectroscopy, Chris T. Middleton, Martin Zouni; Univ. of Wisconsin at Madison, USA. This talk will cover recent developments in the use of femtosecond pulse shaping technology for collecting 2-D IR and 2-D Vis spectra and their applications to biophysical and energy related topics.

LWH2 • 2:00 p.m.  Multiply Resonant Coherent Multidimensional Spectroscopy, John Wright; Univ. of Wisconsin at Madison, USA. Multiply resonant methods create frequency domain measurement of multidimensional spectra using multiple quantum coherences involving individual electronic and vibrational quantum states and time domain measurement of their coherent and incoherent dynamics. We discuss many examples.

Highland K

1:30 p.m.–3:30 p.m.
LWI • Photophysics of Energy Conversion II
Tianquan Lian; Emory Univ., USA, Presider

LWI1 • 1:30 p.m.  Spin Signatures of Light Induced Charge Separated States in Polymer-Fullerene Bulk Heterojunctions: High-Frequency Pulsed EPR Spectroscopy, Oleg Poluektov1, Salvatore Filipponi2, Nazario Martin3, Andreas Specht4, Carsten Drieh1, Vladimir Dyakonov1, Argonov Neil, Lah, USA, 1Univ. Complutense de Madrid, Spain, 2Institut Max-Milian Univ. of Wuerzburg and Bavarian Ctr. for Applied Energy Res. e. V., Germany. Charged polaron in thin films of polymer-fullerene composites are investigated by light-induced electron paramagnetic resonance. Comparative analysis of photogenerated charge separation states in organic photovoltaic cells and natural photosynthetic proteins are given.

LWI2 • 2:00 p.m.  Optically and Electrically Detected Magnetic Resonance Studies of Organic Light-Emitting Materials and Devices, Joseph Shinar; Iowa State Univ., USA. Optically and electrically detected magnetic resonance studies of luminescent π-conjugated thin films and organic light-emitting devices (OLEDs) have provided striking insight into their various excitations.
Thank you for attending FiO/LS.
Look for your post-conference survey via email and let us know your thoughts on the program.
### FI O

**FWS • Nanopatterning and metamaterials—Continued**

**FWS3 • 2:30 p.m.**
Constrained Parametric Optimization of Point Geometries in Multi-Beam-Interference Lithography, Guy M. Burrow, Thomas K. Gaylord, Georgia Tech, USA. Multi-beam-interference lithography parameters are systematically analyzed and optimized. High absolute contrast and a variety of point geometries ranging from elliptical to rectilinear or rhombic intensity profiles are demonstrated.

**FWS4 • 2:45 p.m.**
Permanent Holographic Waveguide Arrays, Eric D. Moore, Robert R. McLeod; Univ. of Colorado, USA. Permanent two-dimensional optical waveguide arrays are demonstrated by exposing diffusion-mediated photopolymer with a multiple-beam interference pattern. A fiber-based phase control system ensures a stable interference pattern during exposure.

**FWS5 • 2:45 p.m.**
Dynamics of Fluctuations of Localized Waves, Andrey Chabanov, Jing Wang, Azriel Genack, D. Y. Liu, Zhongqing Zhang; Univ. of Texas at San Antonio, USA, *Queen College of CUNY, USA, Hong Kong Univ. of Science and Technology, Hong Kong*. Dynamics of mesoscopic fluctuations of localized waves reflect the evolving contributions of short- and long-lived electromagnetic modes of the random medium. Complex transport phenomena for localized waves can be clarified by applying a modal analysis.

**FWS6 • 2:45 p.m.**
Imitating the Cherenkov Radiation in Backward Directions, Tsuyuki Ochiai; Natl. Inst. for Materials Science, Japan. A novel radiation emission from traveling charged particles in vacuum is demonstrated theoretically. This radiation is conical as in the Cherenkov radiation, but can be emitted in backward directions of particle trajectories.

### LS S

**LWG • General Laser Science—Continued**

**LWG6 • 2:45 p.m.**
Comparison of Spontaneous Behavior in a Synchrotron and Asynchronously Mode-Locked EDFL, Camilla C. Dias, Banzéto A. de Souza; Univ. Presbiteriana Mackenzie, Brazil. We investigated the spontaneous behavior of an Erbium-doped-fiber laser synchronously and asynchronously mode-locked operating at 10GHz. We observed that the central wavelength shifts to a lower one. This knowledge is necessary to achieve the mode-locking stabilization.

**LWH • Chemical Dynamics I: Multi-Dimensional Ultrafast Spectroscopy—Continued**

**LWH3 • 2:30 p.m.**
Two Dimensional Femtosecond Stimulated Raman Spectroscopy: A New Technique to Probe Vibrational Coupling, David W. McCamant, Kristina C. Wilson, Randy D. Mehlenbacher, Brendan Lyons; Univ. of Rochester, USA. Two-dimensional femtosecond stimulated Raman spectroscopy (2D-FSRS) can potentially quantify vibrational coupling. However, our results indicate that all signals measured thus far are attributable to a 3rd-order cascade and not the intended 5th-order mechanism.

**LWH4 • 2:45 p.m.**
Watching Chemical Reactions and Dynamics with Ultrafast Multidimensional Infrared Spectroscopy, Carlos R. Batz, Jessica M. Anna, Robert McCanne, John T. King, Kevin J. Kubarych; Univ. of Michigan, USA. Using equilibrium and non-equilibrium multidimensional infrared spectroscopy, we can track chemical reactions with exquisite detail. Examples we will discuss include: ultrafast chemical exchange, bimolecular recombination, charge transfer and solvation dynamics.

---

**Note:** The above text is a continuation of the session details, providing a summary of the presentations and discussions at the FI O/LS 2010 conference held in October 24–28, 2010.
<table>
<thead>
<tr>
<th>Highland A</th>
<th>Highland B</th>
<th>Highland C</th>
<th>Highland D</th>
<th>Highland E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FWO • Plasmonics and Metamaterials for Information Processing I—Continued</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWO6 • 3:00 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metamaterial Optical Diodes for Linearly and Circularly Polarized Light, Eric Plum, Vassili A. Fedotov, Nikolay Zheludev; Univ. of Southampton, UK. Total intensity of light transmitted at non-normal incidence in planar metamaterials can be different for forward and backward propagation. For metamaterial patterns of different symmetries we observe this effect for circularly or linearly polarized light.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWO7 • 3:15 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resonance Cones in Cylindrically Anisotropic Metamaterials: A Green’s Function Analysis, Hui-kan Liu, Kevin J. Webb; Purdue Univ., USA. A Green’s function analysis for cylindrically anisotropic media is presented. Resonance cones result from the Green’s function singularity when the permittivity tensor elements have opposite sign. This model will facilitate the design of various components.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWP • Optical Design with Unconventional Polarization II—Continued</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWP5 • 3:00 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstration of an Elliptical Plasmonic Lens Illuminated with Radially-Like Polarized Field, Gilad M. Lerman, Avner Yanai, Nissim Ben-Ze'ev, Uriel Levy; Hebrew Univ. of Jerusalem, Israel. We demonstrate an elliptical plasmonic lens illuminated by a TM “radially-like” polarized field. The surface plasmons interference generates a wavelength dependent structured pattern that can be used in structured illumination microscopy, particles trapping and sensing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWP6 • 3:15 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imaging Atomic States Using Radially-Polarized Light, Fredrik K. Fatemi, G. Beadie; NRL, USA. We have used cylindrical vector beams to probe an optically pumped warm rubidium vapor. Optical pumping produces a spatial modulation of the vector beam according to the spin state of the atoms.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWQ • Photonic Bandgap and Slow Light—Continued</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWQ6 • 3:00 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adiabatic Perfectly Matched Layer for Absorbing Slow Group Velocity Modes in Numerical Simulation of Photonic Crystal Waveguides, Murata Askari, Babak Momeni, Charles M. Reihl, Ali Adibi; Georgia Tech, USA. We show why some of the previously reported PMLs do not work well in absorbing slow group velocity modes in PCWs. We also present a unique method to efficiently absorb these modes for PCW simulations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWQ7 • 3:15 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact of Slow Light on Nonlinear Effects in Silicon-on-Insulator Photonic Crystal Waveguide with Device Application, Swati Rawal, Ravindra K. Sinha; Delhi Technological Univ. (Formerly Delhi College of Engineering), India. The effect of slow light on two photon absorption and self phase modulation process in silicon-on-insulator (SOI) photonic crystal waveguide. It is observed that in slow light regime, these two nonlinear effects are enhanced.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWR • Laser Based Particle Acceleration II—Continued</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWR4 • 3:00 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photoemission by Large Electron Wave Packets Emitted out the Side of a Relativistic Laser Focus, Eric Cunningham, Jacob Johansen, Grayson Tarbox, Justin Prattross, Michael Ware; Brigham Young Univ., USA. We provide an update on an experimental effort to measure the radiation from individual electron wave packets that are spread over an area on the scale of an optical wavelength.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FWR5 • 3:15 p.m.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atomic and Nuclear Coherence Excited by Optical Pulses: CEP Effects and Generation of X-Ray and Nuclear Radiation, Yuri Rostovtsev; Deptartment of Physics, Univ. of North Texas, USA. We study population transfer and excitation of quantum coherence in atomic and nuclear systems interacting with strong ultra-short laser pulses. We discuss CEP effects and possible applications to cooperative generation of XUV and nuclear radiation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3:30 p.m.–4:00 p.m.  **Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center**

**NOTES**

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
Azimuthally Varying Graded Reflectivity Mirrors, Zachary A. Roth, Menelaos K. Poutous, Pradeep Srinivasan, Aaron Pang, Eric G. Johnson; Ctr. for Optoelectronics and Optical Communication, Univ. of North Carolina at Charlotte, USA. Space variant optics have novel and useful spatial and spectral properties. In this paper, we present a novel optical component that exploits the properties of resonant structures to make an azimuthally varying spectral filter.

Dispensing Nanolitre Droplets for Liquid Nano-printing and Nanopatterning, Sara Coppola, Veronica Vespini, Melania Paturzo, Simonetta Grilli, Pietro Ferraro; CNR Inst. Nazionale di Ottica, Italy. Nano- and pico-droplets have been extracted and dispensed from sessile drop or liquid film reservoirs through pyroelectric effect activated by a hot tip or an IR laser source on polar dielectric substrates.

Coherent Linewidths of Interfacial GaAs Quantum Dot Excitons and Incoherent Coupling from Quantum Well Excitons, Alan D. Bristow1, Galan Moody3, Mark E. Siemens1, Xingcan Dai2, Deniz Karaiskaj1, Allan S. Bracker2, Daniel Gammon2, Steven T. Cundiff1; 1JILA, Natl. Inst. of Standards and Technology and Univ. of Colorado, USA, 2NRL, USA. Optical two-dimensional Fourier-transform spectroscopy is used to study interfacial GaAs quantum dots (QDs). We extract the temperature dependence of the QD homogeneous linewidth and energy relaxation from quantum well excitons to the lower energy QDs.

Ultrafast Fourier Transform with a Femtosecond-Laser-Driven Molecule, Kenji Ohmori; Inst. for Molecular Science, Japan. We have experimentally demonstrated a new logic gate based on the temporal evolution of a molecular wave function. An optically tailored vibrational wave-packet implements 4- and 8-element discrete Fourier-transform with arbitrary real and imaginary inputs.
FWU1 • 4:00 p.m.  
**Invited**  
A Plasmonic Waveguide with Subwavelength Mode Confinement, Md M. Hasnain1, Mark D. Turner1,2, Baohua Bai1, Min Gu1; 1Swinburne Univ. of Technology, Australia, 2CRC for Polymers, Australia.  
We report on a new kind of plasmonic waveguides in metallic nano-shelled cylindrical dielectric cores. The excitation of propagating plasmon modes in the nanoshells can effectively guide light with subwavelength confinement.

FWU2 • 4:15 p.m.  
Loss Measurement in Plasmonic Modes in Metal-Insulator-Metal Waveguides by Attenuated Total Reflection, Chien-I Lin1,2, Thomas K. Gaylord1, Georgia Tech, USA.  
We report experimental characterization of plasmonic modes in metal-insulator-metal waveguides based on the attenuated total reflection (ATR) configuration. The loss is measured without physically changing the waveguide length as in conventional methods.

