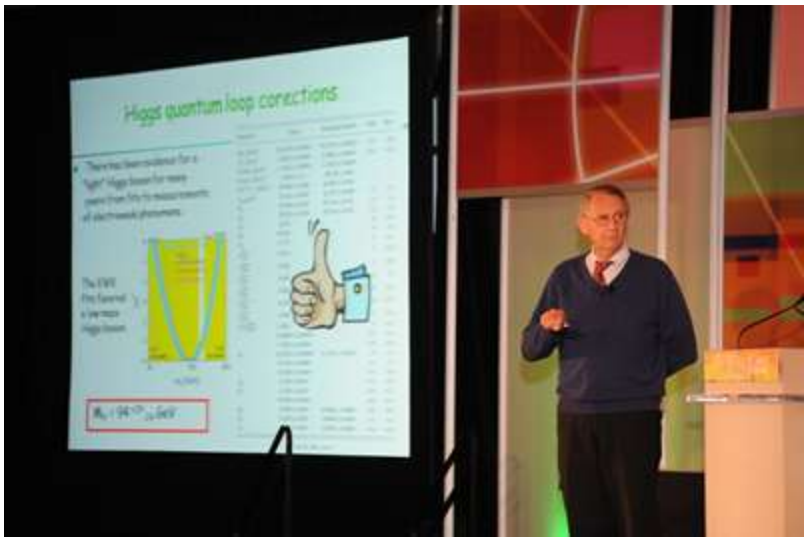
Frontiers in Optics (FiO) 2012/ Laser Science (LS) XXVIII

14-18 October 2012

OSA's Annual Meeting, Frontiers in Optics 2012, wrapped up today Rochester, N.Y., featuring nearly 900 presentations over five days -- 96 years after the Optical Society was founded in this very city. Collocated with the American Physical Society Division of Laser Science's annual meeting, Laser Science XXVIII, FiO brought together more than 1,700 attendees–a significant increase over last year– covering the latest advances in all areas of optics and photonics – from adaptive optics and optical sensing to silicon photonics and quantum information science.

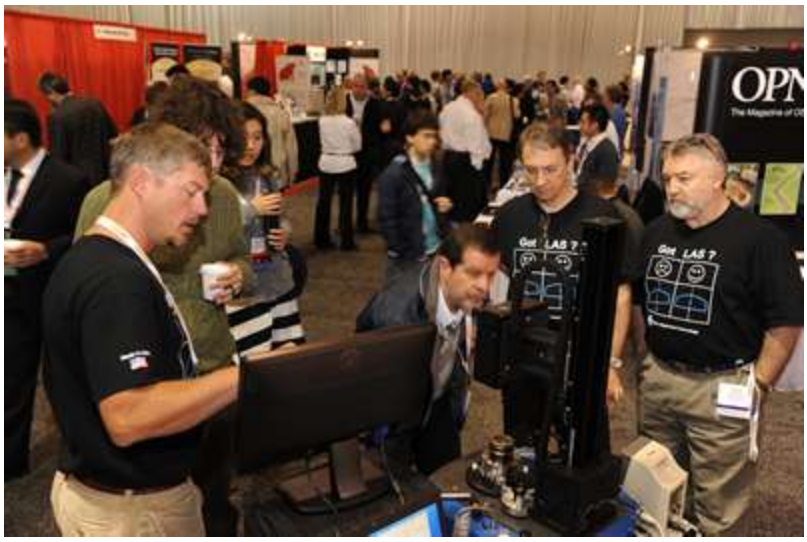
The first day of the conference featured a variety of short courses on timely optics topics, as well as a tribute to Emil Wolf—a well-known optics luminary whose work at the University of Rochester and elsewhere has had a considerable impact on the optics community today.

The second day kicked off with a Plenary Session and Awards Ceremony, showcasing presentations from five world-renowned researchers in optics and beyond. OSA's Frederic Ives Medal Winner Marlan Scully discussed quantum photocells, followed by APS's Schawlow Award Winner Michael Fayer of Stanford, who covered ultrafast 2D IR vibrational echo spectroscopy.



Attendees were then treated to a special guest keynote presentation by Al Goshaw, a Duke University researcher who worked directly on the likely discovery of the Higgs boson particle that rocked the physics world this summer.

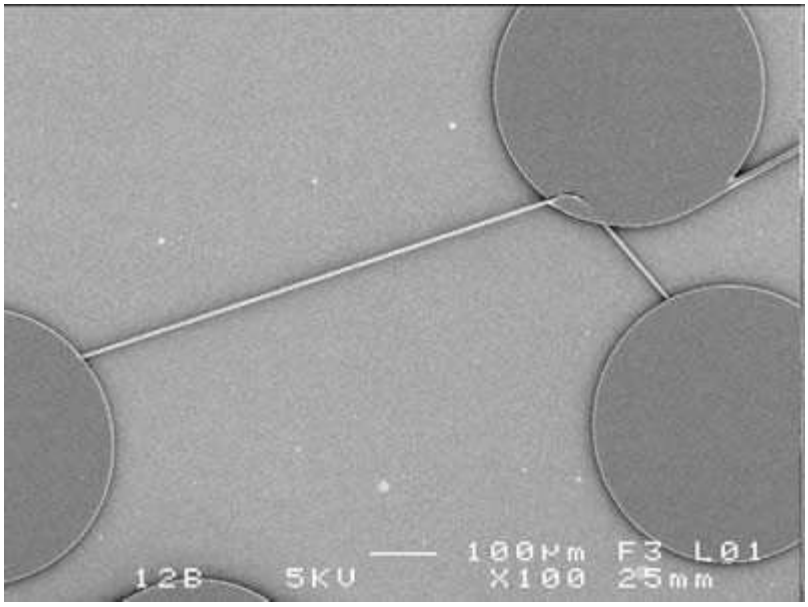
Rounding out the session were David Williams of the University of Rochester and Paul Corkum of Canada's NRC and University of Ottawa, who discussed retinal imaging and attosecond photonics, respectively.

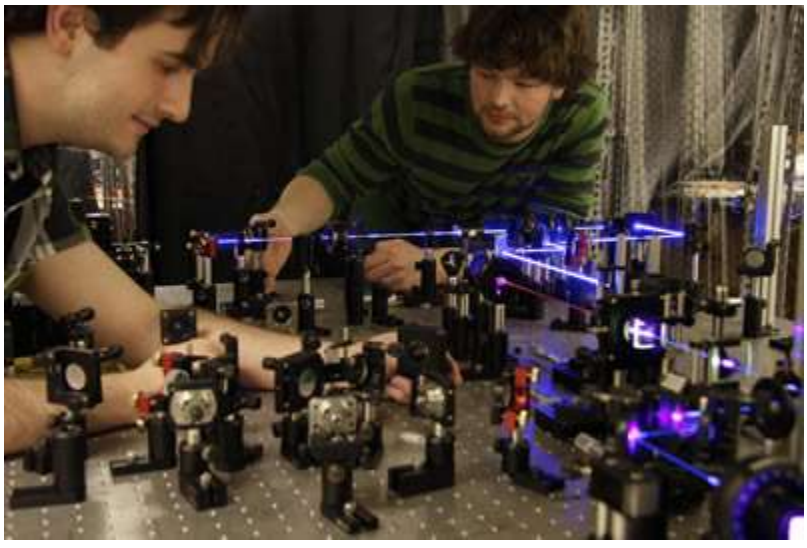


On Tuesday and Wednesday, the show floor was abuzz with the latest products and features from 80 leading optics and photonics companies.

The exhibits were supplemented by enlightening programming, including a Town Hall discussion with key members of the National Academy of Sciences' Harnessing Light Committee, as well as an intimate conversation with IDEX Optics & Photonics President Michael Cumbo as part of OSA's Executive Speaker Series.

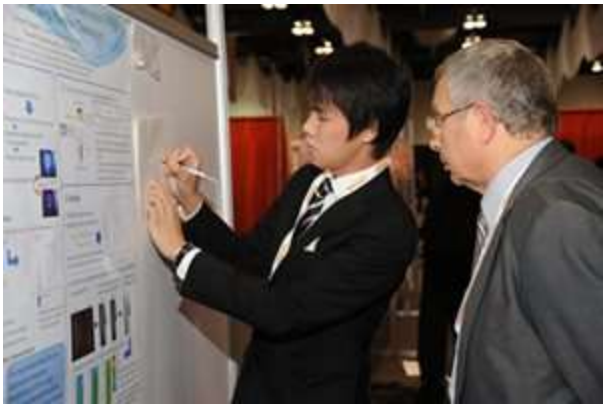
Networking opportunities were plentiful with several receptions—including OSA's disco-themed member reception—as well as more formal opportunities at the Minorities and Women of OSA breakfast featuring *Digital Rochester*'s 2012 Tech Woman of the Year Jennifer Kruschwitz, OSA's Network of Entrepreneurs session, the OSA Foundation breakfast, and a luncheon for OSA Fellows.





Highlighted technical session papers included a new technique for halting the progression of myopia in children, the use of pure spider silk in optical applications like biosensors, detection of explosives using a laser pointer and Raman spectroscopy, a new 3-D handheld scanner for point-of-care diagnostics, and the first report of a direct violation of Heisenberg's famous uncertainty principle. These papers and more generated buzz in the media – from *Wired* and *Popular Science* to the local Rochester newspaper *Democrat & Chronicle*.

Back by popular demand, registered technical attendees have free access to recorded sessions from more than 40 percent of the technical conference. In addition, all conference papers are now accessible through OSA's Optics InfoBase.



Join us next year in Orlando, Florida for Frontiers in Optics 2013, Oct. 6-10.