FWU3 • 4:30 p.m.  
One-Way Waveguides and Impedance Matching of Loads, Olli Laukkonen1, Nader Engheta1,2, Univ. of Pennsylvania, USA.  
We theoretically investigate interaction of propagating waves in one-way waveguides with terminal loads and cavities, showing that the impedance mismatch between the load and the waveguide has no effect on energy propagation through the structure.

FWW1 • 4:00 p.m.  
Sequential Diversity Imaging: Phase Diversity with AO Changes as the Diversities, Robert A. Gonalvez1,2, Tufte Univ., USA.  
A digital camera with an Adaptive Optic (AO) can be a phase-diversity imager if the frame-rate is about 10 times faster than the changing optical medium. Sequential images are the diverse images and the AO changes are the phase diversities.

FWW2 • 4:30 p.m.  
Two-Pump Fiber-Optic Parametric Amplifier with 66dB Gain and Errorless Performance, Ana Peric1,2, Steven More1, Nikola Alic2, Arthur J. Anderson2, Colin J. McKinstrie2, Stojan Radic1; 1Univ. of California - San Diego, USA, 2Bell Labs, Alcatel-Lucent, USA.  
We demonstrate a 66dB-gain two-pump fiber-optic parametric amplifier with an errorless performance measured for a 10.7-Gb/s non-return-to-zero differential phase-shift-keyed signal. A radio-frequency noise source was used for the pumps' stimulated Brillouin scattering threshold enhancement.

FWX2 • 4:15 p.m.  
Infrared Spectroscopic Imaging for Label-Free and Automated Histopathology, Rohith Bhargava1,2, R. K. Reddy1, Jason Ip, Frances N. Pounder, Matthew V. Schulermerich, David Mayerich, Xavier Llora, Rong Kong, Michael J. Wald; Univ. of Illinois at Urbana-Champaign, USA.  
Infrared spectroscopic imaging is used to classify tissue into cell types and diseases without stains or human supervision. Human-competitive performance in cancer detection is achieved by combining infrared imaging, chemometrics, image analysis and optical theory.
### Highland F

**FWY • 4:00 p.m.–5:30 p.m.**

**Biomedical Systems II**

Presider to Be Announced

### Highland G

**FWZ • 4:00 p.m.–5:30 p.m.**

**General Non-linear Optics**

Neil Broderick; Univ. of Southampton, UK, Presider

### Highland H

**LWJ • 4:00 p.m.–5:30 p.m.**

**Quantum Enhanced Information Processing II**

Robert J. Schoeckpf; Yale Univ., USA, Presider

### Highland J

**LWK • 4:00 p.m.–5:30 p.m.**

**AttoSecond and Strong Field Physics II**

David Villeneuve; Natl. Res. Council Canada, Canada, Presider

### Highland K

**LWL • 4:00 p.m.–5:30 p.m.**

**Single Molecule Approaches to Biology II**

William A. Eaton; Natl. Inst. of Health and Natl. Inst. of Diabetes and Digestive and Kidney Diseases, USA, Presider

---

**FWY • 4:00 p.m.**

**Invited**

High Resolution Optical Volumetric Imaging of Blood Perfusion with Microcirculation Tissue Beds, Ruikang K. Wang; Oregon Health and Science Univ., USA. The basic principle for optical microangiography is presented, and its potential applications in a number of animal models will discussed, including stroke, hemorrhage, and traumatic brain injury.

**FWZ1 • 4:00 p.m.**

Observation of Classical Optical Wave Condensation, Can Sun; Shu Jia; Christopher Baez; Antonio Pizzolli; Sergio Rina; Jason W. Fleischer; Princeton Univ., USA; ‘Inst. Carnet de Bourgogne, France; ‘Ecole Normale Superieure, France. We demonstrate the nonlinear condensation of classical optical waves. The condensation is observed directly, as a function of nonlinearity and wave kinetic energy, in a self-defocusing photorefractive crystal.

**FWZ2 • 4:15 p.m.**

Self-Phase Matched Four-Wave Mixing in Cold Vapour, Joel A. Greenberg, Daniel J. Gauthier; Duke Univ., USA. We demonstrate novel four-wave mixing processes in a cold vapor that arise due to atomic spatial self-organization. This leads to a reduced parametric oscillation threshold and a more rapid increase of gain with pump power.

**FWZ3 • 4:30 p.m.**

All-Optical Switching in a Coupled Cavity-Atom System, Jiepeng Zhang; Xiagang Wei; Yin Zhu; physics Div., Los Alamos Natl. Lab., USA; ‘Dept. of Physics, Florida Inst. Univ., USA. ‘College of physics, Ilin Univ., China. We report an experimental demonstration of all-optical switching in a cavity QED system consisting of multiple three-level atoms confined in a cavity mode.

**LWJ1 • 4:00 p.m.**

Quantum Illumination for Improved Detection, Imaging, and Communication, Jeffrey H. Shapiro, Joel A. Greenberg, Daniel J. Gauthier; Duke Univ., USA. Quantum illumination transmits part of an entangled state, retaining the rest for subsequent joint measurement in detection, imaging, or communication. It outperforms classical-state systems of the same average transmitted energy over entanglement-breaking channels.

**LWJ2 • 4:30 p.m.**

Deterministic Entanglement of Two Neutral Atoms Using Rydberg Blockade, Xiand Li. Zhang; Larry Isenhower, Alex T. Gill; Thad G. Walker; Mark Saffman; Univ. of Wisconsin, USA. We demonstrate a neutral atom CNOT gate using Rydberg state mediated interactions. The gate is used to deterministically create entangled Bell states with a fidelity of F=0.71, without correcting for loss of atoms.

**LWK1 • 4:00 p.m.**

Time-Resolved High-Harmonic Spectroscopy of Photochemical Dynamics, Hans Jakob Wörner, Julien B. Bertrand, Paul B. Corkum, David M. Villeneuve; Joint Lab for Attosecond Science, Natl. Res. Council Canada and Univ. of Ottawa, Canada. We use high-harmonic spectroscopy to observe the evolution of the electronic structure of molecules undergoing ultrafast photochemical reactions. Using the transient grating technique allows us to determine amplitude and phase of the excited state emission.

**LWK2 • 4:30 p.m.**

Magnetic-Bottle Electron Spectrometer for Measuring Isolated 25 as Pulses, Pan Zhou; Qiang Zhang; Steve Gilbertson; Michael Chini; Sabih Khan; Zenghu Chang; Kun Zhao; Ido Golding; Baylor College of Medicine, USA. We study the life-cycle of bacteriophage lambda at the resolution of individual viruses and cells. I will present some of our recent findings with regards to long-standing open questions in the lambda system.

**LWL2 • 4:30 p.m.**

Imaging Dynamic Events Inside Living Cells: Intracellular Degradation of LDL, Christine Payne; Georgia Tech, USA. The intracellular degradation of LDL was probed with single particle tracking fluorescence microscopy. LDL particles were labeled such that enzymatic degradation leads to an increase in fluorescence allowing us to relate endosomal dynamics to degradation.
In this presentation, I will give an overview of these state-of-the-art systems, discuss key technologies, and speculate on what's to come in future builds. We experimentally demonstrate squeezing and guiding electromagnetic (EM) waves in a designer surface plasmonic waveguide with mode cross section down to 0.04λ by 0.03λ.

We demonstrate the feedback phase on spectrum and temporal pulse train evolution is demonstrated experimentally and numerically.

A new approach has been made in diagnostics of the advanced technological processes have been developed. A new method of optical monitoring of industrial processes, Neal S. Bergman, TE SubCom, USA. Undersea transoceanic telecommunications cables are routinely installed with multiple tera-bit capacity. In this presentation, I will give an overview of these state-of-the-art systems, discuss key technologies, and speculate on what’s to come in future builds.

Dipole Antenna Couplers for Subwavelength Metal-Insulator-Metal Waveguides, Mehmet Cengiz Onbasli, Ali K. Oksanen1, 2; MIT, USA, 2Bilkent Univ., Turkey. Near-infrared light (λ=1550 nm) was coupled into a 100-nm-core Ag/SiO2/Ag waveguide using dipole antennas. We demonstrate that using antennas, the field intensity inside the waveguide can be enhanced by changing the antenna size and location.

We report an automated Stokesmetric imaging laser radar, Shih Ting1, Xue Liu1, Selim M. Shahriz1; North western Univ., USA, 2Digital Optics Technologies, USA. We report an automated Stokesmetric imaging eye safe laser radar that can detect all four components of the Stokes parameters in the reflected signal, with a variable input polarization state, capable of full Mueller-metric imaging.
**FWY • Optical Design for Biomedical Systems II—Continued**

**FWY4 • 4:45 p.m.**
Electromagnetically-Induced Phase Grating, Luis de Araujo, Univ. Estadual de Campinas, Brazil. An atomic phase grating, based on the giant Kerr nonlinearity under electromagnetically induced transparency, is described. The grating is highly efficient and diffracts close to 30% of a probe beam into the first diffraction order.

**FWZ • General Non-linear Optics—Continued**

**FWZ4 • 4:45 p.m.**
Four-Wave-Mixing Between the Upper-Excited States in a Cascade Configuration, Usha Khadilkar, Huaibin Zheng, Min Xiao, Univ. of Arkansas, USA. Two-color resonant four-wave-mixing radiation is generated between the \( ^3\text{P}_2 \) and \( ^3\text{P}_0 \) excited states in atomic rubidium vapor using atomic coherence via Doppler-free EIT and two-photon absorption mechanisms, and studied in the frequency domain.

**FWZ5 • 4:00 p.m.**
Parallel 3-D Confocal Imaging with Varifocal Lens, Guoqiang Li, Wayne Knox, Inst. of Optics, Univ. of Rochester, USA. Using only ~5 mW laser power, we imaged in backscattering mode a nonlinear absorbing object at 2.5 mm depth, which is five times the mean-free-path-length in a turbid medium, by optimizing the detection.

**FWZ6 • 5:15 p.m.**
All-Band Bragg Solitons and CW Eigenmodes, Alexander E. Kaplan, Johns Hopkins Univ., USA. We found an amazingly simple “all-band” intensity profile of any bandgap or Bragg solitons for arbitrary parameters of the system; we also found nonlinear eigen-modes of the system propagating without energy exchange between waves.

**LWJ • Quantum Enhanced Information Processing II—Continued**

**LWJ3 • 4:45 p.m.**
EPR Entanglement Using EEC and Beam Splitter Interactions, Peter D. Drummond, Qiongyi He, Margaret D. Reid, Swinburne Univ. of Technology, Australia. We develop strategies for generating spatial EPR entanglement in a trapped double well atomic BEC with multiple spin eigenstates. By applying appropriate entanglement criteria, we show how spatial entanglement can be generated and detected.

**LWJ4 • 5:00 p.m.**
Progress Towards Scalable Quantum Information Processing with Trapped Ions, David Hanneke, NIST, USA. Recent advances in trapped-ion quantum information processing include the combination of a complete set of scalable techniques as well as development of scalable trap technologies, high-fidelity operations, quantum networks, and quantum simulation.

**LWK • Attosecond and Strong Field Physics II—Continued**

**LWK3 • 4:45 p.m.**
Ultrafast Dynamics in Helium Nanodroplets Studied by Femtosecond EUV Photoelectron and Ion Imaging, Oliver Bünemann1, Oleg Kornilov1, Stephen R. Leone1,2, Daniel M. Neumark1,2, Oliver Geiser1,2, Lawrence Berkeley Natl. Lab, USA, Univ. of California Berkeley, USA. Femtosecond time resolved EUV photoelectron and ion imaging studies of pure helium nanodroplets (~2x10^9) reveal rich electronic and nuclear dynamics. Inter-band relaxation in the superfluid clusters and emission of Rydberg atoms are monitored in real-time.

**LWL • Single Molecule Approaches to Biology II—Continued**

**LWL3 • 5:00 p.m.**
Time-Resolved 3D Tracking of Individual Quantum Dot Labeled Proteins in Live Cells via Confocal Feedback, Jim Werner, M. Lisa Phipps, Peter M. Goodwin1, Patrick J. Cutler2, Diane S. Lidke1, Bridget S. Wilson1; Los Alamos Natl. Lab, USA, Univ. of New Mexico USA. We have developed a microscope system that uses active feed-back to follow individual quantum dot labeled proteins moving in three dimensions in live cells at cm/s transport velocities with 100 picoseconds temporal resolution.
Airy beams were performed and analyzed.

FThA1 • 8:00 a.m.
Second Harmonic Generation of Airy Beams in Quadratic Nonlinear Photonic Crystals, Ido Doler, Ady Arie; Tel Aviv Univ., Israel. We study three wave mixing processes of accelerating Airy beams in quadratic periodically poled nonlinear crystal. Experiments of second harmonic generation of 1–D and 2–D Airy beams were performed and analyzed.

FThA2 • 8:15 a.m.
Quasi-Phase-Matched Second-Harmonic Generation in High-Intensity AlGaAs Waveguides Pumped at 1.55 μm, Tomonori Matsushita, Jyunya Ota, Ikuma Ohta, Takashi Kondo; Univ. of Tokyo, Japan. We have fabricated high-quality periodically-inverted AlGaAs ridge waveguides by introducing the low temperature MBE growth process, and achieved relatively low propagation losses and highly efficient quasi-phase-matched second harmonic generation pumped at 1.55 μm.

FThA3 • 8:30 a.m.
Integrated, Continuous Wave Second Harmonic Source Using AlGaAs Photonic Wire Waveguides, David Duchesne1, Katarzyna Rutkowska2, Maite Volatier1, Francoise Legare1, Sebastien Delprat1, Mohamed Chaker1, Daniele Modotto4, Andrea Locatelli1, Constantino De Angelis, Demetrios Christodoulou1, Marc Sorel, Gregory J. Salamo7, Richard Ares3, Vincent Walsh1; 1Royal Inst. of Technology, Sweden, 2Warsaw Univ. of Technology, Poland, 3Univ. of Sherbrooke, Canada, 4Univ. di Brescia, Italy, 5CREOL, Univ. of New Orleans, USA, 6Univ. of Arkansas, USA.

FThB1 • 8:00 a.m.
Extraordinary Transmission Resonance due to Near-field Effect in Periodic U-shaped Metal Nanostuctures, Srirojan Iyer1, Sergei Popov2, Ari T. Friberg1,2,3; 1Royal Inst. of Technology, Sweden, 2Aalto Univ., Finland, 3Univ. of Joensuu, Finland. The far-field transmission spectrum of crescent-like metallic nanostructures on a glass substrate at normal incidence is studied numerically. The interpretation of transmission resonances arising from a periodic subwavelength U-shaped metal nanostructure is revisited.

FThB2 • 8:15 a.m.
Fabrication and Dark-Field Scattering Characterization of Deterministic Aperiodic Plasmonic Spirals, Jacob Trevino, Nate Lawrence, Luca Dal Negro; Boston Univ., USA. Plasmonic aperiodic spirals with various geometries have been designed, fabricated and characterized for the first time. These new structures could result in the engineering of novel plasmonic devices for plasmonic-enhanced, polarization-insensitive broadband photo-detectors.

FThB3 • 8:30 a.m.
Depolarization of Scattered Radiation by Diffractively Coupled Plasmonic Nano-Arrays, Gary Walsh, Luca Dal Negro; Boston Univ., USA. We experimentally investigate the role of long-range diffractive coupling in close packed plasmonic particle clusters through the depolarization of the scattered fields. We find that the quasi-static coupling regime strongly enhances depolarization.

FThB4 • 8:45 a.m.
Inertio-confinement Fusion Research at the Laboratory for Laser Energetics, David Meyerhofer; Lab for Laser Energetics, Univ. of Rochester, USA. Inertial confinement fusion research using the OMEGA Laser has demonstrated the highest deuterium-tritium areal density ever measured, ~6.3 g/cm², and a Lawson’s performance parameter, Pe, comparable to that obtained on the Joint European Torus.
**Friday, October 29**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>FThF1 • Transformation Optics and Cloaking with Metamaterials</td>
<td>Xiang Zhang; Univ. of California at Berkeley, USA, Presider</td>
</tr>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>FThG1 • General Quantum Electronics I</td>
<td>Presider to Be Announced</td>
</tr>
<tr>
<td>8:00 a.m.–9:45 a.m.</td>
<td>LThA1 • Chemical Dynamics II: Multi-Dimensional Ultrafast Spectroscopy</td>
<td>David McCamant; Univ. of Rochester, USA, Presider</td>
</tr>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>LThB1 • Frontiers in Ultracold Molecules II</td>
<td>David DeMille; Yale Univ., USA, Presider</td>
</tr>
<tr>
<td>8:00 a.m.–9:45 a.m.</td>
<td>LThC1 • Nanophotonics, Photonic Crystals and Structural Slow Light I</td>
<td>Antonio Badolato; Univ. of Rochester, USA, Presider</td>
</tr>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>LThD1 • Manipulation of Ultracold Chemistry, John L. Bohn</td>
<td>JILA, NIST, Univ. of Colorado, USA. I will discuss the molecular physics underlying recent experimental observations of, and control over, chemical reactions at JILA. For these polar species, possible handles for control include the quantum statistics of the molecules, the temperature, applied electric fields, and confinement in reduced-dimensional geometry. These aspects of control are described remarkably well by simple theoretical ideas.</td>
</tr>
</tbody>
</table>

**Friday, October 29**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 a.m.–5:30 p.m.</td>
<td>FIO/LS 2010 • October 24–28, 2010</td>
<td>Highland F Highland G Highland H Highland J Highland K</td>
</tr>
</tbody>
</table>
Applications are discussed. The fundamental theory of nonlinear processes in these waveguides, opened a new era in the nonlinear waveguides field. The transmission of light through a thin Au film with subwavelength double nanoholes is modeled using vectorial three-dimensional finite element method. The performance of such perforated films as a potential retractive index sensor is discussed.

We observe forward stimulated Brillouin scattering (FSBS) in a standard highly-nonlinear fiber, enables IR emitters with low power consumption and low thermal mass of thin free standing substrates. We have fabricated plasmonic infrared (IR) emitters on flexible polyimide substrates, and low thermal mass of thin free standing substrates enables IR emitters with low power consumption and fast switching time.

Chalcogenide Nano-waveguide Devices, Fabrication and Characterization of On-chip Chalcogenide Nano-waveguide Devices, Qiming Zhang, Xiang Wu, ming Li, Living Liu, Lei Xu; Fudan Univ, China. Buried As$_2$S$_3$ nano-waveguides with size down to 200 nm on silicon wafer are prepared. The fabricated waveguide and micro-ring cavity show excellent optical properties. Optical nonlinearity of the nano-waveguides is characterized as well.

Near Quantum Limited Optical Phase Measurements on a Dark Fringe, David J. Starling, P. Ben Dixon, Nathan S. Williams, Andrew N. Jordan, John C. Howell; Univ. of Rochester, USA. We describe an optical experiment that makes use of weak value inspired amplification. We show that the signal-to-noise ratio of a phase measurement using this method rivals modern techniques, even on a dark fringe.

The influence of the degree of cross-polarization on the Hanbury Brown-Twiss Effect, Asma Al-Qasimi, Mayukh Lahiri, David Kuebel, Daniel P. T. James, Emil Wolf; Dept. of Physics, Univ. of Toronto, Canada, 'Dept. of Physics and Astronomy, Univ. of Rochester, USA, Dept. of Physics, St. John Fisher College, USA, 'Inst. of Optics, Univ. of Rochester, USA. We show by example that correlations between intensity fluctuations at two detectors generated by two beams may be different, even if the beams have the same degree of coherence and the same degree of polarization.

Howell; Univ. of Rochester, USA. We describe an optical experiment that makes use of weak value inspired amplification. We show that the signal-to-noise ratio of a phase measurement using this method rivals modern techniques, even on a dark fringe.

The Influence of the Degree of Cross-Polarization on the Hanbury Brown-Twiss Effect, Asma Al-Qasimi, Mayukh Lahiri, David Kuebel, Daniel P. T. James, Emil Wolf; Dept. of Physics, Univ. of Toronto, Canada, 'Dept. of Physics and Astronomy, Univ. of Rochester, USA, Dept. of Physics, St. John Fisher College, USA, 'Inst. of Optics, Univ. of Rochester, USA. We show by example that correlations between intensity fluctuations at two detectors generated by two beams may be different, even if the beams have the same degree of coherence and the same degree of polarization.

The focal properties of a set of two modified zone plates, Qasimi; Inst. of Polar Lasers, Jordan P. Leidner, Robert F. A. Norwood 1, 2, Christian Kremers 2, Dmitry A. Kropachev 2, Terje Skotheim 2, Robert G. Brown 1; Inst. of Optics, USA, 'Ctr. College, USA. We analyze and test a guided-mode-resonance filter fabricated with periodic defects. The guided mode resonance of a phase measurement using this method rivals modern techniques, even on a dark fringe.

We describe an optical experiment that makes use of weak value inspired amplification. We show that the signal-to-noise ratio of a phase measurement using this method rivals modern techniques, even on a dark fringe.

The Influence of the Degree of Cross-Polarization on the Hanbury Brown-Twiss Effect, Asma Al-Qasimi, Mayukh Lahiri, David Kuebel, Daniel P. T. James, Emil Wolf; Dept. of Physics, Univ. of Toronto, Canada, 'Dept. of Physics and Astronomy, Univ. of Rochester, USA, Dept. of Physics, St. John Fisher College, USA, 'Inst. of Optics, Univ. of Rochester, USA. We show by example that correlations between intensity fluctuations at two detectors generated by two beams may be different, even if the beams have the same degree of coherence and the same degree of polarization.

Fast Ignition Integrated Experiments Using Gekko-XII and LFEX Lasers, Hirayuki Shiraiga, Inst. of Laser Engineering, Osaka Univ., Japan. Implosion and heating experiments of Fast Ignition (FI) targets for FIREX-1 project have been performed with Gekko-XII and LFEX lasers at Osaka University. Enhancement of the neutron generation due to fast heating has been achieved.
Thank you for attending FIO/LS.
Look for your post-conference survey via email and let us know your thoughts on the program.
narrow-band non-classical light source. This is the first step towards a low-threshold, phase matched frequency conversion at 1064nm in a polished LiNbO3 whispering gallery mode resonator. We report fiber fuse effect in a hollow optical fiber for the first time, where tadpole-like voids were observed at much higher threshold power in contrast to bullet-like voids in conventional optical fibers.

Continued

Developing Whispering Gallery Mode Resonators for Quantum Optics Applications, Matt T. Simons, Eugene E. Mikhailov, Irina Novikova; College of William & Mary, USA. We have achieved non-critically phase matched frequency conversion at 1064nm in a polished LiNbO3, whispering gallery mode resonator disk. This is the first step towards a low-threshold, narrow-band non-classical light source.

Frequency Conversion of Surface Plasmon-Polariton in a Metal-Nonlinear Dielectric Boundary, Michael Volodarsky1, Ido Dolev1, Yonatan Sivan2, Tal Ellenbogen1, Ady Arieli1; 1Tel Aviv Univ., Israel, 2Imperial College London, UK. Frequency doubling of a surface plasmon-polariton in metallic nanotip coupled to the silicon waveguide. Strong field enhancement is observed at the apex of the tip.

On-Chip Focusing of Light by Metallic Nanotip, Boris Desiatov, Rya Goykhman, Uriel Levy; Hebrew Univ. of Jerusalem, Israel. We investigate numerically and experimentally the on-chip nanoscale focusing of surface plasmon polaritons (SPPs) in metallic nanotip coupled to the silicon waveguide. Strong field enhancement is observed at the apex of the tip.

Continued

Frequency doubling of a surface plasmon-polariton in metallic nanotip coupled to the silicon waveguide. Strong field enhancement is observed at the apex of the tip.

We systematically investigate the near-field enhancement of LDOS in concentric circular MIM structures using analytical scattering theory. We find unique confined plasmon modes and large, three orders of magnitude, enhancement of LDOS.

Deep-Subwavelength Coplanar Plasmonic Laser Based on an Edge-Coupled Hybrid Plasmon Waveguide, Yusheng Bian1, Ya Liu1, Jinsong Zhu2, Tao Zhou3; 1Beihang Univ., China, 2Natl. Ctr. for Nanoscience and Technology of China, China, 3New Jersey Inst. of Technology, USA. We introduce a new interferometric pulse-measurement technique, MUDTADPOLE, for measuring the full temporal field of very complex arbitrary optical waveforms and, using it, measure waveforms with ~40 fs temporal resolution and time-bandwidth products >250,000.

Deep-Subwavelength Coplanar Plasmonic Laser Based on an Edge-Coupled Hybrid Plasmon Waveguide, Yusheng Bian1, Ya Liu1, Jinsong Zhu2, Tao Zhou3; 1Beihang Univ., China, 2Natl. Ctr. for Nanoscience and Technology of China, China, 3New Jersey Inst. of Technology, USA. A novel coplanar plasmonic laser based on an edge-coupled hybrid plasmon waveguide is proposed. The easy-to-fabricate structure could enable deep-subwavelength lasing with low pump thresholds and be readily integrated with other plasmonic structures.