Conference Program

- Abstracts
- Agenda of Sessions
- Key to Authors
- Program Front Matter
- Subject Index
- **LS** Symposium on Undergraduate Research Abstracts

- **FiO Postdeadline Papers**

Committees

Frontiers in Optics 2012 Chairs

- **Colin Mckinstrie, *Alcatel-Lucent Bell Labs, USA*, General Chair**
- **Donna Strickland, *University of Waterloo, Canada*, General Chair**
- **Alfred U'Ren, *Universidad Nacional Autonoma de Mexico, Mexico*, Program Chair**
- **Adam Wax, *Duke Univ., USA*, Program Chair**

Laser Science XXVIII Chairs

- **Philippe M. Fauchet, *Vanderbilt University, USA*, General Chair**
- **David M. Villeneuve, *National Research Council Canada, Canada*, General Chair**

2012 Frontiers in Optics Subcommittees

FiO 1: Optical Design and Instrumentation

- **Qiwen Zhan, *Univ. of Dayton, USA*, Subcommittee Chair**
- **Peter Blake, *NASA, USA***
- **Thomas Brown, *Univ. of Rochester, USA***
- **Bruce Dean, *NASA, USA***
- **Andrew Forbes, *Nat'l Laser Center, South Africa***
- **John Koshel, *Univ. of Arizona, USA***
- **Alan Kost, *Univ. of Arizona, USA***
- **Byoungho Lee, *Seoul National Univ., South Korea***
- **Guoqiang Li, *Univ. of Missouri - St. Louis, USA***
- **Ronguang Liang, *Univ. of Arizona, USA***
- **Zhaolin Lu, *Rochester Institute of Technology, USA***
- **Krzysztof Patorski, *Warsaw Univ. of Technology, Poland***

FiO 2: Optical Sciences

- **Igor Jovanovic, *Penn State Univ., USA,* Subcommittee Chair**

- **Selçuk Aktürk, *Istanbul Technical Univ., Turkey***
- **Ian Coddington, *NIST, USA***
- **Carlos Lopez Mariscal, *Naval Research Lab., USA***
- **Rodrigo Lopez-Martens, *École Nationale Supérieure de Techniques Avancées, Fra*nce**
- **Carl Schroeder, *Lawrence Berkeley National Laboratory, USA***
- **Laszlo Veisz, *Max Planck Institute for Quantum Optics, USA***
- **Koichi Yamakawa, *Japan Atomic Energy Agency, Japan***

FiO 3: Optics in Biology and Medicine

- **Bernard Choi, *Univ. of California Irvine, USA,* Subcommittee Chair**
- **Elliot Botvinick, *Univ. of California Irvine, USA***
- **Alvaro Casas-Bedoya, *Univ. of Sydney, Australia***
- **Andrew Dunn, *Univ. of Texas at Austin, USA***
- **Dan Hammer, *Physical Sciences, Inc., USA***
- **Nozomi Nishimura, *Cornell Univ., USA***
- **Aydogan Ozcan, *Univ. of California Los Angeles, USA***
- **Alvin Yeh, *Texas A&M Univ., USA***

FiO 4: Optics in Information Science

- **Scott Carney, Univ. of Illinous at Urbana Champaign, USA, Subcommittee Chair**
- **Mark Anastasio, *Wash Univ. in St Louis, USA***
- **Randy Bartels, *Colorado State Univ., USA***
- **Johannes Courtial, *Univ. of Glasgow, Scotland***
- **Greg Gbur, *Univ. of North Carlonia at Charlotte, USA***
- **David Fischer, *NASA Glenn Research Center, USA***
- **Michael Gehm, *Univ. of Arizona, USA***
- **Olga Korotkova, *Univ. of Miami, USA***
- **Daniel Marks, *Duke Univ., USA***
- **Dan Marom, *Hebrew Univ. of Jeruslaem, Israel***
- **Amy Oldenburg , *Univ. of North Carolina at Chapel Hill, USA***
- **Sapna Shroff, *Ricoh Innovations, USA***
- **Markus Testorf, *Dartmouth College, USA***

FiO 5: Fiber Optics and Optical Communications

- **Nikola Alic, *Univ. of California at San Diego, USA*, Subcommittee Chair**
- **Mikhail Brodsky, *ATT Research, USA***
- **Goery Genty, *Univ. of Tempere, Finland***
- **Yannik Lize, *Applied Micro Corp., USA***
- **John Marciante, *Univ. of Rochester, USA***
- **Thomas Murphy, *Univ. of Maryland, USA***
- **Siddarth Ramachandran, *Boston Univ., USA***
- **Chongjin Xie, *Alcatel-Lucent Labs, USA***
- **Lianshan Yan, *Jiamtong Southwest Univ., China***

FiO 6: Integrated Optics

- **Mihaela Dinu, *Alcatel-Lucent Bell Labs, USA*, Subcommittee Chair**
- **Ivan Biaggio, *Lehigh Univ., USA***
- **Long Chen, *Bell Labs, Alcatel-Lucent, USA***
- **Luca Dal Negro, *Boston Univ., USA***
- **Nicholas X. Fang, *MIT, USA***
- **Nicolae Panoiu, *Univ. College London, UK***
- **Joyce Poon, *Univ. of Toronto, Canada***
- **Mahmoud Rasras, *Bell Labs, Alcatel-Lucent, USA***
- **Ron Reano, *Ohio State Univ., USA***
- **Shuang Zhang, *Univ. of Birmingham, USA***

FiO 7: Quantum Electronics

- **Shayan Mookherjea, *University of California - San Diego, USA*, Subcommittee Chair**
- **Tal Carmon, *Univ. of Michigan, USA***
- **Lev Deych, *CUNY Queens College,USA***
- **Josh Rothernberg, *Northrop Grumman Corp., USA***
- **Christine Silberhorn, *Univ. Paderborn, Germany***
- **Kartik Srinivasan, *NIST, USA***
- **Hong Tang, *Yale Univ., USA***
- **Paul Voss., *Georgia Inst. Of Technology - Lorraine, France***
- **Stephen Walborn, *Univ. Federal de Rio de Janeiro, Brazil***
- **Shuang Zhang, *Univ. of Birminigham, UK***

FiO 8: Vision and Color

- **Jennifer Hunter*, Univ. of Rochester, USA*, Subcommittee Chair**
- **David Andrew Atchison*, Queensland Univ. of Technology, Australia***
- **Melanie Campbell*, Univ. of Waterloo, Canada***
- **Alfredo Dubra, *Medical College of Wisconsin, USA***
- **Rafael Navarro*, Consejo Superior Investigaciones Cientificas, Spain***
- **Jason Porter*, Univ. of Houston, USA***
- **Brian Vohnsen, *Univ. College Dublin, Ireland***
- **Alex Wade, *Univ. of York, UK***

2012 Laser Science Topic Organizers

LS 1: Fundamentals and Applications of Photonic Crystals

- Robert W. Boyd, *Univ. of Ottawa, Canada and Univ. of Rochester, USA*

LS 2: Optical and Laser-Based Approaches in Chemical and Biological Sensing

- Sharon M. Weiss, *Vanderbilt Univ., USA*
- Jeremy W. Mares, *Vanderbilt. Univ., USA*

LS 3: Solid-state Quantum Optics

- Nick Vamivakas, *Univ. of Rochester, USA*

LS 4: Cold Atoms and Molecules

- Nick Bigelow, *Univ. of Rochester, USA*

LS 5: Optics and Alternative Energy Sources

- Shanhui Fan, *Stanford Univ., USA*

LS 6: Attosecond and Strong Field Physics

- Eleftherios Goulielmakis, *Max Planck Inst. of Quantum Optics, Germany*

LS 7: Ultrafast Chemical Dynamics

- Hans Jakob Worner, *ETH Zurich, Switzerland*

LS 8: Physics with Ultrafast X-rays

- Nora Berrah, *Western Michigan Univ., USA*

LS 9: Precision Measurements and metrology Using Lasers

- Alan Madej, *National Research Council, Canada*

LS 10: Quantum Optics and Quantum Information

- Ben Sussman, *National Research Council, Canada*

LS 11: Nano-opto-mechanics

- Qiang Lin, *Univ. of Rochester, USA*

Location Information

Rochester, NY, USA, the world leader in optics and imaging, is home to more than 50 leading optics and imaging based businesses. The region's imaging history is renowned; Rochester, NY is where OSA was founded. As the Northwestern gateway to New York's Finger lakes, Rochester is also part of a splendid region ranked by Money Magazine as one of the 10 "best places to vacation," and called a "serendipitous and surprising getaway" by USA Today. More recently, Expansion Management Magazine ranked Rochester as number one among metropolitan areas having the best Quality of Life in the Nation. In addition, Places Rated Almanac ranked Rochester as the sixth best place to live in America in its just released 25th anniversary edition. Please visit the Visit Rochester website for more information at www.visitrochester.com.

Plenary Session

Paul Corkum - "Attosecond Photonics: What we learn by transforming many photons into one."
Alfred T. Goshaw - "History of the Higgs boson and recent discoveries at the CERN Large Hadron Collider"
David R. Williams - "Imaging Single Cells in the Living Retina"

Paul Corkum
Joint Attosecond Science Laboratory
National Research Council and University of Ottawa, Canada

Presentation:

"*Attosecond Photonics: What we learn by transforming many photons into one.*"

Abstract:

The extreme nonlinear optics that creates attosecond pulses is understood through quantum trajectories of an ionizing electron. Each trajectory is essentially an electron interferometer created by light. I will show how this concept leads to a method for measuring the space-time properties of attosecond pulses, the space-time structure of electronic wave packets and chemical dynamics of small molecules.