Light Scattering, Field Localization and Local Density of States in Co-Axial Plasmonic Nanowires, Nate Lawrence, Luca Dal Negro; Boston Univ., USA. We systematically investigate the near-field enhancement, scattering and LDOS in concentric circular MIM structures using analytical scattering theory. We find unique confined plasmon modes and large, three orders of magnitude, enhancement of LDOS.

400 fs temporal resolution and time-bandwidth products >250,000.

On-Chip Focusing of Light by Metallic Nanotip, Boris Desiatov, Rya Goykhman, Uriel Levy; Hebrew Univ. of Jerusalem, Israel. We investigate numerically and experimentally the on-chip nanoscale focusing of surface plasmon polaritons (SPPs) in metallic nanotip coupled to the silicon waveguide. Strong field enhancement is observed at the apex of the tip.

Light Scattering, Field Localization and Local Density of States in Co-Axial Plasmonic Nanowires, Nate Lawrence, Luca Dal Negro; Boston Univ., USA. We systematically investigate the near-field enhancement, scattering and LDOS in concentric circular MIM structures using analytical scattering theory. We find unique confined plasmon modes and large, three orders of magnitude, enhancement of LDOS.

Light Scattering, Field Localization and Local Density of States in Co-Axial Plasmonic Nanowires, Nate Lawrence, Luca Dal Negro; Boston Univ., USA. We systematically investigate the near-field enhancement, scattering and LDOS in concentric circular MIM structures using analytical scattering theory. We find unique confined plasmon modes and large, three orders of magnitude, enhancement of LDOS.

Light Scattering, Field Localization and Local Density of States in Co-Axial Plasmonic Nanowires, Nate Lawrence, Luca Dal Negro; Boston Univ., USA. We systematically investigate the near-field enhancement, scattering and LDOS in concentric circular MIM structures using analytical scattering theory. We find unique confined plasmon modes and large, three orders of magnitude, enhancement of LDOS.

10:00 a.m.–10:30 a.m. Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center
FThF • Transformation Optics and Cloaking with Metamaterials—Continued

FThG • General Quantum Electronics I—Continued

FThH • Frontiers in Ultracold Molecules II—Continued

FThJ • Nanophotonics, Photonic Crystals and Structural Slow Light I—Continued

FThK • General Quantum Physics

FThF7 • 9:30 a.m. Molding the Flow of Light with Artificial Optical Materials, Dentcho A. Genov1, Shuang Zhang2, Xiang Zhang1; Louisiana Tech Univ., USA, NSF, NSEC, Univ. of California at Berkeley, USA. We propose to link the fields of optical metamaterials and celestial mechanics, opening the way to investigate light phenomena reminiscent of orbital motion, strange attractors and chaos, in a controlled laboratory environment.

FThG7 • 9:30 a.m. Modes in Random Media, Azriel Z. Genack, Jing Wang; CUNY Queens College, USA. The transmitted speckle pattern of localized microwave radiation is decomposed into the underlying modes. Strong correlation is found between neighboring modes.

FThH5 • 9:30 a.m. Sympathetic Heating Spectroscopy: Probing Molecular Ions with Laser-Cooled Atomic Ions, Ken Brown; Georgia Tech, USA. Sympathetic heating spectroscopy measures atomic and molecular ion spectra by observing the heating of a laser-cooled control ion. Limits of the method are tested using two isotopes of calcium. Applications for molecular ions are discussed.

LThC5 • 9:30 a.m. Peculiar Discrete Diffraction Characteristic of Two-Dimensional Backbone Lattice, Yiling Qi, Guoquan Zhang; MOE Key Lab of Weak Light Nonlinear Photonics, Nankai Univ., China. A peculiar discrete diffraction pattern in two-dimensional backbone lattice is illustrated through numerical simulations when the light is injected into a low-index site of the backbone lattice. The corresponding formation mechanism is also discussed.

FThG8 • 9:45 a.m. Phase Locking Multiple Fibers by a Talbot Mirror Fiber Device, Renjie Zhou1,2, Qiwen Zhan1, Peter E. Powers1, Baldemar Ibarra-Escamilla2, Joseph W. Haus1; 1Univ. of Dayton, USA, 2Inst. Nacional de Astrofisica, Optica y Electronica, Mexico. We numerically demonstrate that periodically placed fibers can be phased together using a large mode area fiber element. The LMA fiber element is a Talbot mirror that images the reflected beams at the fibers’ input.

10:00 a.m.–10:30 a.m. Coffee Break, Highland Ballroom Foyer Rochester Riverside Convention Center

NOTES
Abstract not available.

**Nonlinear Silicon Photonics**, Tal Ellenbogen, Ady Arie; Tel Aviv Univ., Israel.

**Controlling the Acceleration Direction and Peak Intensity**, Ido Dolev, Tal Ellenbogen, Ady Arie; Tel Aviv Univ., Israel.

**Ultra-Fast On-Chip All-Optical Integration**, Marcella Ferreira, Yongwoo Park; Luca Razzari1, Brent E. Little, Sai T. Choi, Roberto Morandotti, Dave J. Moss1, Jose Azana1; 1INRS-EMT, Canada, 2Dept. di Elettronica, Univ. di Pavia, Italy, 3Infineon Ltd, USA, 4CUDOS, School of Physics, Australia. We report about ultra-high speed temporal-integration of arbitrary optical complex waveforms by using an integrated and fully CMOS compatible micro-ring resonator. The device offers an unprecedented time bandwidth product approaching the remarkable value of 100.

**Transport, Curvature, and Geometric Potential in Photonic Topological Crystals**, Alexander Sumorin1, Felix Dreisow2, Matthias Heinrich3, Robert Kell3, Stefan Noeth3, Andreas Tünnermann1, Stefano Longhi3, 1Institut für Angewandte Physik, Germany, 2Dept. of Physics, Swiss Federal Institute of Technology, Switzerland, 3Dept. di Fisica, Politecnico di Milano, Italy. We report on the first experimental realization of topological crystals, solely formed by a geometric potential of an undulated slab waveguide. Transport mechanisms like Bloch oscillations and Zener tunneling are demonstrated.

**Engineering Cavity Modes in Photonic Crystal Double-Heterostructures**, Sahand Mahmoodian1, Kokou B. Dossou1, Christopher G. Poulton1, Ross C. McPhedran1, Lindsay C. Botten1, C. Martin de Sterke2, 1CUDOS, School of Physics, Univ. of Sydney, Australia, 2CUDOS, Dept. of Mathematical Sciences, Univ. of Technology Sydney, Australia. We present a new method for designing mode fields of 3D photonic crystal heterostructure cavities. The method is several orders of magnitude faster than existing numerical methods and enables rapid design of heterostructure cavity resonances.

**Improved Aperture Synthesis for Digital Holography**, Abbie E. Tippie, Sapna A. Shroff, James R. Fienup; 1Northwestern Univ., USA. We demonstrated aperture synthesis for digital holography in the laboratory by mosaicking an array of single frames. We developed improved focus correction, frame-to-frame sub-pixel registration, and piston phase-error correction.

**FDTD Simulation of Semiconductor Plasmonic Nano-Lasers at 1550nm Based on Realistic Semiconductor Gain Model: Square Resonators and Waveguide Coupled Rings**, Xi Chen1, Bipin Bhola2, 1Northwestern Univ., USA, 2National University of Singapore. We present a new nano-scale plasmonic-semiconductor laser resonator design. The device operates at 1550nm, which is the predominant wavelength for optical telecommunication. We present a comprehensive design methodology to achieve stable lasing at 1550nm. Low temperature operation is also explored.

**Spatial Light Interference Microscopy (SLIM)**, Yingyan Huang3, Seng-Tiong Ho1; 1Northwestern Univ., USA, 2Nanyang Technological University, Singapore. We present about an improved interferometric technique for determining optical pathlength changes of 0.3 nm spatially and 0.03 nm temporally. SLIM combines two classic ideas in light imaging: Zernike’s phase contrast microscopy and Gabor’s holography.

**Ultra-Fast On-Chip All-Optical Integration**

**Transport, Curvature, and Geometric Potential in Photonic Topological Crystals**

**Engineering Cavity Modes in Photonic Crystal Double-Heterostructures**

**Improved Aperture Synthesis for Digital Holography**

**FDTD Simulation of Semiconductor Plasmonic Nano-Lasers at 1550nm Based on Realistic Semiconductor Gain Model: Square Resonators and Waveguide Coupled Rings**
### FThM1 • 10:30 a.m. Invited Spatio-Temporal Processing Methods Mitigating Bandwidth Issues Advanced Infrared Sensors, Dean Scribner; Northrop Grumman Corp., USA. Abstract not available.

### FThM2 • 11:00 a.m. Compressive Sensing Approach Reducing Number Exposures Multi-view Projection Holography, Tair Rivenson, Adrian Stern, Joseph Rosen; Ben-Gurion Univ. of the Negev, Israel. Compressive imaging enables reconstruction of images from far fewer number measurements predicted by classical sampling theorem. Here we demonstrate how this approach can dramatically reduce number exposures in multi-view projection holography.

### FThM3 • 11:00 a.m. Mie Scattering Arbitrary Focused Fields, Nicole J. Moore, Miguel A. Alonso; Beloit College, USA, Aalto Univ., Finland. An efficient model Mie scattering arbitrary incident fields high numerical aperture presented. Several simple test cases shown, including monochromatic fields with linear, radial and azimuthal polarization.

### FThM4 • 10:30 a.m. The Effects Spatial Coherence Angular Distribution Radiant Intensity Generated Scattering Sphere, Taco D. Visser, Thomas van Dijk, Dave G. Fischer, Emil Wolf; Delft Univ. of Technology, Netherlands, Free Univ. Netherlands, NASA, Univ. of Rochester, USA. We study effects spatial coherence incident beam scattering sphere. Strong modifications radiant intensity predicted.

### LhE1 • 10:30 a.m. Invited Quantum Teleportation Quantum Information Processing Akira Furusawa, Univ. of Tokyo, Japan. Teleportation-based quantum information processing reviewed.

### LhE2 • 11:00 a.m. Calculation Tripartite Entangled States Generated Spontaneous Two-Photon Cascade Emission, Emily A. Alden, Aaron E. Leanhardt; Univ. of Michigan, USA. Tripartite entangled states generated spontaneous two-photon cascade emission three-level systems spin-1/2 ground states. Prototypical W GHZ states produced for certain initial conditions photon emission directions.

### LhE3 • 11:00 a.m. Novel Light-Guiding Properties Photonic Crystals, R. Hamam, I. Celanovic, Z. Wang, Y. Chong, J.D. Joannopoulos, Marin Soljacic; MIT, USA. We present two photonic crystal enabled platforms, exhibiting novel light-guiding properties: a system exhibiting angular photonic bandgap, a system exhibiting uni-directional light propagation.
Nonlinear Medium, Light Scattering in a Random but Non Diffusive
Xavier Vidal1, USA, 3Univ. Autónoma de Madrid, Spain, 4Univ. Politècnica de Catalunya, Spain.
We demonstrate a pulse delay of 1.5 ns over a wide bandwidth via stimulated Brillouin scattering in an optical fiber pumped by a swept source with a sweep rate of 20 MHz/s.

Broadband Slow Light with a Swept-Frequency Source, Rui Zhang1, Yunhui Zhu1, Jing Wang2, Daniel Gauthier3; 1Duke Univ., USA, 2Key Lab of All Optical Network & Advanced Telecommunication Network of EMC, Beijing Juotong Univ., China. We demonstrate a pulse delay of 1.5 ns over a wide bandwidth via stimulated Brillouin scattering in an optical fiber pumped by a swept source with a sweep rate of 20 MHz/s.

Device—Continued
Demonstration of a White Light Cavity for High-Speed Data Buffer Using Bi-Frequency Pumped Brillouin Gain, Honam Yum1, May Kim1, Philip Henneman1, Selim M. Shadrivov1; 1Northwestern Univ., USA, 2Texas A&M Univ., USA. We demonstrate a white-light-cavity (WLC) using a fiber resonator, pumped by two frequencies for two Brillouin gain peaks. Such a WLC is suitable for trap-door data buffering with a high delay-bandwidth product and negligible distortion.

Demonstration of a White Light Cavity for High-Speed Data Buffer Using Bi-Frequency Pumped Brillouin Gain, Honam Yum1, May Kim1, Philip Henneman1, Selim M. Shadrivov1; 1Northwestern Univ., USA, 2Texas A&M Univ., USA. We demonstrate a white-light-cavity (WLC) using a fiber resonator, pumped by two frequencies for two Brillouin gain peaks. Such a WLC is suitable for trap-door data buffering with a high delay-bandwidth product and negligible distortion.

Emission Control of One-Dimensional Parabolic-Beam Photonic Crystal Laser, Ju-Hyung Kang1, Byeong-Hyun Ahn1, Myung-Ki Kim1, Hong-Gyu Park1, Yong-Hae Lee2; 1Korea Univ., Korea, Republic of, 2KAIST, Korea. We experimentally control the emission properties of one-dimensional parabolic-beam photonic crystal fundamental mode lasers by changing the position of tapering end.

We demonstrate a pulse delay of 1.5 ns over a wide bandwidth via stimulated Brillouin scattering in an optical fiber pumped by a swept source with a sweep rate of 20 MHz/s.

Invited
Light Scattering in a Random but Non Diffusive Nonlinear Medium, Francisco Rodriguez1, Jorge Bravo-Abad1, Jorge L. Dominguez-Juarez1, Cam Yao2, Xavier Vidal1, Jordi Martorell1; 1ICFO, Spain, 2MIT, USA, 3Univ. Autónoma de Madrid, Spain, 4Univ. Politècnica de Catalunya, Spain. The second-harmonic generation from transparent strontium-barium niobate crystals is experimentally studied and explained from the emission patterns of randomly scattered nonlinear domains and the far field interference of the light generated from such domains.

Optical Frequency Comb Generation via a Heterostructure Cavity Embedded within a Photonic Crystal Ring Resonator, Amin Khorshidahmad1, Andrew G. Kirk1; 1Northwestern Univ., USA, 2Air Force Res. lab, Materials and Manufacturing Directorate, USA. We propose a novel broadband OTDM that generate 20Gb/s and 40Gb/s signals from a 5Gb/s input signal. It has a small footprint with a bandwidth of over 100nm making it suitable for high-speed optical networks.

We demonstrate a pulse delay of 1.5 ns over a wide bandwidth via stimulated Brillouin scattering in an optical fiber pumped by a swept source with a sweep rate of 20 MHz/s.

Empirical Study on Optimal Pinhole Focal Distance for Broadband Infrared Illumination in Thermal Hartmann Wavefront Sensing, Kelvin J. A. Ooi1, Liping Zhao1, Xiang Li1, Ricky L. K. Ang1; 1Nanyang Technological Univ., Singapore, 2Singapore Inst. of Manufacturing Technology, Singapore. We discuss and review recent results and applications.

Optical Time Division Multiplexer on Silicon Chip, Abdelwahab A. Abokrie1, Ali W. Elshaari1, Stefan F. Preble1; 1Rochester Inst. of Technology, USA. We demonstrate a novel broadband OTDM that generate 20Gb/s and 40Gb/s signals from a 5Gb/s input signal. It has a small footprint with a bandwidth of over 100nm making it suitable for high-speed optical networks.

Empirical Study on Optimal Pinhole Focal Distance for Broadband Infrared Illumination in Thermal Hartmann Wavefront Sensing, Kelvin J. A. Ooi1, Liping Zhao1, Xiang Li1, Ricky L. K. Ang1; 1Nanyang Technological Univ., Singapore, 2Singapore Inst. of Manufacturing Technology, Singapore. We discuss and review recent results and applications.

Leaky Modes of Two-Dimensional Photonic Crystals Transferred to a Low Refractive Index Substrate, Michael J. de Dood1; 1Nanyang Technological Univ., Singapore, 2Singapore Inst. of Manufacturing Technology, Singapore. We present a method to transfer free standing photonic crystal membranes to a low refractive index substrate. These structures are optically flat and we compare the optical properties with the properties of free standing membranes.

The Effect of Calibration Error on Polarimetric Reconstruction in Microgrid Polariometric Imagery, Charles F. LeCates1, J. Scott Tyo; Univ. of Arizona, USA. We discuss and review recent results and applications.

Metal-nanostructures can be employed for efficient index modulation, two-photon wave-mixing. We discuss and review recent results and applications.
FThM • Sensing in Higher Dimensions — Theory and Hardware for Computational Imaging II—Continued

FThM3 • 11:15 a.m.
Light Field Imaging Spectrometer: Conceptual Design and Simulated Performance, Zhihui Zhou¹, Yan Yuan¹, Bin Xiangli¹,²; ¹Univ. of Science and Technology of China, China, ²Beihang Univ., China. We present a snapshot imaging spectrometer using a light field camera combined with an array of narrow-band spectral filters. Simulation results demonstrate its post-processing performance, including spectrum acquisition, digital refocusing and correction of chromatic aberrations.

FThM4 • 11:30 a.m.
Compressive Measurements for Target Tracking, Tariq Osman¹, Daniel J. Townsend², Adrian V. Mariano¹, Michael D. Stenner², Michael E. Gehm¹; ¹Univ. of Arizona, USA, ²MITRE Corp., USA. We present an imaging system for target tracking with compressive measurements for large area persistent surveillance. Multiplexed sensing with a mask-based optical system and signal retrieval from underdetermined measurements using l-1 minimization are explored.

FThN • General Quantum Electronics II—Continued

FThN4 • 11:15 a.m.
Electromagnetically Induced Vector-Potential for Slow Light, Ofer Firstenberg¹, Dimitry Yankelev¹, Paz London¹, Morike Shuker³, Amiramin Roi³, Nir Davidson³; ¹Technion-Israel Inst. of Technology, Israel, ²Weizmann Inst. of Science, Israel. Slow-light polaritons in a thermal vapor experience abnormal diffraction when detuned from a pump laser. Diffraction manipulation is demonstrated for a uniform pump, and a Schrödinger-like dynamics with induced vector-potential is demonstrated for structured pumps.

FThN5 • 11:30 a.m.
Fast Reconfigurable Slow Light System based on Off-resonant Raman Absorption Scheme, Praveen K. Vadsetty¹, Ruan M. Camacho¹, John Howell¹; ¹Univ. of Rochester, USA, ²Caltech, USA. We present an off-resonant slow light system with fast switching dynamics based on Raman absorption. This scheme combines the low dispersion broadening of double absorption system and all optical control of Raman absorption.

FThN6 • 11:45 a.m.
Simultaneous Two-Channel Control of Light Speed in a Single Delay Element, Anil K. Patnaik¹,², Paul S. Hsu¹,², Sukeshe Roy³, James R. Good³; ¹Wright Patterson AFB, USA, ²Wright State Univ., USA, ³Spectral Ener- gies, LLC, USA. Simultaneous two-channel control of light speed in a single delay element of a Rb cell is demonstrated using an homogeneous magnetic field in conjunction with a single elliptically polarized resonant laser containing two signals.

LTHD • Single Molecule Approaches to Biology III—Continued

LThE • Quantum Enhanced Information Processing III—Continued

LThF • Nanophotonics, Photonic Crystals and Structural Slow Light II—Continued

LThF4 • 11:15 a.m.
Phase Jumps in Electro-Magnetically Induced Transparency, Francesco A. Narducci¹, Jon P. Davis¹, Jon H. Noble¹, George R. Welch³; ¹Naval Air Systems Command, USA, ²AMPHAC, USA, ³Institute for Quantum Science and Engineering and Dept. of Physics, USA. We present an imaging system for target tracking with compressive measurements for large area persistent surveillance. Multiplexed sensing with a mask-based optical system and signal retrieval from underdetermined measurements using l-1 minimization are explored.

LThF5 • 11:30 a.m.
Differential Reflection Spectroscopy of Photonic Crystal Cavities Containing Coupled InAs Quantum Dots, Erik D. Kim¹, Arka Majumdar¹, Hyochul Kim², Pierre Petroff³, Jelena Vuckovic¹; ¹Stanford Univ., USA, ²Univ. of California, Santa Barbara, USA. We present an imaging system for target tracking with compressive measurements for large area persistent surveillance. Multiplexed sensing with a mask-based optical system and signal retrieval from underdetermined measurements using l-1 minimization are explored.

LThF6 • 11:45 a.m.
Simultaneous Two-Channel Control of Light Speed in a Single Delay Element, Anil K. Patnaik¹,², Paul S. Hsu¹,², Sukeshe Roy³, James R. Good³; ¹Wright Patterson AFB, USA, ²Wright State Univ., USA, ³Spectral Ener- gies, LLC, USA. Simultaneous two-channel control of light speed in a single delay element of a Rb cell is demonstrated using an homogeneous magnetic field in conjunction with a single elliptically polarized resonant laser containing two signals.

LThN5 • 11:30 a.m.
Invited
Superresolution Optical Fluctuations Imaging (SOFI), T. Dertinger¹, R. Colyer¹, R. Vogel¹, M. Heilemann², M. Sauer¹, J. Enderlein³, Shimon Weiss¹; ¹Univ. of California at Los Angeles, USA, ²Bielefeld Univ., Germany, ³Julius-Maximilians-Universität Würzburg, Germany. We present a novel, simple, and fast superresolution imaging method that is based on blinking of fluorescence emitters and high order statistical analysis.

LThN6 • 11:45 a.m.
Simultaneous Two-Channel Control of Light Speed in a Single Delay Element, Anil K. Patnaik¹,², Paul S. Hsu¹,², Sukeshe Roy³, James R. Good³; ¹Wright Patterson AFB, USA, ²Wright State Univ., USA, ³Spectral Ener- gies, LLC, USA. Simultaneous two-channel control of light speed in a single delay element of a Rb cell is demonstrated using an homogeneous magnetic field in conjunction with a single elliptically polarized resonant laser containing two signals.

12:00 p.m.–1:30 p.m. Lunch (on your own)
FThO • Nonlinear Optics in Micro/Nano-Optical Structures III
Presider to Be Announced

1:30 p.m.–3:30 p.m.

FTh03 • 2:00 p.m.


We present an omnidirectional imaging which the image is composed of front and lateral fields of view regions, adopting the OcamCalib toolbox to obtain the geometric parameters of the images and refine the optical design.

FTh01 • 1:30 p.m. • Invited

CMOS Compatible All-Optical Chips, David Mozer1, A. Pasquari2, M. Pescianni3, L. Razzari4, D. DucShane1, M. Ferrera5, S. Ch4, B. E. Little1, R. Marandottili; 1Univ. of Sydney, Australia, 2INRS-EMT, Canada, 3Infinea Corp., USA. We demonstrate a wide range of novel functions in integrated, CMOS compatible, devices. This platform has promise for telecommunications and on-chip WDM optical interconnects for computing.

FThP1 • 1:30 p.m.

Indentation Size Effects in Multilayer Hafnia-Silica Thin Films, Karun Mehrotra1, John C. Lambropoulos, Univ. of Rochester, USA. An experimental study of indentation size effect (ISE) on HfOx-SiO2 multilayer thin films is presented. Decrease in hardness with increasing loads is observed using cube corner tip. Data is discussed using the model of Nix-Gao.

FThP2 • 1:45 p.m.

Ultrasound Detection Using Dispersion Due to Spectral Holes, Jian Wei Tay, Patrick M. Ledingham, Irvan J Longdell, Univ. of Otago, New Zealand. Detection of ultrasound requires high efficiency phase to amplitude conversion. We demonstrate detection using dispersive effects in hole-burning materials which have large etendue compared to conventional methods. We show high sensitivity using modest hole parameters.

FThP3 • 2:00 p.m.

Resonance Enhancement of the Two-Photon Absorption in PbS Quantum Dots, Gero Nootz, Lazzaro A. Padilha1, Scott Webster1, David J. Hagan2, Eric W. Van Stryland1, Larissa Levina2, Vlad Sukhovatkin1, Edward H. Sargent1; 1College of Optics and Photonics - CREOL & FPCE - Univ. of Central Florida, USA, 2Univ. of Toronto, Canada. Photonics - CREOL & FPCE - Univ. of Central Florida, Eric W. Van Stryland1, Larissa Levina2, Vlad Sukhovatkin2, Edward H. Sargent1; 1College of Optics and Photonics - CREOL & FPCE - Univ. of Central Florida, USA. We demonstrate a wide range of novel functions in integrated, CMOS compatible, devices. This platform has promise for telecommunications and on-chip WDM optical interconnects for computing.