Biography:

Paul Corkum received his Ph. D. degree from Lehigh University in 1972. He joined NRC as a post doctoral fellow in 1973 switching from theory to experiment. Dr. Corkum is best known for introducing many of the concepts for how atoms and molecules interact with intense light pulses. From this work he showed how atomic or molecular gases can be used to produce and measure attosecond pulses. He also showed how a molecule can be made to "photograph" itself.

Dr. Corkum is a fellow of the Royal Society (of Lndon) and a member of the US National Academy of Sciences. He has been awarded the Optical Society's Charles H. Townes Award; the IEEE's Quantum Electronics Award, the American Physical Society's Arthur L. Schawlow Prize and the American Chemical Society's Zewail Prize.

Dr. Corkum is an officer of the Order of Canada, a fellow of Royal Societies of the Canada and London and winner of Canada's Gerhard Herzberg Gold Medal for Science and Engineering. He currently directs the Joint Attosecond Science Laboratory in Ottawa and holds a Canada Research Chair in Attosecond Technology at the University of Ottawa.

Alfred T. Goshaw
***Duke University*, USA**

Presentation:

"History of the Higgs boson and recent discoveries at the CERN Large Hadron Collider"

Abstract:

The particle referred to as the Higgs boson has been a centerpiece of the Standard Model of elementary particle physics ever since it was theoretically proposed almost 50 years ago. The bold conjecture was that there existed in Nature a field that interacted with particles in a manner that generated their masses and still preserved the symmetry principles of the electro-weak force between quarks and leptons. In July of this year the ATLAS and CMS experiments presented evidence for the production of a new massive boson that is a strong candidate for the Higgs particle. The history of the Higgs boson and the recent observations by the ATLAS and CMS experiments will be reviewed.

Biography:

Goshaw received his Ph. D. from the University of Wisconsin in 1966 and was a postdoctoral at Princeton University. He was then a staff physicist at CERN for four years, before joining the faculty at Duke University in 1973 – where he is currently a James B. Duke Professor. Since 2008 Goshaw has served as the chair of the U.S. ATLAS Institutional Board, the governing board for the U.S. physicists who run the ATLAS detector. He previously served as the Chair of Fermilab Users Executive Committee, Co-spokesperson of the Collider Detector at Fermilab Collaboration, and Secretary Treasurer of the APS Division of Particles and Fields.

Goshaw's research is focused on the study of Nature's most massive particles, the W and Z bosons (carriers of the weak force) and the top quark (discovered in 1994). These studies have been carried out using 1.96 TeV proton-antiproton collisions provided by Fermilab's Tevatron, and analyzed using the CDF detector. In recent years his interest has been on testing the electro-weak sector of the Standard Model and searches for new physics phenomena that lead to the production of W/Z bosons and high energy photons. Currently he is working on understanding the source of electro-weak symmetry breaking with measurements that use the high energy proton-proton collisions provided by the CERN Large Hadron Collider.

David R. Williams
Univ. of Rochester, USA

Presentation:

"Imaging Single Cells in the Living Retina"

Abstract:

Technologies including optical coherence tomography and adaptive optics scanning laser ophthalmoscopy have transformed the ophthalmoscope into a microscope, revealing not only structure but also function at a cellular spatial scale in the living eye. These devices offer new views of how the healthy eye works and the diseased eye fails.

Biography:

Williams received his Ph.D. from the University of California, San Diego in 1979. He was a postdoctoral fellow at Bell Laboratories, Murray Hill in 1980 and joined the University of Rochester in 1981, where he has an appointment in the Institute of Optics as well as in the departments of Brain and Cognitive Sciences, Biomedical Engineering, and Ophthalmology. He is currently William G. Allyn Professor of Medical Optics. Since 1991, Williams has served as Director of Rochester's Center for Visual Science, an interdisciplinary research program of 32 faculty interested in the mechanisms of human vision. In 2011, he was appointed Dean for Research of Arts, Sciences and Engineering where he is responsible for maximizing opportunities for faculty research and scholarship, including the development of partnerships with industry and government as well as other academic institutions.

Williams' research marshals optical technology to address questions about the fundamental limits of human vision. His research team demonstrated the first closed-loop adaptive optics system for the eye, showing that vision can be improved beyond that provided by conventional spectacles. This work led to wavefront-guided refractive surgery used in more than half the refractive surgical procedures conducted worldwide today. More recently, his group has been deploying adaptive optics and other advanced imaging technologies to study the normal and diseased retina, obtaining microscopic images with unprecedented resolution in the living eye. Williams is a Fellow of the Optical Society of America, the American Association for the Advancement of

Science, and the Association for Research in Vision and Ophthalmology. Awards he has received include the OSA Edgar D. Tillyer Award in 1998, the Association for Research in Vision and Ophthalmology's Friedenwald Award in 2006, and the Bressler Prize from the Jewish Guild for the Blind in 2007.

Awards Presentation

Michael D. Fayer - "Ultrafast 2D IR Vibrational Echo Spectroscopy"

Marlan O. Scully - "*Quantum Photocell*: Increasing Efficiency via Quantum Coherence"

Michael D. Fayer
Stanford University, USA

APS Arthur L. Schawlow Prize Recipient

Presentation:

"Ultrafast 2D IR Vibrational Echo Spectroscopy"

Abstract:

Ultrafast 2D IR vibrational echo spectroscopy is a method akin to 2D NMR but it operates on times scales that are many orders of magnitude faster than NMR. The 2D IR method will be described, and its application to several problems involving molecular dynamics and interactions will be presented.

Biography:

Michael D. Fayer received both his B.S. (1969) and Ph.D. (1974) in chemistry from the University of California at Berkeley. He started his academic career at Stanford University in 1974 as an Assistant Professor. Today he is the David Mulvane Ehrsam and Edward Curtis Franklin Professor of Chemistry at Stanford University. Fayer is a pioneer in the development and application of ultrafast non-linear laser techniques for the study of complex molecular systems ranging from solids at liquid helium temperature to flames. Currently his work emphasizes liquids and biological molecules. In large part due to his work, ultrafast nonlinear and coherent spectroscopic techniques such as transient gratings, photon echoes, and vibrational echoes have become powerful techniques that have spread worldwide for studying complex molecular systems in chemistry,

biophysics, and materials science. Michael Fayer is a member of the National Academy of Sciences of the United States of America and of the American Academy of Arts and Sciences. He has won a number of national and international awards including the Ellis R. Lippincott Award given by the Optical Society of America, the E. Bright Wilson Award for Spectroscopy given by the American Chemical Society and the Earl K. Plyler Prize for Molecular Spectroscopy given by the American Physical Society.

Marlan O. Scully
Texas A&M, Princeton, and Baylor Universities, USA

OSA's Frederic Ives Medal/Jarus W. Quinn Prize Recipient

Presentation:
"Quantum Photocell: Increasing Efficiency via Quantum Coherence"

Abstract:
Laser and photocell quantum heat engines (QHEs) are powered by thermal light and governed by the laws of quantum thermodynamics. To appreciate the deepconnection between quantum mechanics and thermodynamics we need only recall that in 1901 Planck introduced the quantum of action to calculate the entropy of thermal light, and in 1905 Einstein's studies of the entropy of thermal light led him to introduce the photon.

We here show how to use quantum coherence induced by external coherent fields1 [1] or by quantum noise2 [2] to improve the efficiency of a laser or photocell QHE.

Surprisingly, this coherence can be induced by the same noisy (thermal) emission and absorption processes that drive the QHE. Furthermore, this noise-induced coherence can be robust against environmental decoherence. Application of these ideas to photosynthesis3[3] will also be discussed.

Biography:
Marlan Scully, a pioneer in quantum optics, developed critical aspects of the field including the Scully-Lamb quantum laser theory and the laser phase transition analogy with special application to Bose-Einstein

condensation. He also provided the first classical theory of the free electron laser and researched novel coherence effects such as the correlated emission laser. In addition, he was the first to demonstrate lasing without inversion and real-time detection of anthrax-type spores.

Scully serves on the faculty at Baylor University, the Max Planck Institute for Quantum Optics, Princeton University, and Texas A&M University. He has received numerous awards for his research including the OSA and Deutsche Physikalische Gesellschaft Herbert Walther Award, the APS Schawlow Prize, the IEEE Quantum Electronics Award, the Franklin Institute's Elliott Cresson Medal, OSA's Charles H. Townes Award and Adolph Lomb Medal, and Humboldt and Guggenheim fellowships. He has been a Harvard Loeb lecturer, and he is a member of the U.S. National Academy of Sciences, Academia Europaea, and AAAS. His many students have gone on to successful research careers in academia, industry and government.

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
Michael D. Fayer, Stanford University, USA

OSA AWARDS AND HONORS

OSA Fellowships

Frederic Ives Medal/Jarus W. Quinn Endowment
Recipient: Marlan O. Scully, Texas A&M University and Princeton University, U.S.A

Esther Hoffman Beller Medal
Recipient: Judith Donnelly, Three Rivers Community College, U.S.A.

Max Born Award

Recipient: Jean Dalibard, École Normale Supérieure-Paris, France

Distinguished Service Award

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

Paul F. Forman Engineering Excellence Award

Recipient: To Be Announced

Joseph Fraunhofer Award/Robert M. Burley Prize

Recipient: Hiroo Kinoshita, University of Hyogo, Japan

Robert E. Hopkins Leadership Award

Recipient: Thomas M. Baer, Stanford Photonics Research Center, U.S.A.

Edwin H. Land Medal

Recipient: Yoichi Miyake, Chiba University (emeritus), Japan

Emmett N. Leith Medal

Recipient: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne, Switzerland

Ellis R. Lippincott Award

Recipient: Keith A. Nelson, Massachusetts Institute of Technology, U.S.A.