FThQ1 • 1:30 p.m.


We present simulation and design of an omnidirectional imaging which the image is composed of front and lateral fields of view regions, adopting the OcamCalib toolbox to obtain the geometric parameters of the images and refine the optical design.

FThQ2 • 1:45 p.m.

Ultra-low Energy Modulation Using High-Q SiO2-Clad Silicon Photonic Crystal Microcavities, Sean P. Anderson, Philippe M. Fauchet, Univ. of Rochester, USA. We show that k-space engineering can be used to achieve Q values above 100,000 in SiO2-clad silicon photonic crystal microcavities, enabling modulation energies of 1 fJ/bit or less.

FThQ3 • 2:00 p.m.

Analysis and Design of a Microring Inline Single Wavelength Reflector, Amir Arbabian1, Young Mo Kang, Synninth L. Goddard, Univ. of Illinois at Urbana-Champaign, USA. We present simulation and design of an inline single wavelength reflector based on engineered coupling between two degenerate microring resonator modes. The proposed structure may find applications as mirrors for tunable single mode lasers.

FThP • General Optical Instrumentation
Presider to Be Announced

1:30 p.m.–3:30 p.m.

FThP1 • 1:30 p.m.

Indentation Size Effects in Multilayer Hafnia-Silica Thin Films, Karun Mehrotra1, John C. Lambropoulos, Univ. of Rochester, USA. An experimental study of indentation size effect (ISE) on HfOx-SiO2 multilayer thin films is presented. Decrease in hardness with increasing loads is observed using cube corner tip. Data is discussed using the model of Nix-Gao.

FThP2 • 1:45 p.m.

Ultrasound Detection Using Dispersion Due to Spectral Holes, Jian Wei Tay, Patrick M. Ledingham, Irvan J Longdell, Univ. of Otago, New Zealand. Detection of ultrasound requires high efficiency phase to amplitude conversion. We demonstrate detection using dispersive effects in hole-burning materials which have large etendue compared to conventional methods. We show high sensitivity using modest hole parameters.

FThP3 • 2:00 p.m.

Resonance Enhancement of the Two-Photon Absorption in PbS Quantum Dots, Gero Nootz, Lazzaro A. Padilha1, Scott Webster1, David J. Hagan2, Eric W. Van Stryland1, Larissa Levina2, Vlad Sukhovatkin1, Edward H. Sargent1; 1College of Optics and Photonics - CREOL & FPCE - Univ. of Central Florida, USA, 2Univ. of Toronto, Canada. Photonics - CREOL & FPCE - Univ. of Central Florida, Eric W. Van Stryland1, Larissa Levina2, Vlad Sukhovatkin2, Edward H. Sargent1; 1College of Optics and Photonics - CREOL & FPCE - Univ. of Central Florida, USA, 2Univ. of Toronto, Canada. We demonstrate a wide range of novel functions in integrated, CMOS compatible, devices. This platform has promise for telecommunications and on-chip WDM optical interconnects for computing.

FThQ1 • 1:30 p.m.


We present simulation and design of an omnidirectional imaging which the image is composed of front and lateral fields of view regions, adopting the OcamCalib toolbox to obtain the geometric parameters of the images and refine the optical design.

FThQ2 • 1:45 p.m.

Ultra-low Energy Modulation Using High-Q SiO2-Clad Silicon Photonic Crystal Microcavities, Sean P. Anderson, Philippe M. Fauchet, Univ. of Rochester, USA. We show that k-space engineering can be used to achieve Q values above 100,000 in SiO2-clad silicon photonic crystal microcavities, enabling modulation energies of 1 fJ/bit or less.

FThQ3 • 2:00 p.m.

Analysis and Design of a Microring Inline Single Wavelength Reflector, Amir Arbabian1, Young Mo Kang, Synninth L. Goddard, Univ. of Illinois at Urbana-Champaign, USA. We present simulation and design of an inline single wavelength reflector based on engineered coupling between two degenerate microring resonator modes. The proposed structure may find applications as mirrors for tunable single mode lasers.

FThR • Plasmonics and Metamaterials for Information Processing II
Greg Gbur; Univ. of North Carolina at Charlotte, USA, Presider

1:30 p.m.–3:30 p.m.

FThR1 • 1:30 p.m. • Invited

Super-Resolution Imaging Based on Interfering Plasmon Waves, Peter T. So, MIT, USA. Abstract not available.

FThS • Strong THz Fields and Applications
Janos Hebling; Univ. of Pecs, Hungary, Presider
Robert A. Kaindl; Lawrence Berkeley Natl. Lab, USA, Presider

1:30 p.m.–3:00 p.m.

FThS1 • 1:30 p.m.

Tutorial
High-Peak-Power THz Field Generation and Applications, Keith Nelson. MIT, USA. Methods for generation of intense terahertz pulses and high terahertz fields will be reviewed. Nonlinear THz spectroscopy will be discussed and THz coherent control objectives will be outlined.
1:30 p.m.–2:00 p.m.  
**FThU** • Lens Design  
Rongguang Liang; Carestream Health, USA, USA, Presider

1:30 p.m.–3:30 p.m.  
**FThU** • Lens Design  
Rongguang Liang; Carestream Health, USA, Presider

1:00 p.m.–1:30 p.m.  
**FThV** • Whispers from the Past  
V. Vardeny, JILA, USA, Presider

1:30 p.m.–3:30 p.m.  
**FThV** • Whispers from the Past  
V. Vardeny, JILA, USA, Presider

1:00 p.m.–1:30 p.m.  
**FThW** • Why We Really Don't Care  
Dr. H. John Caulfield works in various capacities for two universities (Fisk and Alabama A&M) and in many capacities (Director, CTO, President, etc.) with about ten companies. John is editor of two journals, past editor of one, and now or in the past on the editorial boards of a dozen journals. He is widely honored (e.g. a record five major awards from SPIE), written about in newstand and airline magazine, published in many books, book chapters, dozens of patents, and over 250 refereed journal articles. His most widely read article is the 1984 National Geographic cover story in holography. Professor Caulfield received a BS in Physics from Rice in 1958 and a PhD in Physics from Iowa State University in 1962. He did research in big companies (Texas Instruments, Raytheon, and Sperry-Rand), small R&D companies (Block Engineering and Aerodyne Research) and universities (UAH and Alabama A&M) before his current "retirement.”

1:30 p.m.–2:00 p.m.  
**LThH2** • 2:00 p.m.  
Testing the Time-Invariance of Fundamental Constants Using Cold, and Not So Cold, Molecules, Hendrik L. Bethlehem; Vrije Univ., Netherlands. I will discuss the status of two experiments ultimately aimed at testing the time-invariance of the proton-to-electron mass using a thermal beam of CO molecules and using cold ammonia molecules in a fountain.
FThO • Nonlinear Optics in Micro-Nano-Optical Structures III—Continued

FThP • General Optical Instrumentation—Continued

FTHQ • Micro Resonators—Continued

FTHR • Plasmonics and Metamaterials for Information Processing II—Continued

FThS • Strong THz Fields and Applications—Continued

FThP3 • 2:15 p.m.
R&D and the optics manufacturing shop floor, Andrew A. Haefner, Robert R. Wiederhold, Michael P. Mandina, Jessica De Grooto Nelson; Optomax Systems Inc., USA. Historically, the research and development department and the optical manufacturing shop floor have been independent entities. Optomax has been able to integrate the two departments for faster deployment and practical utilization.

FThP4 • 2:15 p.m.
Pumped AlGaAs, Amir Nevet, Alex Hayat, Meir Amir Nevet

FThP5 • 2:30 p.m.
Optical Pulse Packet Generation by Using a Novel Fiber Stacker, Li Mingchong, Lin Honghuan, Wang Ji-Linghuan; Chinese Acad. of Engineering Physics, China. We report the first observation of two-photon gain in solids, specifically with theory. We demonstrate strong optical nonreciprocity in microring add-drop filters with asymmetric input and output coupling coefficients. Up to 16dB isolation was achieved with a silicon-on-insulator high-Q microring of 5 micrometer radius.

FThQ4 • 2:15 p.m.
A CMOS Compatible Microring-Based On-Chip Isolator with 18th Optical Isolation, Li Fan, Jian Wang, Hao Shen, Lei T. Varghese, Ben Niu, Jing Ouyang, Minghao Qi; Purdue Univ., USA. We demonstrate high-Q silicon ring resonators fabricated by selective oxidation without any silicon etching. We achieve an intrinsic quality factor of 480,000 in 50 μm radii rings with ring losses of 0.9 dB/cm.

FThQ5 • 2:30 p.m.
High-Q Ethylene Silicon Ring Resonators, Jian-Wei Lu, Gustavo S. Wiederhold; Jame Cardenas, Michael Lipson; Cornell Univ., USA. We demonstrate high-Q silicon ring resonators fabricated by selective oxidation without any silicon etching. We achieve an intrinsic quality factor of 480,000 in 50 μm radii rings with ring losses of 0.9 dB/cm.

FThQ6 • 2:45 p.m.
Athermal Performance In Titania-clad Microresonators On SOI, Payam Alipour, Vishal S. Jagtap, Na-anjun, Wang Mingzhe; Res. Ctr. of Laser Fusion, China Acad. of Engineering Physics, China. We propose the use of titania dioxide as clad-ding material to reduce the temperature sensitivity of silicon-based microresonators. The advantages of using titanium dioxide over the conventional alternatives are discussed, and experimental results are presented.

FThQ7 • 3:00 p.m.
Polymer Coated Silica Ultra-High-Q Microresonators, Hong Seok Choi, Chunlei Guo; Univ. of Rochester, USA. Using femtosecond laser irradiation, we create polymer-coated microcavities with Q-factors over 10^9. The use of both polymethylmethacrylate and polystyrene coatings are shown. A theoretical model based on FEM simulations was developed to explain the relationship between Q degradation and film thickness.

FThR3 • 2:15 p.m.
Room Temperature Plasmon Laser, Ren-Min Ma, Rupert F. Oulton, Volker I. Sorge, Guy Bartal, Xiang Zhang; UC Berkeley, USA. We report plasmon lasers with strong cavity feedback and optical confinement to 1/20th wavelength. Strong feedback arises from total internal reflection of plasmons, while confinement enhances the spontaneous emission rate by up to 18 times.

FThS2 • 2:15 p.m.
Femtosecond Cross-Correlation Spectroscopy of Resonantly Enhanced Surface Plasmons in Planar Plasmonic Crystals, Vladimir O. Besonov, Polina P. Vahldieck, Fedor Yu. Sychev, Maxim R. Shcherbakov, Tatiana V. Dolgova, Andrey A. Fedyanin; Lomonosov Moscow State Univ., Russian Federation. Significant reshaping of femtosecond pulse reflected from one-dimensional plasmonic crystal is observed using time-resolved cross-correlation technique. Surface plasmon-polaritons with Fano-type lineshape strongly disturb reflected pulse on picosecond timescale.

FThS3 • 2:30 p.m.
Femtosecond Laser-Induced Nanostucture-Covered Large Scale Wave Formation on Metals, Taek Yong Hwang, Chanlee Guo; Univ. of Rochester, USA. Using femtosecond laser irradiation, we create a unique large-scale wave surface structure densely covered by nanostuctures. The formation mechanism of this structure is also discussed in this work.

FThS4 • 2:45 p.m.
Energy-Momentum Tensor for the Electromagnetic Field in a Dielectric, Michael E. Crenshaw, Thomas B. Baldus; US Army RDECOM, USA. The total momentum of a thermodynamically closed system is unique. The Gordon total momentum of a propagating electromagnetic field and negligibly reflecting dielectric is used to construct a tracless, diagonally symmetric energy—momentum tensor.
Menon, Rajakumar Manthena 1, Mohit Diwekar 1, 2

FThT • Encoding Optical Information — Nano-photonics, Diffractive Optics and Refractive Optics for Shaping Optical Signals—Continued

FThU • Lens Design—Continued

FThU4 • 2:15 p.m.
Refractive Index Dispersion Curves Measured for Several Polymer Films, G. Beadle, A. Rosenberg, James S. Shirk, NRL, USA. We use interference fringes measured in transmission spectra combined with high-accuracy index measurements at point wavelengths to construct dense, high-accuracy refractive index curves across the visible for several polymer films.

FThU5 • 2:30 p.m.
Gradient Index Polymer Optics: Achromatic Single Lens Design, G. Beadle, F. Fleet, James S. Shirk, NRL, USA. We have developed an analytic approximation useful for designing achromatic single lenses. The designs are based on gradient index lenses fabricated from nanolayered polymer materials. Ray traced results confirm the achromatic performance of the designs.

FThU6 • 2:45 p.m.
Implementing Lens Design Software in a Distributed Computing Environment, Stan Szpiro, Catherine Greenhalgh, Raytheon ELCAN Optical Technologies, Canada. A state-of-the-art lens design software (CodeV®) is deployed and enabled in the distributed computing environment. Impact on statistical tolerancing, global optimization, and other lens design practices is discussed.

FThU7 • 3:00 p.m.
Approximate Diffraction Model for Optical Free Form Surfaces, Markus Testorf, Stefan Sinzinger 1, 2
Dartmouth College, USA, 2Technical Univ. Ilmenau, Germany. Optical free form surfaces implement elements with potentially large surface gradients and large modulation depths. An approximate diffraction model is developed as a tool for analyzing and designing optical surfaces.

LTHG • Metrology and Precision Measurements II—Continued

LTHG3 • 2:30 p.m.
High Resolution Fabry-Perot Displacement Interferometry: A Bridge Between the Meter and the Farad, Mathieu Durand, John Lawall, Yicheng Wang; NIST, USA. A high resolution Fabry-Perot interferometer system is designed to measure displacement. We achieve a fractional uncertainty of δL/L~1.25x10^-9 without any optical frequency standard, and resolve hysteresis in a piezoelectric actuator over 7 nm.

LTHG4 • 2:45 p.m.
An Improved Limit on the Permanent Electric Dipole Moment (EDM) of 209Hg, Tom Loftus; Univ. of Washington, USA. We describe the 209Hg EDM search recently completed by W. C. Griffith et al [Phys. Rev. Lett. 102, 101601 (2009)] which gives a new upper bound: |δ(209Hg)| < 3.1 x 10^-26 e cm (95% C.L.).

FThU1 • 109 • Friday, October 22
LTHG4 • 2:45 p.m.
An Improved Limit on the Permanent Electric Dipole Moment (EDM) of 209Hg, Tom Loftus; Univ. of Washington, USA. We describe the 209Hg EDM search recently completed by W. C. Griffith et al [Phys. Rev. Lett. 102, 101601 (2009)] which gives a new upper bound: |δ(209Hg)| < 3.1 x 10^-26 e cm (95% C.L.).
FThO • Nonlinear Optics in Micro/ Nano-Optical Structures III—Continued

FThP • General Optical Instrumentation—Continued

FThQ • Micro Resonators—Continued

FThR • Plasmonics and Metamaterials for Information Processing II—Continued

FThO5 • 3:15 p.m.
Two-Photon Absorption at Milliwatt Powers with Rb in Photonic Bandgap Fibers, Vivek Venkataraman, Kaustabi Saha, Pablo Londero, Alexander L. Gaeta; School of Applied and Engineering Physics, USA. We observe large enhancement of Doppler-free two-photon absorption on the 5S_{1/2} to 5D_{5/2} transition in Rb vapor confined to a photonic bandgap fiber. We estimate ~1% absorption with ~1 mW of power in the fiber.

FThP8 • 3:15 p.m.
Effect of Substrate Impurities on the Q Factor of Toroidal Microcavities, Xiaomin Zhang, Hong-Sook Chu, Andrea M. Armani; Univ. of Southern California, USA. We have experimentally demonstrated that the quality (Q) factor of the silica microtoroid depends on the silicon substrate dopant concentration. This dependence agrees well the theoretical prediction and calculation.

FThQ8 • 3:15 p.m.
Extraction of Light from Microdisk Lasers by Radial Direction Coupling Waveguide, Xiangyu Li, Fang Ou, Yingyan Huang; Seng-Tiong Ho; Dept. of Electrical Engineering and Computer Science, USA, OptoNet Inc., USA. Extraction of light from microdisk lasers using radial direction coupling waveguide is investigated numerically. FDTD simulation demonstrates higher coupling efficiency into a single-port output compared to the conventional tangential direction waveguide coupling scheme.

FThR7 • 3:15 p.m.
Birefringent and Dichroic Behaviour of Plasmonic Nano-Antennas, Erdem Ogut, Kursat Sendur; Sabanci Univ., Turkey. Birefringence and dichroism of plasmonic nano-antennas are investigated. We demonstrated that birefringent and dichroic behaviour of a cross-dipole nanoantenna is due to a length difference, and a relative plasmonic enhancement of the antenna particles, respectively.

3:30 p.m.–4:00 p.m. Coffee Break, Highland Ballroom Foyer, Rochester Riverside Convention Center
Thursday, October 28

FThT • Encoding Optical Information — Nano-photonics, Diffractive Optics and Refractive Optics for Shaping Optical Signals—Continued

FThU • Lens Design—Continued

LThG • Metrology and Precision Measurements II—Continued

FThV • Diffractive and Holographic Optics I—Continued

FThT5 • 3:15 p.m.
Optical Cavity Mode Standing in the Free Space from Non-Periodic Dielectric Gratings, Jingjing Li, David Fattal, Marco Fiorentino, Raymond G. Beausoleil; Hewlett Packard Labs, USA. We present the method of designing optical cavities of high quality factors and small mode volumes with most of the optical field standing in the free space, supported by non-periodic dielectric gratings.

FThT6 • 3:30 p.m.
Transparent Format Conversion of 10 Gb/s NRZ-OOK Data to RZ-OOK in a Si Photonic-Wire Waveguide Using XPM, Jeffrey B. Driscoll, W. Astar, Xiaoqing Lin, Jerry J. Dadap, William M. J. Green, Yuriy A. Vlasov, Gary M. Carter; Microelectronics Science Labs, Columbia Univ., USA. We present a format conversion of 10-Gb/s NRZ-OOK to RZ-OOK via XPM in a Si Photonic-Wire with a 2.5-dB 10⁻⁹ BER receiver-sensitivity enhancement for the converted signal. Scalability of the technique beyond 160 Gb/s is shown theoretically.

FThT7 • 3:45 p.m.
Experimental Validation of Exact Optical Transfer Function of Cubic Phase Mask Wavefront Coding Imaging Systems, Manjunath Somayaji, Vikrant R. Bhakta, Marc P. Christensen; Southern Methodist Univ., USA. The spatial frequency response of cubic phase mask wavefront coding imagers under extreme defocus conditions is experimentally measured. The results are compared against analytically derived expressions for optical transfer functions of these computational imaging systems.

FThU8 • 3:15 p.m.
Design and Fabrication of the Progressive Addition Lens, Wei-Yao Hsu, Yen-Liang Liu, Yuan-Chieh Cheng, Guo-Dung Su; Institute Technology Res. Ctr., Natl. Applied Res. Labs, Taiwan. This paper focuses on the design and fabrication technologies of the PAL. The PAL surface is described by B-spline parameters. After the optimization of B-spline parameters, the surface is fabricated using CZX diamond turning technology.

LThG5 • 3:15 p.m.
Continuous Supersonic Beams for an Electron Electric Dipole Moment Search, Jeongwon Lee, Jinhai Chen, Aaron Leanhardt; Univ. of Michigan, USA. A continuous tungsten carbide (WC) molecular beam is being developed to probe for the existence of a possible permanent electric dipole moment (EDM) of the electron. The flux and divergence of the beam are characterized.

LThG6 • 3:30 p.m.
Towards Metrological Grade Mid-IR Quantum Cascade Laser Sources, Pablo Cancio Pastor, Saverio Bartalini, Paolo De Natale; Inst. Nazionale di Ottica-CNR, Italy. For the first time, the intrinsic QCL linewidth is measured and compared with the theory. The narrow linewidth, well beyond the ‘classical’ Schawlow-Townes limit, opens new scenarios for the molecular-based clocks and mid-IR metrology.

3:30 p.m.–4:00 p.m. Coffee Break, Highland Ballroom Foyer, Rochester Riverside Convention Center
High Frequency Operation,
3-D Integration of RF and Photonic Devices for thermal rectifiers. Examples include a pho-
nonic band theory for plasmonic meta-materials, a sub-wavelength super-scatterer, and a photon-based tonic band theory. We review our recent works in the theory of nano-
photonic structures. Examples include a pho-
tonic band theory, Photonic Band Theory,
properties of the bulk semiconductor material.
conformable crystalline semiconductor layers with enabling the placement of flexible, deformable,
and conformable crystalline semiconductor layers with properties of the bulk semiconductor material.

FThW1 • 4:00 p.m. Invited
Understanding Three-Dimensional Meta-Mate-
rials, from Refractive Index Concept to Rigorous Understanding Three-Dimensional Meta-
materials

FThX • 4:00 p.m.
A Radial Basis Function Method for Freeform Optics Surfaces, Ilham Kayal; Janick P. Rolland
Uni. of Central Florida, USA, Dept. of Optics, Univ. of Rochester, USA. Explicit formulation of a radial basis function method, RBF-QR, to describe optical freeform surfaces is given. Method extends use of RBFs for freeform surfaces to minimize number of basis required for a level of accuracy.

FThX1 • 4:00 p.m. Invited
Simple Demonstration of Visible Evanescent Wave Enhancement with Far-Field Detection, Emily A. Ray, Meredith J. Hampton, Rose Lopez; Univ. of North Carolina at Chapel Hill, USA, Univ. of North Carolina at Chapel Hill, Dept. of Chemistry, USA. We demonstrate the fabrication of a simple metamaterial-diffraction grating device that both amplifies and converts evanescent waves into propagating ones while operating in the visible and being probed in a simple total internal reflection configuration.

FThX2 • 4:15 p.m.
Design and Fabrication of Free-Form Shaped Lens for Laser Leveler Instrument, Yuan-Chieh Cheng; Wei-Yao Hsu, Yi-Hsien Chen, Guo-Dung Su, Pei Jen Wang; Instrument Technology Res. Ctr., Natl. Applied Res. Labs, Taiwan, Dept. of Power Mechanical Engineering, Natl. Taiwan Univ., Taiwan, Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan. This paper focuses on the design and fabrication of the free-form shaped lens for green laser leveler instru-
ment. We design a novel free-form shaped lens with two aspheric-cylindrical surfaces to solve the energy concentrate problem.

FThX3 • 4:30 p.m. Invited
3-D Integration of RF and Photonic Devices for High Frequency Operation, Dennis Prather; Univ. of Delaware, USA. Nanomembranes are crystalline semiconductor materials that have been released from their substrates and redeposited on foreign substrates, enabling the placement of flexible, deformable, and conformable crystalline semiconductor layers with properties of the bulk semiconductor material.

FThY • 4:00 p.m.
Specifying More than Peak to Valley, Michael G. Martucci; Optoelectronics Systems Inc., USA. This paper is an introduction to specifications and tolerances intended to more thoroughly define figure and form of precision optical elements. Specifications that will be outlined here include Mid-Spatial Frequency Wavefront Error, Slope, and PVr.

FThY1 • 4:00 p.m. Invited
Geometric Resonances Imposed by Destructive Interferences in Heterogeneous Ag/Au Nanoparticle Arrays, Ying Gu, Jia Li, Qihuang Gong; Peking Univ., China. In a newly proposed binary array composed of silver and gold spherical nanoparticles alternatively, the spectrum is characterized by additional geometric resonances near diffraction orders originating from the periodicity twice of the interparticle spacing.

FThY2 • 4:30 p.m. Invited
Ultrafast THz Studies of Electronic Dynamics and Correlations in Carbon Nanomaterials, Robert A. Kaindl; Lawrence Berkeley Natl. Lab, USA. This talk will review applications of tunable THz and mid-infrared pulses for studies of carbon nanomaterials, yielding insight into the dynamics of quasi-2-D Dirac fermions in graphene and quasi-1-D intracell resonances in single-walled carbon nanotubes.

FThZ1 • 4:00 p.m. Invited
High Energy THz Pulse Generation by Tilted Pulse Front Excitation and Its Applications, Janos Hebling; Iztet A. Fulop, László Fálfalvi, Gabor Almási; Dept. of Experimental Physics, Univ. of Pécs, Hungary. Nowadays, highest energy (up to 30 [[Unsupported Character - Symbol Font μ]]) single-cycle THz pulses from table-top systems can be generated by velocity-matching using tilted-pulse-front-excitation (TPFE). THz pulse generation using TPFE, and present and possible future applications will be reviewed.