Adolph Lomb Medal

Recipient: Hatice Altug, Boston University, U.S.A.

William F. Meggers Award

Recipient: Xi-Cheng Zhang, University of Rochester, USA

David Richardson Medal

Recipient: Gregory Forbes, QED Technologies Inc., Australia

R.W. Wood Prize

Recipients: Eric A. Van Stryland, University of Central Florida, U.S.A., and Mansoor Sheik-Bahae, University of New Mexico, U.S.A.

FiO Invited Speakers

FiO 1: Optical Design, Fabrication, and Instrumentation

FiO 1.1: Coherence, Interferometry, Optical Testing, Diffractive and Holographic Optics

- High-speed 3-D Motion-picture Recording by Parallel Phase-shifting Digital Holography, Yasuhiro Awatsuji, *Kyoto Institute of Technology, Japan*
- Digital Holographic Adaptive Optics Techniques with Coherent or Incoherent Sources, Myung K. Kim, *Univ. of South Florida, USA*
- Status and Issues of Holographic Display of Dynamic Images, Byoungho Lee, *Seoul National Univ, Korea*
- Three-dimensional Hologram Capture Using Integral Imaging Under Incoherent Illumination, Jae-Hyeung Park, *Chungbuk National Univ., Korea*

FiO 1.2: Three-Dimensional Optical Structure Design, Fabrication and Nanopatterning

- Title to be Announced, Ali Adibi, *Georgia Tech., USA*
- 3D Patterning Using Nanoimprint and Guided-Self-Assembly and Applications in Nanoplasmonics, Stephen Chou, *Princeton Univ., USA*
- 3D Optical Devices Fabricated Using Multiphoton Absorption Polymerization, John Fourkas, *Univ. of Maryland, USA*
- Lithographically-defined 3-D Chip-scale Optical Interconnects Enabling, Michael Haney, *Univ. of Delaware/DARPA, USA*
- Smart Plasmonics for Chemistry and Biology, Na Liu, *Rice Univ., USA*

FiO 1.3: Optical Design and Unconventional Polarization

- Hybrid Spiral Plasmonic Lens: Towards High Efficiency Miniature Circular Polarization Analyzer, Weibin Chen, *Univ. of Dayton, USA*
- Geometric Phase Holograms - Fabricating Generalized Polarization Gratings Enabling Arbitrary Wavefront Control with Perfect Efficiency, Michael Escuti, *North Carolina State Univ., USA*
- Cylindrical Vector Beams for Imaging and Spectroscopy of Single Nanoparticles and Single Quantum Systems, Alfred J. Meixner, *Univ. of Tuebingen, Germany*
- Vector Fields and their Novel Properties, Huitian Wang, *Nankai Univ., China*

FiO 1.4: Wavefronts and Aberrations: Engineering, Sensing and Applications

- Aberration Balancing, Orthonormal Polynomials, and Wavefront Analysis, Vini Mahajan, *Aerospace Corp., USA*
- Sensing and Managing Field-Dependent Wavefront Error, Rick Paxman, *General Dynamics, USA*
- Aberration Correction of Coherent Imagery, Samuel T. Thurman, *Lockeed Martin, USA*

FiO 1.5: Adaptive Optics for Vision and Imaging (Joint with FiO 8)

- Adaptive Optics for Visual Testing: from the Lab to the World, Pablo Artal, *Univ. of Murcia, Spain*
- Adaptive Lenses for Vision Correction and Optical Imaging, Guoqiang Li, *Ohio State Univ., USA*
- In vivo Adaptive Optics Imaging of the Lamina Cribrosa in Normal and Glaucomatous Eyes, Jason Porter, *Univ. of Houston College of Optometry, USA*
- Adaptive Optics Scanning Ophthalmoscopy with Annular Pupils, Yusufu Sulai, *Univ. of Rochester, USA*

FiO 1.6: General Optical Design and Instrumentation

- Inverse Optical Design of the Human Eye, Aleander Goncharov, *National Univ. of Ireland, Ireland*
- Optical Tricks to Image Habitable Planets Around Nearby Stars, Olivier Guyon, *Univ. of Arizona and Subaru Telescope, USA*

FiO 2: Optical Sciences

FiO 2.1: Wavefront Engineering and Sensing

- Phase Singularities in Partially Coherent Wavefields, Greg Gbur, *Univ. of North Carolina, Charlotte, USA*
- Tutorial: Field Tracing for Unified Optical Modeling, Frank Wyrowski, *Univ. of Jena, Germany*
- Plasmon-driven Bessel Beams, Carlos Zapata-Rodriguez, *Univ. of Valencia, Spain*

FiO 2.2: Advanced Fiber and Solid State Laser Technologies and Applications

- High energy diode pumped Yb:doped crystal amplifiers for ultrashort OPCPA, Dimitrios Papadopoulos, *Laboratoire Charles Fabry, Institut d'Optique and LULI, Ecole Polytechnique, France*
- Kilowatt Level Burst-mode OPCPA Pump Amplifier Concepts, Michael Schulz, *Deutsches Elektronen Synchrotron Research Department Hasylab, Germany*
- High Brightness Microchip Lasers for Engine Ignition, Takunori Taira, *Inst. for Molecular Science, Japan*

FiO 2.3: Laser-driven Electron and Light Sources

- Ultrafast Electron Diffraction and Suitable Sources, Peter Baum, *Max-Planck-Institute of Quantum Optics & LMU München, Germany*
- Femtosecond x-rays from Relativistic Laser-plasma Interaction, Sebastien Corde, *LOA, France*
- Tutorial: Ultrafast Laboratory Snapshots and Movies of Intense Laser-plasma Interactions, Mike Downer, *Univ. of Texas at Austin, USA*

FiO 3: Optics in Biology and Medicine

FiO 3.1: Optical Trapping and Manipulation

- Force Measurements of the Pericellular Matrix, Jennifer Curtis, *Georgia Tech., USA*
- Optical Microscopy-based Analysis of Dynamic Tissue Mechanics, Celeste Nelson, *Princeton Univ., USA*

FiO 3.2: Biophotonics and Optofluidics for Point-of-Care and Global Health Applications

- Primary Care Imaging using Optical Coherence Tomography for Advanced Point-of-Care Diagnostics, Stephen Boppart, *Univ. of Illinois at Urbana-Champaign, USA*
- Cellular Traction Stresses in Disease Progression, Cindy Reinhart-King, *Cornell Univ., USA*
- Molecular Diagnostics with Optofluidic Platform, Holger Schmidt, *Univ. of California-Santa Cruz, USA*
- Optofluidics in Chemical and Biological Analysis, Yuze (Alice) Sun, *National Inst. of Health, USA*
- Cost Effective, High Performance Optics for POC Applications, Tomasz Tkaczyk, *Rice Univ., USA*

FiO 3.3: Microscopy and OCT (Joint with FiO 1)

- Adaptive Optics for High-resolution Optical Microscopy, Martin Booth, *Oxford Univ., UK*
- Integrated Multimodality Intravascular Imaging System, Zhongping Chen, *Univ. of California-Irvine, USA*
- Diffraction Phase Microscopy with White Light (wDPM), Gabi Popescu, *Univ. of Illinois, USA*
- Advances in Multiphoton Microscopy, Jeff Squier, *Colorado School of Mines, USA*

FiO 3.4: Methods for Tissue Imaging and Therapy

- Optical Imaging and Microscopy of the Living Brain, Elizabeth M. C. Hillman, *Columbia Univ., USA*
- Phase Contrast Microscopy in Thick Tissue, Jerome Mertz, *Boston Univ., USA*
- In vivo Multiphoton Imaging of Subcortical Structures in an Intact Mouse Brain, Chris Xu, *Cornell Univ., USA*

FiO 4: Optics in Information Science

FiO 4.1: Coherence and Quantum Imaging

- Quantifying Quantum Correlations: What is the Best Way to Measure 'Quantumness' in a System, Asma Al-Qasimi, *Univ. of Toronto, Canada*
- Inverse Problems in Quantum Imaging, John Schotland, *Univ. of Michigan, USA*
- Coherence Properties of X-ray Free-electron Lasers, Ivan Vartanyants, *HASYLAB, DESY, Germany*
- Lensless Imaging with Ultrabroadband Light Sources: Towards Efficient Table-top Soft-X-ray Microscopy, Stefan Witte, *VU Univ. Amsterdam, Netherlands*

FiO 4.2: Image and Information Processing in Biooptics

- Optimization of Stochastic Three-dimensional Fluorophore Localization in Optical Microscopy, Rafael Piestun, *Univ. of Colorado at Boulder, USA*
- Phase Space Analysis of Partially Coherent Imaging in a Microscope, Colin Sheppard, *National Univ. of Singapore, Singapore*
- Optical Remote Sensor for Alcohol Concentration in Blood, Zeev Zalevsky, *Bar-Ilan Univ., Israel*

FiO 4.3: Generalized Imaging and Non-imaging Techniques for Diagnostics and Sensing Including Plasmonics

- Phase in the Near Field, Brad Deutsch, *Univ. of Rochester, USA*
- Tutorial: Compressed Sensing and Applications to Optical Imaging, Yonina Eldar, *Technion, Israel*
- Addressing the Inverse Problem of Imaging with 'Heavy Atom' Optics, Aaron Lewis, Hebrew *Univ. of Jerusalem, Israel*
- Non-diffracting Airy Surface Plasmons: Generations, Manipulation and Interference, Alexander Minovich, *Australian National Univ., Australia*
- Hybrid Plasmonic Nanodevices for All-optical Control of Information, Otto Muskens, *Univ. of Southampton, UK*
- Plasmon Switching: Observation of Dynamic Surface Plasmon Steering by Selective Mode Excitation in a Sub-wavelength Slit, Taco Visser, *DeIft Univ. of Technology, Netherlands*