FThZ2 • 4:30 p.m. Invited
High Efficiency Near-infrared Electroluminescence Devices Based On PbS Nanocrystals, Fan Xu, Xin Ma, Sylvain G. Cloutier; Univ. of Delaware, USA. We report on the structural and optoelectronic properties of low-cost near infrared light-emitting diodes using dip-coated lead-sulfide nanocrystal films as the active layer. We achieved efficient room-temperature electroluminescence using this facile fabrication scheme.
FThBB1 • 4:00 p.m.  
Invited  
Theoretical and Practical Implementation of Novel Nanostructured Diffractive and Micro-Optics, Mohammad R. Taghizadeh, Andrew J. Waddie, Heriot-Watt Univ., UK. We present a nanostructured micro-optical design technology, compatible with the stack-and-draw photonic crystal fibre fabrication technique, which allows the fabrication of high NA micro lenses and sub-wavelength diffraction gratings.

FThBB2 • 4:30 p.m.  
Invited  
Plasmonic Diffractive Optics - Its Analogy to Classical Diffractive Optics and Use for Subwavelength Metallic Devices, Byoungso Lee, Junghyun Park, Seung-Yool Lee, Hwi Kim, Seong-Woo Cho, Seyoon Kim; Seoul Natl. Univ., Korea, Republic of. We show various analogies of plasmonic diffractive optics to classical diffractive optics and distinguished characteristics of plasmonic diffractive optics. Novel subwavelength metallic devices based on those properties are also presented.
FThW • Three-dimensional Metamaterials—Continued

FThY • Plasmonics and Metamaterials for Information Processing III—Continued

FThY3 • 4:45 p.m.
Optimization of a Surface Plasmon Enhanced Metal-Semiconductor-Metal Photodetector on Gallium Arsenide, Richard R. Grote 1, Richard M. Osgood, Jr. 1, Jonathan E. Spanier 2, Bahram Nabet 2; 1Microelectronics Sciences Lab, Columbia Univ., USA, 2Drexel Univ., USA. The effects of grating geometry on a Surface Plasmon enhanced planar Metal-Semiconductor-Metal photodetector on GaAs are investigated via Finite-difference Time-domain simulations. Substrate absorption is increased by a factor greater than 10 without compromising time response.

FThY4 • 5:00 p.m.
Array of Carbon Nanotubes Integrated with Plasmonic Particles Offering Enhanced Characteristic, Babak Memarzadeh, Zhongwei Hua, Hassein Mostafaei; Northeastern Univ., USA. The performance of array of carbon nanotubes antenna integrated with plasmonic materials is investigated. It is shown that using plasmonic particles inside CNT dipoles gaps one can enhance the current distribution of the composite system.

FThY5 • 5:15 p.m.
Plasmonically Enhanced Optical Transmission through a Metalized Nano-Structured Photonic Crystal Fiber Taper, Hasam Arab, Marzieh Pournoury, Minooa Park, Ji Hoon Park, Seongil Im, Kyungwon Oh; Yonsei Univ., Korea, Republic of. Transmission of light through arrays of sub-wave-length holes in the thin silver film was numerically investigated for various arrangements. We also experimentally investigated metalized nano-structured photonic crystal fiber taper to observe an enhanced transmission.

FThX • Fabrication & Testing—Continued

FThX5 • 5:00 p.m.
Fabrication of Singulated Micro-Retro-Reflecting Elements, Menelaos K. Poutou 1, Michael J. Martin 1, Stephen Leibholz 2, Eric G. Johnson 3; 1Cts. for Optoelectronics and Optical Communications, Univ. of North Carolina at Charlotte, USA, 2VizorNet, Inc., USA. The fabrication and testing of singulated micro-retro-reflecting optical elements using conventional photolithography is presented. The elements consist of dielectric skeletons coated with a metallic thin film, and are optimized for retro-reflectivity in the near infrared.

FThX4 • 4:45 p.m.
Asphere Manufacturing Considerations for the Designer, Mark Schickler 1, Robert Wiederhold, Michael Mandma; OptiMax Systems Inc., USA. This paper will present designers with topics to consider during aspheric lens design. There are geometrical restrictions that hinder producing particular aspheric shapes. Understanding these restrictions will help drive cost out of the design.

FThX6 • 5:15 p.m.
Simple Manufacturability Estimates for Optical Aspheres, Greg W. Forbes 1, P. E. Murphy; QED Technologies Inc., USA. The difficulty of fabricating an asphere is typically related to the difference between the local principal curvatures over its surface. Manufacturability estimates are derived by tailoring methods for estimating the rms of this difference.

FThZ • THz Fields and Nonlinear Optics—Continued

FThZ3 • 5:00 p.m.
Photo-Thermal Mirror Method for Determination of Thermal Diffusivity of Nontransparent Samples, Aristides Marcano 1, Franz Delima, Gabriel Gwanmesia, Noureddine Melikechi; Delaware State Univ., USA. We determine the thermal diffusivity of nontransparent samples by measuring the reflectivity changes of a collimated probe light beam generated by the absorption of a focused pump beam. Good agreement with previous measurements is reported.

FThZ4 • 5:15 p.m.
Nonlinear Absorption in the Blue: Photophysics of a New Ruthenium-Based Phthalocyanine, San-Hui Chi 1, Sang Ho Lee 1, Mason A. Wolok 1, Raghunath Dasari 2, Seth R. Marder 2, Guy Beadie 1; 1Univ. College Cork, Ireland, 2Tyndall Natl. Inst., Ireland. We present a method for tuning whispering gallery modes in microspheres to the cooling transition of 87Rb in vacuum. The ability of this device as a sensitive atom-optic sensing tool is presented for bio-sensing applications.

FThAA • Optics in Micro/nano Devices—Continued

FThAA4 • 4:45 p.m.
Thermo-Optic Tuning of Whispering Gallery Modes in Microspheres to the 87Rb Cooling Transition in a Vapor Cell, Amy Watkins 1, Jonathan Ward 2, Sile Nic Charmain 3; 1Univ. College Cork, Ireland, 2Tyndall Natl. Inst., Ireland. We demonstrate a method for tuning whispering gallery modes in microspheres to the cooling transition of 87Rb in vacuum. The ability of this device as a sensitive atom-optic sensing tool is presented for bio-sensing applications.

FThAA5 • 5:00 p.m.
Thermo-Optic Tuning of Whispering Gallery Modes in Microspheres to the 87Rb Cooling Transition in a Vapor Cell, Amy Watkins 1, Jonathan Ward 2, Sile Nic Charmain 3; 1Univ. College Cork, Ireland, 2Tyndall Natl. Inst., Ireland. We demonstrate a method for tuning whispering gallery modes in microspheres to the cooling transition of 87Rb in vacuum. The ability of this device as a sensitive atom-optic sensing tool is presented for bio-sensing applications.

FThAA6 • 5:15 p.m.
Observation of a Frequency-Shift in Rh Absorption Spectrum using an Optical Nanofiber in a Vapor Cell, Amy Watkins 1, Karen Deasy 2, Jonathan Ward 2, Sile Nic Charmain 3; 1Univ. College Cork, Ireland, 2Tyndall Natl. Inst., Ireland. We present results obtained using a tapered optical fiber to observe the atom-surface interactions of a hot rubidium vapor. A frequency shift in the absorption spectrum as a function of rubidium vapor density is investigated.

Thursday, October 28
FThBB • Diffractive and Holographic Optics II—Continued

FThBB3 • 5:00 p.m.
Generation of Modulated Vortices with a Femtosecond Laser and a Programmable Pulse Shaper, Antonio Talamantes, Matt E. Anderson; San Diego State Univ., USA. Femtosecond optical vortices are created with a reflective programmable pulse shaper. Patterns include the spiral phase mask, blazed fork grating, and modulated spiral phase. The authors will discuss these results and present their latest work.

FThBB4 • 5:15 p.m.
Bayesian Reconstruction in Optical Scanning Holography, Xianglin Li, Jun Ke, Xin Zhang, Edmund Y. Lam; Univ. of Hong Kong, Hong Kong. Optical Scanning Holography (OSH) is a technique that scans 2-D objects onto a 2-D hologram. Here, we analyze the OSH object reconstruction process from a Bayesian perspective and provide an appropriate solution.
FThW • Three-dimensional Metamaterials—Continued

FThW5 • 5:30 p.m.
The Homogeneous 3-D Microfabrication by the Hologram, Masahiro Yamaji, Hayato Kawashima, Jun’ichi Suzuki, Shuhei Tanaka; New Glass Forum, Japan. For the 3-D microfabrication using the femtosecond laser pulse and the hologram, all fabricated elements must be homogeneous especially in terms of shape, which is realized by controlling the light intensity distribution of each element.

FThX • Fabrication & Testing—Continued

FThX7 • 5:30 p.m.
Specifying and Modeling as-Built Centration Errors for Singlets and Cemented Doublets, Brandon Light; Optimax Systems, USA. This presentation will look at sources of lens centration manufacturing errors in singlets and cemented doublets, how manufacturing errors can be modeled in lens design software and how to specify centration tolerances on lens drawings.

FThZ • THz Fields and Nonlinear Optics—Continued

FThZ5 • 5:30 p.m.
Self Phase Modulation of Chirped Ultrashort Pulses in Gas Filled Hollow Core Photonic Bandgap Fibers, Amir Gilad, Amiel Ishaaya, Ilana Bar; Ben-Gurion Univ. of the Negev, Israel. Self-phase-modulation (SPM) of femtosecond pulses in gas-filled photonic bandgap fibers was studied. SPM was observed at significantly lower powers compared to free-space focused beams, and its dependence on initial chirp and gas pressure was measured.

FThAA • Optics in Micro/nano Devices—Continued

FThAA7 • 5:30 p.m.
Optical Admittance Model of Semiconductor Quantum Wells for Optoelectronic Devices, Thomas Szkopak; McGill Univ., Canada. The optical admittance of interband and intersubband transitions in semiconductor quantum wells is set by the fine structure constant. Compact models for free-space and guided wave properties of quantum wells using optical admittance are presented.

FThW6 • 5:45 p.m.
Single Step Fabrication of Scalable Complex Photonic Chiral Structures, Jolly Xavier, Joby Joseph; Indian Inst. of Technology Delhi, India. We present a versatile single step fabrication approach for scalable complex photonic chiral structures with engineered phase shifts. By optical phase engineering, we experimentally investigate for the first time the complex quasicrystallographic photonic chiral structures.

FThX8 • 5:45 p.m.
The Effect of Phase Distortion on Interferometric Measurements of Thin Film Coated Optical Surfaces, Jonathan Z. Watson, Daniel Savage; Optimax Systems, Inc., USA. The effect of phase distortion on reflection due to thin-film interference coatings of interferometric measurements is examined. This paper discusses difficulty in accurately interpreting surface form data from a PSI measurement of a coated surface.

FThAA8 • 5:45 p.m.
Study of Radiation Coupling to Cavity Modes Using Dipole Feeds and Patch Antenna, Vishal S. Jagtap1, Christophe Masse1; ‘Lab of Photonics and Nanostructures, CNRS-LPN, France, ‘Inst. TELECOM, TELECOM ParisTech, France. When the dipole is placed inside a sub-wavelength cavity, its radiation properties are modified significantly. Here, we studied the fundamental physics of this problem using a novel technique of electromagnetic patch antenna model.
FThBB5 • 5:30 p.m.
Photorefractive Two-Wave Mixing for Image Amplification in Digital Holography, Nektarios Koukourakis1, Nils C. Gerhardt1, Martin R. Hofmann1, Yiu Wai Lai1; 1Photonics and Terahertz Technology, Ruhr-Univ. Bochum, Germany, 2Res. Dept., Integrity of Small-Scale Systems/High-Temperature Materials, Ruhr-Univ. Bochum, Germany. We use photorefractive two-wave mixing gain for coherent amplification in digital holography. This enables the reconstruction of amplitude and phase images that are not detectable otherwise, leading to an enhanced dynamic range.

FThBB6 • 5:45 p.m.
Phase Compression Technique to Suppress the Zero-Order Diffraction from a Pixelated Spatial Light Modulator (SLM), Jinyang Liang1, Zhangjie Cao1,2, Michael F. Becker1; 1Univ. of Texas at Austin, USA, 2Southwest Jiaotong Univ., China. A phase compression technique is demonstrated that creates a peak to destructively interfere with the undesired zero-order diffracted beam in a hologram produced by a pixelated, phase-only SLM. Image precision and diffraction efficiency are simulated.
Key to Authors and Presiders

(Bold denotes Presider or Presenting Author)