FiO 4.4: Pupil and Wavefront Engineering

- Dictionary Learning for Hyperspectral Video Compressive Sensing, Guillermo Sapiro, *Duke Univ, USA*

- Controlling Light in Complex Media in Space and Time: Looking Around Corners and Through Turbid Layers, Ori Katz, *Weizmann Inst. of Science, Israel*
- Extracting Information From Unresolved Sources, Grover Swartzlander, *Rochester Inst. of Technology, USA*

FO 4.5: Parametric Imaging or Analysis

- Laser Trapping Complex Shapes: the Effect of Complex Geometry on the Interaction of Radiation and Particulate Matter, Alex Levin, *UCLA, USA*
- Motility Contrast Imaging and Fluctuation Spectroscopy of Living Tissue, David Nolte, *Purdue Univ., USA*
- Functional Imaging by OCT, from Flow and Diffusion Towards Perfusion of Tissue?, Ton G. van Leeuwen and Jereon Kalkman, Univ. of Amsterdam Netherlands

FiO 5: Fiber Optics and Optical Communications

FiO 5.1: High Power and Agile Lasers

- Ultra-high Efficiency Erbium-doped Fiber Lasers and Amplifiers, Mark Dubinskii, *Army Research Labs, US*A
- Amplifying a Single Higher-order Mode in a Very-large-core Fiber Amplifier, Cliff Headley, OFS Labs, USA
- High Peak-Power 2-micron Pulsed Fiber Lasers, Shibin Jiang, AdValue, USA
- Parametrically Tuned Agile Oscillators, Bill P. Kuo, UCSD, USA
- Semi-Guiding High Aspect Ratio Core (SHARC) Fiber Laser: The Fiber Path to High Peak and Average Powers, David Rockwell, Raytheon, USA

FiO 5.2: Photonic Crystal Fibers and Sensing

- Advanced Optical Fibers and Their Applications in Fiber Lasers, Liang Dong, *Clemson Univ., USA*
- Title to be Announced, Tijmen Euser, *Max Planck Institute, G*ermany
- Solving Pulse Delivery Problems Using Hollow Core Fibers : Where Angels Fear to Tread, Jonathan Knight, *Univ. of Bath, UK*
- High Performance Distributed Optical Fiber Sensors Based on Raman Scattering, Fabrizio Di Pasquale, S*cuola Superiore Sant'Anna, Italy*
- Nonlinear Properties of Silicon Optical Fibers, Anna Peacock, Univ. of Southampton, UK

FiO 5.3: Optics in a Cloud

- Silicon Photonics in the Data Center: System Level Considerations, Madeleine Glick, *Apic, USA*
- Power Efficient Tb/s Optical Interconnects, Clint Schow, *IBM, USA*
- Optical Switching Architecture for Data Center Networks, Lei Xu, *NEC Research, USA*

FiO 5.4: Enabling Technologies for High-Capacity Transport

- MODE-GAP Project, Andrew Ellis, *Tyndall Institute, Ireland*
- Fiber Supporting Orbital Angular Momentum States for Information Capacity Scaling, Steve Golowich, *MIT Lincoln Labs, USA*
- Integrated-photonic Signal Processing for Optical Communication, Inuk Kang, *Seoul National University, Korea*
- Tutorial: Space-division Multiplexed Transmission in Novel Few-mode Fibers, Roland Ryf, *Bell Labs, Alcatel Lucent, USA*
- Optical Phase-Sensitive Amplification: Towards Ultra-Low Noise Transmission Links, Zhi Tong, *Univ. of California San Diego, USA*

FiO 6: Integrated Photonics

FiO 6.1: Silicon Photonics

- Monolithic Integration of CMOS and Silicon Nanophotonics for Optical Interconnects, Solomon Assefa, *IBM Research, USA*\
- Tutorial: Active Silicon Photonic Devices and Integrated Circuits, John Bowers, *UCSB, USA*
- Slow-light and Microcavities for Optical Signal Processing in the SOI Platform, Philippe Fauchet, *Vanderbilt Univ., USA*
- Nonlinear Photonic Circuits on Hybrid Silicon Substrates, Hong X. Tang, *Yale Unv., USA*

FiO 6.2: Active and Functional Metamaterials

- Multipole Analysis of Meta-atoms, Falk Lederer, *Univ. of Jena, Germany*
- Interscale Mixing for High-Resolution and Highly-Compact Imaging Systems, Viktor Podolskiy, *Univ. of Massachussetts Lowell, USA*

FiO 6.3: Nanophotonics and Integrated Photonics and Plasmonics

- Hybrid Plasmonic Waveguides for On-chip Polarization Control, J. Stewart Aitchison, *Univ. of Toronto, Canada*

- Laser Propulsion and Optothermal Trapping of Particles in Air-filled Hollow-core Photonic Crystal Fiber, Tijmen Euser, *Max Planck Institute for the Science of Light,Germany*
- Plasmonic and Photonic Structures for Nanoparticle Trapping, Color Filtering and Single Molecule SERS, Ken Crozier, *Harvard Univ., USA*
- Ultracompact CMOS-compatible modulators, Juerg Leuthold, *Karlsruhe Institute of Technology, Germany*

FiO 6.4: Bioinspired Photonic Devices (Joint FIO 3)

- Title to be Announced, Naomi Halas, *Rice Univ., USA*
- Bioinspiration, Biomimetics and Bioreplication for Harvesting Solar Energy, Akhlesh Lakhtakia, *Pennsylvania State Univ., USA*
- Silk-based Optics and Photonics, Fiorenzo Omenetto, *Tufts Univ., USA*

FiO 6.5: Integrated Photonics for High Capacity Communications (Joint FIO 5)

- Coherent, Superchannel, Terabit/s InP Photonic Integrated Circuits, Radha Nagarajan, *Infinera, USA*
- Monolithic and hybrid integrated photonic devices and circuits for optical switching and interconnect, Yoshiaki Nakano, *Univ. of Tokyo, Japan*
- Photonic Integrated Circuits for Advanced Modulation Formats, Michael Wale, *Oclaro, UK*

FiO 7: Quantum Electronics

FIO 7.1: Integrated Quantum Optics (Joint with FIO 6)

- Sinusoidally Gated InGaAs/InP Avalanche Photodiodes for Entanglement-based Quantum Key, Shuichiro Inoue, *Inst. of Quantum Science, Nihon Univ., Japan*
- Integrated Quantum Optics Using the Silicon on Insulator (SOI) Platform, Serge Massar, *Laboratoire d'Information Quantique, Belgium*
- Femtosecond Laser Written Optical Circuits for Quantum Computation and Simulation, Roberto Osellame, *Inst. for Photonics and Nanotechnologies - CNR, Italy*
- Quantum Networks of Spin Registers in Diamond, Tim Taminiau, *TU Delft, Netherlands*
- Engineering Polarization Entangled States at Telecom Wavelengths, Sebastien Tanzilli, *CNRS, France*

FiO 7.2: Hybrid Quantum Systems and Quantum-Enabled Sensors

- Quantum Dots as Tools for Quantum Technologies, Mete Atature, *Cambridge Univ., UK*
- Tutorial: Entang-bling: quantum correlations in room-temperature diamond, Ian Walmsley, *Oxford Univ., UK*
- Single Photons Storage in Nuclear Spins of Diamond Defects and Rare Earth Atoms, Jorg Wrachtrup, *Univ. of Stuttgart, Germany*

FiO 7.3: Nonlinear Optics in Micro/Nano-Optical Structures

- Nonlinear Optical Phononics: Harnessing Sound and Light in Nonlinear Nanoscale Circuits, Benjamin Eggleton, *Univ. of Sydney, Australia*
- Mid-Infrared Light Sources Using Parametric Amplification in Silicon Nanophotonic Wires, William Green, *IBM, USA*
- Silicon Microresonators for Nonlinear Optical, Quantum Optical, and Optomechanical Applications, Qiang Lin, *Univ. of Rochester, USA*
- Nonlinear Optics, Andrea Melloni, *Politecnico di Milano, Italy*
- Microresonator-Based Optical Frequency Combs: Time-Domain Studies, Andrew Weiner, *Purdue Univ., USA*

FiO 7.4: Order, Disorder and Symmetry in Photonic Structures

- Random Caustics and Intensity Fluctuations in Weakly Disordered Media, Ragnar Fleishmann, *Max Planck Inst., Germany*
- Dark, Bright, and Optically Active Modes in Magneto-plasmonic Structures, A. Femius Koenderink, *AMOLF, Netherlands*
- Superballistic Transport and Anomalous Diffusion in Inhomogeneous Lattices, Alexander Szameit, *Friedrich-Schiller-Universität, Germany*

FiO 7.5: Non-plasmonic Polaritonics

- Tutorial: Microcavity Polaritonics: Interacting Quantum Liquids on a Chip, Jeremy Baumberg, *Univ. of Cambridge, UK*
- An Unconventional Microcavity System for Polaritons, Hui Deng, *Univ. of Michigan, USA*
- Nonlinear Polarization Phenomena in Quantum Microcavities, Ivan Shelykh, *Univ. of Iceland, Iceland*
- Bose-Einstein Condensation of Long-Lifetime Polaritons in Semiconductor Microcavities, David Snoke, *Univ. of Pittsburgh, USA*

FiO 7.6: Quantum Computation and Communications

- Quantum Communication Using Entangled Photon Holes, James Franson, *Univ. of Maryland, USA*
- Narrowband Photon From an Atomic Source, Andrew MacRae, *Univ. of Calgary, Canada*
- Coherence and Photon Statistical Properties of the Mollow Triplet Sideband Emission of a Quantum Dot, Peter Michler, *Univ. of Suttgart, Germany*
- Continuous-variable Measurements of Non-classical Light, Paulo Nussenzveig, *Univ. of Sao Paulo, Brazil*

FiO 8: Vision and Color

FIO 8.1: High-Resolution Imaging of the Living Cornea

- Corneal Structure Assessed with Adaptive Optics Second-Harmonic Generation Imaging, Juan M. Bueno, *Universidad de Murcia, Spain*
- Using the HRT-RCM to Quantify in vivo Leukocyte Migration in the Inflamed Murine Cornea, Samuel Hanlon, *The Univ. of Houston College of Optometry, USA*
- Clinical Applications of Corneal Optical Coherence Tomography, David Huang, *Casey Eye Institute, USA*

FIO 8.2: The Impact of the Chromatic Aberration on the Visual System

- Measurement and Correction of Transverse Chromatic Aberration with the Adaptive Optics Scanning Laser Ophthalmoscope, Wolf Harmening, *Univ. of California Berkeley, USA*
- Chromatic Aberration as a Possible Cue to Specify the Sign of Defocus in the Eye, Philip Kruger, *SUNY College of Optometry, USA*
- Visual Consequences of Chromatic Aberration Reduction and Correction in Pseudophakia, Patricia Piers, *Abbott Medical Optics Inc., Netherlands*
- Tutorial: Ocular Chromatic Aberration and its Effect on Retinal Image Quality, Larry Thibos, *Indiana Univ. School of Optometry, USA*

LS Invited Speakers

1. Fundamentals and Applications of Photonic Crystals

- Cavity QED and Lasing in Single Quantum Dot Photonic Crystal Nanocavity Coupled Systems, Yusuhiko Arakawa, *Univ. of Tokyo, Japan*
- Periodic Structures in Plamonics, Pierre Berini, *Univ. of Ottawa, Canada*

- Nanophotonic Sensing Structures: Photonic Crystal Principles and Metamaterial Principles Compared, Richard De La Rue, *Universiti Malaya, Malaysia*
- Photonic Crystals in Biosensing, Philippe Fauchet, *Vanderbilt Univ., USA*
- Enhancing Optical Functionalities of Silicon with Photonic Crystal Cavities, Matteo Galli, *Univ. of Pavia, Italy*
- Open-system Quantum Optics in Photonic Crystal Chips with Embedded Quantum Dots, Stephen Hughes, *Queen's Univ. of Kingston, Canada*
- Nonlinear Optics in Photonic Crystals - Opportunities and Limitations, Thomas Krauss, *Univ. of St. Andrews, UK*
- Recent Progress in Photonic Crystals and their Device Applications, Susumu Noda, *Kyoto Univ., Japan*
- Applications of Photonic Crystals for Spectroscopoy, Zhimin Shi, *Univ. of Rochester, USA*

2. Optical and Laser-Based Approaches in Chemical and Biological Sensing

- Detection of Cancer Biomarkers using Fluorescence Enhanced by Silicon-Based Photonic Crystals and Bandgap-Matching Laser Scanner, Brian Cunningham, *Univ. of Illinois at Urbana-Champaign, USA*
- Micro-fluidic based Detection Platform for Rapid Pathogen Characterization in Water, Peter Kiesel, *PARC, USA*
- Universal Quantification of Binding Affinity Using Back-Scattering Interferometry, Amanda Kussrow, *Vanderbilt Univ., USA*
- Waveguide-coupled Two-dimensional Photonic Crystals as Ultrasensitive Optical Virus Sensors, Benjamin Miller, *Univ. of Rochester, USA*
- Stand-off Chemical and Biological Sensing, Martin Richardson, *Univ. of Central Florida, USA*
- Optofluidic Lasers for DNA Mutation Detection, Yuze (Alice) Sun, *National Inst. of Health, USA*
- IRIS: Interferometric Reflectance Imaging Sensor – Multiplexed Assays and Single Virus Detection, M. Selim Ünlü, *Boston Univ., USA*
- Multicolor Quantum dot-based Fluorescence Excitation for Cellular Micro-array Screening, John X.J. Zhang, *Univ. of Texas at Austin, USA*

3. Solid-State Quantum Optics

- Quantum Optics with Cavity-coupled Spin Qubits in Diamond, Victor Acosta, *HP Labs, USA*
- Macroscopic Self-trapping and Non-linear Oscillations in Coupled Polariton Condensates, Alberto Amo, *Laboratoire de Photonique et Nanostructures, CNRS, France*
- Title to be Announced, Antonio Badolato, *Univ. of Rochester, USA*

- Quantum Optics of Semiconductor Excitons, Steve Cundiff, *JILA/Univ. of Colorado and NIST, USA*
- Scanning Probe Magnetometry and Nanoscale Magnetic Resonance Imaging Using Nitrogen-vacancy Spins in Diamond, Michael Grinolds, *Harvard, USA*
- Quantum Correlated Photons in Arrays of Wealkly Nonlinear Cavities, Vincenzo Savona, *Laboratory of Theoretical Physics of Nanosystems, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland*
- Optical Control of the Electronic and Nuclear States in a Single Quantum Dot, Duncan Steel, *Univ. of Michigan, USA*
- Quantum Photonics for Computation and Simulation, Jake Taylor, *NIST, USA*

4. Cold Atoms and Molecules

- Progress Toward a Precision Measurement of the Atomic Recoil Frequency Using A Grating Echo Interferometer, A. Kumarakrishnan, *York Univ., Canada*
- Ultracold Atomic Mixtures in Optical Lattices, Dominik Schneble, *SUNY Stony Brook, USA*
- Observation of Blue Shifted Ultralong-Range Cs2 Rydberg Molecules, Jim Shaffer, *Oklahoma Univ.., USA*
- Ultracold Atomic Gases for Hybrid Quantum Systems, Mukund Vengalattore, *Cornell Univ., USA*
- Rovibrational Cooling of Translationally Ultracold, Polar NaCs Molecules, Patrick Zabawa, *Rochester Univ., USA*

5. Optics and Alternative Energy Sources

- Title to be Announced, Harry Atwater, *Caltech, USA*
- Light Trapping in Thin Crystalline Si Photovoltaic Cells, Gang Chen, *Michigan Inst. of Technology, USA*
- Supercell Gratings for Light Trapping, Thomas Krauss, *Univ. of St. Andrews, UK*
- Taming the Blackbody with Metamaterials for Energy Harvesting Applications, Willie Padilla, *Boston College, USA*
- Design and Modeling of Nanowire-array Solar Cells, Michelle Povinelli, *Univ. of Southern California, USA*
- 3D Photonic Crystals for Photon Management in Solar Cells, Ralf Wehrspohn, *Fraunhofer Inst. for Mechanics of Materials Halle, Germany*

6. Attosecond and Strong Field Physics

- Generation of Single Isolated 67-Attosecond Pulses, Zhengu Chang, *Univ. of Central Florida, USA*

- Exploiting Energetic XUV Super-Continua, Dimitris Charalambidis, *FORTH-IESL and Univ. of Crete, Greece*
- Attosecond science at the Lund Laser Centre, Per Johnsson, *Lund Univ., Sweden*
- Subfemtosecond Photoconductive Switching in Dielectrics, Nick Karpowicz, *Max-Planck-Institut für Quantenoptik, Germany*
- High Harmonic Generation in Aligned N2O for Orbital Tomographic Imaging, Bastian Manschwetus, *CEA Saclay, France*
- Generation of Multigigawatt Isolated Attosecond Pulses, Katsumi Midorikawa, *Riken, Japan*
- Electron Dynamics Investigated by Attosecond Pulses, Giuseppe Sansone, *Politecnico di Milano, Italy*

7. Ultrafast Chemical Dynamics

- High Harmonic Probes of Inner Electron Sub-cycle Dynamics in Molecules, Phil Bucksbaum, *Stanford Univ., USA*
- Molecular Dynamics with Ultrafast X-rays, Henry Kapteyn, *JILA, Univ. of Colorado, USA*
- Laser Waveform Control of Electron Dynamics, Matthias Kling, *Kansas State Univ., USA*
- Controlling Large Molecules at High Repetition Rates: Toward the “Molecular Movie", Jochen Küpper, *Center for Free Electron Laser Science, DESY and University of Hamburg, Germany*
- Channel-resolved Above-threshold Ionization in the Molecular Frame, Jochen Mikosch, *National Research Council, Canada*
- Ring Opening of 1,3-cyclohexadiene Probed by Time-resolved Optical and X-ray Fragmentation, Vladimir Petrovic, *Stanford Univ, USA*
- Watching Chemical and Physical Processes in the Molecular Frame, Henrik Stapelfeldt, *Aarhus Univ., Denmark*
- Theory of Nonadiabatic Electronic and Nuclear Dynamics in Laser Fields; Observation and Control, Kazuo Takatsuka, *Univ. of Tokyo, Japan*
- Molecular Orbital Imaging by High-order Harmonic Generation, Caterina Vozzi, *IFN-CNR & Politecnico di Milano, Italy*

8. Physics with Ultrafast X-rays

- Probing Non-Born-Oppenheimer Dynamics and Conical Intersections in Polyatomic Molecules Using Two-color Femtosecond XUV Pulses, Ali Belkacem, *Lawrence Berkeley National Laboratory, USA*
- Covariance Mapping of Double Core Hole States in Atoms and Molecules, Raimund Feifel, *Uppsala Univ., Sweden*
- Ultrafast Nucleobase Photoprotection Probed by Soft X-rays, Markus Guehr, *SLAC, Stanford Univ., USA*

- Multiphoton X-ray Dynamics in Atoms and Molecules, Brendan Murphy, *SLAC, Stanford Univ., USA*
- Ultrafast Wave Packet Dynamics in Molecules Clocked and Induced by Few-cycle UV Pulses, Alicia Palacios, *Universidad Autónoma de Madrid, Spain*
- Double Core Hole Spectroscopy of Small Molecules, Kevin Prince, *Elettra, Italy*
- Atomic and Molecular Inner-Shell X-Ray Laser, Nina Rohringer, *Centre for Free Electron Laser Science, Germany*
- Time-Resolved Photoelectron Diffraction of Laser-Aligned Molecules, Daniel Rolles, *Max Planck Advanced Study Group, Center for Free-Electron Laser Science, Hamburg, Germany*
- Imaging Electronic Quantum Motion with Light, Robin Santra, *Univ. of Hamburg, Germany*

9. Precision Measurements and Metrology Using Lasers

- Progress in Gravitational Wave Detection at LIGO, Stephan Ballmer, *Dept. of Physics, Syracuse Univ., USA*
- Strontium and Mercury of Optical Lattice Clocks, Sebastien Bize, LNE-SYRTE, *Observatoire de Paris, France*
- Making a New SI System of Measurement by Learning from the Metre Redefinition, John Hall, *2005 Nobel Laureate in Physics, JIST/NIST, Univ. of Colorado, Boulder, USA*
- XUV Frequency Combs for Spectroscopic Applications, David Jones, *Dept. of Physics and Astronomy, Univ. of British Columbia, Canada*
- Atom Interferometry, Mark Kasevich, *Dept. of Physics, Stanford Univ., USA*
- Ultra-stable Laser Local Oscillators, David Leibrandt, *National Inst. of Standards and Technology, Boulder, USA*
- Precision Determination of the Fine Structure Constant from Atomic Recoil, Francois Nez, *Laboratoire Kastler Brossel, Ecole Normale Superieur, France*
- Precision Metrology and Many-body Quantum Physics, Jun Ye, *NIST/JILA, Univ. of Colorado, USA*

10. Quantum Optics and Quantum Information

- The Promise of Quantum Nonlinear Optics, Robert Boyd, *Univ. of Ottawa, Canada*
- Raman Scattering: a Coherent Mediator for Quantum Technologies, Philip Bustard, *National Research Council, Canada*
- Atomic Self-organization Around Tappered Nano Fibers, Ignacio Cirac, *Max-Planck-Institut für Quantenoptik, Germany*
- Quantum Memories for Long Distance Quantum Communication, Nicholas Gisin, *Univ. of Geneva, Switzerland*

- Entropy, Information and Compressive Sensing in the Quantum Domain, John Howell, *Univ. of Rochester Dept. of Physics and Astronomy, USA*
- Standard Polarization-Maintaining Fiber as a Photon Source for Quantum Communication Applications, Virginia Lorenz, *Univ. of Delaware Dept. of Physics and Astronomy, USA*
- Quantum Nonlinear Optics with Single Photons Enabled by Strongly Interacting Atoms, Mikhail Lukin, *Harvard Univ., USA*
- Entangbling – Quantum Correlations in Diamond, Ian Walmsley, *Oxford Univ., UK*
- Quantum Relais Made from Single Rare Earth Ions, Joerg Wrachtrup, *Universität Stuttgart, Germany*

11. Nano-opto-mechanics

- Ultrahigh-Q Mechanical Oscillators Through Optical Trapping of Tethered Membranes, Darrick Chang, *ICFO, Spain*
- GaAs Nano-optomechanical Systems, Ivan Favero, *Universite´ Paris Diderot*, *France*
- Quantum-coherent Coupling of Light and Micromechanical Motion, Tobias Kippenberg, *Ecole Polytechnique Federale de Lausanne, Switzerland*
- Traveling-wave Phonon Emission at the Nanoscale, Peter Rakick, *Sandia National Laboratory, USA*
- Nano-optomechanical Circuits on Silicon Substrates, Hong Tang, *Yale Univ., USA*
- Quantum Optomechanics with Microwave Photons, John Teufel, *NIST Boulder, US*
- Phonon Lasers in Cavity Optomechanics, Kerry Vahala, *Caltech, USA*

Special Symposia

The Future of Optics: A Perspective at Emil Wolf's 90th Birthday

Two thousand and twelve marks Emil Wolf's 90th birthday. The OSA would like to congratulate Prof. Wolf and wish him well on this occasion. Over his 90 years he has had tremendous impact across all of optics. His service to the community, the OSA, and the University of Rochester has left strengthened institutions and vibrant intellectual communities. In his honor we will have a special symposium with distinguished speakers on the future of four areas where Prof. Wolf has made special impact: inverse problems, coherence and quantum optics, physical optics, and optics at the University of Rochester. The Future of Inverse Problems, Anthony Devaney, *Northeastern Univ., USA*

- The Future of Inverse Problems, Anthony Devaney, *Northeastern Univ., USA*
- The Future of Vision, Wayne Knox, *Univ. of Rochester, USA*
- The Future of Coherence and Quantum Optics, Peter W. Milonni, *Los Alamos National Laboratory, USA*

- The Future of Physical Optics, Lukas Novotny, *Univ. of Rochester, USA*

FiO Symposium on Understanding the Developing and Aging Visual Systems

As life expectancy continues to rise, there is an increasing desire to better understand age-related changes in the visual system. This symposium will first explore developmental changes in the eye's optics and in the visual system that occur early in life. In the second half of the symposium, speakers will shed light on current understandings of alterations in the eye's optical quality, retinal characteristics and visual performance during the course of normal aging.

The Developing Visual System

- The Impact of Accommodation on Retinal Image Quality During Human Infancy, Rowan Candy, *Indiana Univ. School of Optometry, USA*
- Retinotopic Mapping in Infant Visual Cortex Using Near-infrared Spectroscopy (NIRS), Lauren Emberson, *Univ. of Rochester, USA*
- Optical Approaches for Controlling Myopia Progression: Evidence from Experimental Models, David Troilo, *SUNY College of Optometry, USA*
- Central and Peripheral Optics in Myopic Children, David Berntsen, *Univ. of Houston College of Optometry, USA*

The Aging Visual System

- Changes in the Optical Quality of the Normal Eye with Age, Ray Applegate, *Univ. of Houston, USA*
- Retinal Changes with Aging, Steve Burns, *Indiana Univ. School of Optometry, USA*
- Changes in Autofluorescence and Macular Pigment with Age & Implications for Vision, François C. Delori, *Schepens Eye Research Inst., Harvard Dept. of Ophthalmology, USA*

FiO Symposium on Optical Parametric Chirped-Pulse Amplification

Optical parametric chirped-pulse amplification is an alternative light amplification technique to lasers. It provides various advantages such as broader bandwidth, higher gain, wavelength tunability, and higher intensity contrast, that motivate its utilization in small-scale high-repetition-rate as well as large-scale high-energy laser systems. This symposium will provide an overview of the state-of-art of this unique technology, its various application areas, and its future development directions.

- OPCPA Modeling, Gunnar Arisholm, *Norwegian Defence Research Establishment, Norway*
- Mid-IR Few-cycle and CEP Stable OPCPA at High Average Power, Jens Biegert, *The Inst. of Photonic Sciences, Spain*
- Developments in High Peak and High Average Power Technology and Systems at RAL, John Collier, *Rutherford Appleton Lab, UK*
- Few Cycle Infrared OPCPA System and Applications, Yunpei Deng, *Max-Planck Institut fur Quantenoptik, Germany*
- Beyond 1 PW: OPCPA/Mixed Nd:glass Technology to Reach 10 – 1000 PW Powers, Todd Ditmire, *Univ. of Texas, Austin, USA*
- OPCPA Front End and Contrast Optimization for the OMEGA-EP Kilojoule Picosecond Laser, Christophe Dorrer, U*niv. of Rochester, Lab for Laser Energetics, USA*
- Fiber Laser Pumped MHz high repetition rate few-cycle OPCPA system, Jens Limpert, *Univ. of Jena, Germany*
- Tutorial: 20 Years of Progress in OPCPA, Algis Petras Piskarskas, *Vilniaus Universitetas, Lithuania*
- Technology and Applications of Single- and Multi-color High-energy Few-cycle Mid-IR sources, Audrius Pugzlys, *Technische Universität Wien, Austria*
- Novel OPCPA System for the FLASH-2 Free Electron Laser, Franz Tavella, *Helmholtz-Institute Jena, Germany*

Laser Science Symposium on Undergraduate Research

This special DLS annual symposium is rapidly becoming one of the most successful DLS traditions (this year's is the 12th 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.

Organizer: Harold Metcalf, *Stony Brook Univ., USA*

Submissions

Author Timeline

14 February 2012 **1** **Call for Papers**

15 May 2012 12:00 EDT (16.00 GMT)	**2 Papers Submissions Deadline**
June 2012	**3 Peer Review**
July 2012	**4 Postdeadline Submissions Open**
20 July 2012	**5 Program Committee Meeting**
The week of 23 July 2012	**6 Author Notification Sent**
August 2012	**7 Program Available**
1 October 2012 12:00 EDT (16.00 GMT)	**8 Postdeadine Submissions Deadline**
9 October 2012	**9 Postdeadline Author Notification Sent**
14-18 October 20121	**10 Present at Meeting**

Submission Categories.

FiO 1: Optical Design, Fabrication and Instrumentation

1.1 Coherence, Interferometry, Optical Testing, Diffractive and Holographic Optics

Topics include: coherence, interferometry, applications of interferometers, optical testing, digital holography for biomedical or nanophotonics applications, holographic micro- and nano-fabrication methods, 3-D holographic microscopy, 3-D optical image processing, 3-D display, computer generated holograms, dynamic holography, beam shaping, diffractive polarizing elements, polarization-independent diffractive elements, broadband diffractive elements, active diffractive elements, subwavelength optics, fabrication of diffractive and micro-optical elements, hybrid design with diffractive-refractive optics.

1.2 Three-Dimensional Structure Design, Fabrication, and Nanopatterning

The field of optical materials has been rapidly developing in recent years, promising to deliver new materials with exotic properties generally unattainable in nature. Full exhibition of their properties and functionalities relies on 3D control of metallic or dielectric structures in the nanoscale. This theme is focused on the design and fabrication of 3D optical materials and integrated circuits, which may include 3D photonic crystals, 3D metamaterials, and 3D optical circuits. Recent progress may bring new synthesis techniques that enable nanoscale spatial control in three dimensions. On the other hand, scalable, fault-tolerant designs and architectures that can lead to large-scale fabrication are also of great interest. The theme also includes optical

nanolithography, EUV lithography, maskless lithography, plasmonic imaging and metamaterials, nanoimprint technology, self-assembly nanopatterning, organic electronic device patterning, lithography for display technology, flexible electronic devices, etc.

1.3 Optical Design and Unconventional Polarization

The polarization of light plays an important role in optical science and engineering. Recently there is an increasing interest in beams with spatially inhomogeneous state of polarizations. New effects and phenomena have been predicted and observed for light beams with these unconventional polarization states. The topics of this theme include but are not limited to: description and characterization of unconventional polarization states (including radial polarizations, azimuthal polarizations, and other types of polarization vortices); creation of unconventional polarization states including active unconventional polarization sources; the interaction of nanostructures with polarized light; ray tracing and optical design with spatially variant polarizations; polarization aberrations in optical design and instrumentation, polarizing in tissue scattering, biomedical imaging, and bio-optics; retrieval techniques in imaging polarimetry.

1.4 Wavefronts and Aberrations: Engineering, Sensing and Applications

This theme is intended to promote technical exchange in the sciences and engineering of optical wavefronts and aberrations with broad coverage ranging from theory, algorithm developments, numerical simulations, to hardware implementation and applications. The topics to be covered include but not limited to: aberration theory; orthogonal polynomials in wavefront and aberration analysis, optical design, optical testing and wavefront sensing; orthogonal polynomials descriptions for optical systems with circular, annular, hexagonal, and other pupil shapes; design and fabrication of freeform optics; effective modeling and measurement methods for freeform optics; conventional wavefront sensing techniques; image-based computational wavefront sensing techniques (e.g., phase-retrieval and phase-diversity); compressive sensing techniques; various estimation approaches; applications in adaptive optical systems and optical instrumentation.

1.5 Adaptive Optics for Vision and Imaging (Joint with FiO8)

This theme is intended to provide a forum for the technical discussions of adaptive optics enabled systems for vision sciences and imaging. The topics include but not limited to the development and application of adaptive optics enabled imaging techniques such as adaptive optics scanning laser ophthalmoscope, adaptive optics optical coherence tomography, and other innovative adaptive optics based systems for the functional and structural study of human eyes, imaging mechanisms of the optical system of the human eyes, vision correction, retinal imaging, and their clinical applications.

1.6 General Optical Design and Instrumentation

Scope includes but not limited to: Design of new optical elements and systems, aberrations, adaptive optics, wavefront sensing, wavefront correction, adaptive optics for the eye, design, testing, and systems analysis of displays, including backlit LCD/LED, 3D, OLED, projection, novel methods, etc. applications of displays, Optical technologies for display and astronomical instruments.

FiO 2: Optical Sciences

2.1 Wavefront Engineering and Sensing

Generating and sensing extended wavefronts of arbitrary shapes has become increasingly important with the advances in of temporal shaping methods, the advent of sources with extended optical spectra and innovative high-resolution detection schemes. This theme explores progress in advanced techniques for wavefront engineering and shaping as well as sensing mechanisms in the optical sciences and applications.

2.2 Advanced Fiber and Solid State Laser Technologies and Applications

Fiber laser technology continues to produce rapid improvements both high average and high peak power. Techniques such as coherent fiber addition promise access to applications traditionally reserved for bulk laser systems. Simultaneously, advances in solid-state laser technology such as thin-disk lasers and ceramic materials open avenues for much higher average power systems.

2.3 Laser-driven Electron and Light Sources

We are witnessing continuing advances in the science and technology of laser acceleration of electrons, with a goal to replace or augment conventional particle accelerators. Innovations to enable improved electron injection, stability, and accelerator staging are some of the most active research areas. Such sources are particularly suitable for increasing the brightness of future advanced light sources, both in tabletop form and in larger facilities.

2.4 General Optical Sciences

Scope includes but not limited to general optical sciences. Topics which do not fit in well with the other specific themes should be submitted to this theme.

FiO 3: Optics in Biology and Medicine

3.1 Optical Trapping and Manipulation

Optical trapping is an established method for study of single-cell behavior in solution. New developments in the field enable exquisite measurements of forces on the order of fN, enabling study of single molecules. The use of fiber optics to create optical traps is a recent exciting advance. Integration of holographic methodologies enables researchers to perform multiplexed experiments on hundreds of trapped particles. Recent fusion of optical trapping technologies with other microscopies (e.g., Raman), enables scientists to take advantage of the strengths of each microscopic technique, to yield integrated information on cellular and molecular behavior. Submissions on these topics are strongly encouraged, as well as on the use of optical trapping and manipulation to perform biomechanical measurements (i.e., microrheology) and on novel beam configurations.

3.2 Biophotonics and Optofluidics for Point-of-Care and Global Health Applications

The explosive growth in LEDs, consumer-grade digital imaging, and cellular technologies has led to development of low-cost imaging platforms based on digital cameras and cell phones. The potential to use these platforms for on-site diagnostic tests in resource-poor areas across the globe is considerable. In addition, the growth in microfluidic/lab-on-a-chip technologies enables development of novel combined optical/microfluidic approaches to achieve point-of-care diagnostics. Submissions on innovative optical technologies and methodologies that are deployable, robust, and easy to use, are strongly encouraged.

3.3 Microscopy and OCT (Joint with FiO 1)

The fields of optical microscopy and optical coherence tomography remain at the forefront of biophotonics and medical optical imaging. The spatial resolution and exquisite sensitivity of these technologies to sources of both endogenous and exogenous contrast, enable scientists to push the boundaries of what is currently known about the structure and function of in-vitro and in-vivo systems. With use of novel superresolution techniques and a wide array of molecular probes and nanostructures, study of single molecules is possible. Advances in light sources and data-acquisition schemes enable real-time microscopy and OCT. Submissions on innovative technology research and the biological and medical applications of microscopy and OCT, are strongly encouraged.

3.4 Methods for Tissue Imaging and Therapy

Due to the interdisciplinary nature of biophotonics research projects, technologies and methodologies from both biology and optics are being combined to yield groundbreaking findings. This is a broad theme related to tissue imaging, spectroscopy, therapy and a range of light-tissue interactions. As evidenced by the increasing number

of high-profile journals that describe experimental methods and protocols, there is a clear growing demand for dissemination of innovative, unique methods to the scientific community. Submissions that are designed to disseminate details on innovative methods, analyze system capabilities and illustrate potential applications are strongly encouraged. Topics which do not fit in well with the other specific themes should be submitted to this theme.

FiO 3.5: General Optics in Biology and Medicine

Topics which do not fit in well with the other specific themes should be submitted to this theme.

FiO 4: Optics in Information Science

4.1 Coherence and Quantum Imaging

Classical and quantum optical correlation effects are becoming integral part of applied optical sciences. At the same time quantum optics is inspiring the development of novel concepts for classical optical information processing. Methods to encode information on the classical or quantum statistics of light provide a means to transmit information in novel and robust ways, to encode and to process that information. The effects of interaction with the environment are also encoded in the quantum and classical correlations of light and so the correlations may be the basis of imaging the medium. Examples include variable coherence imaging and ghost imaging. Contributions are solicited on topics in coherence and quantum optics that pertain to imaging. Examples include but are not limited to spatial coherence imaging, ghost imaging, and propagation in random media.

4.2 Image and Information Processing in Biooptics

Interrogation of biological systems with light presents unique opportunities and challenges. Contributions are sought that address the particular issues of imaging, diagnosing, transmission/reception of information via an optical field, and otherwise interrogating biological samples and the subsequent analysis and processing of data from biological samples. Examples include phase retrieval in bioimaging, image analysis, optical modulation, data multiplexing, the transmission of beams through various media.

4.3 Generalized Imaging and Non-Imaging Techniques for Diagnostics and Sensing Including Plasmonics

Progress in the design of micro- and nano-optical structures to support and tailor the behavior of plasmons, together with advances in manufacture of three-dimensional microstructures, have opened to avenues in the

control of the electronic-electromagnetic field. Plasmonic interactions offer means to enhance local fields and transport energy in ways that enable new sensing and imaging technologies. Traditionally, optical information referred to the information contained in an image gathered by a standard geometrical imaging system. Modern techniques, however, have been developed to extract additional information from an optical signal, to form images in unconventional ways, and to probe specific questions without imaging. The combination of imaging methods with nonimaging methods or even the combination of multiple modalities can offer much more useful information than isolated techniques. These techniques provide additional information that can be used for applications such as sensing and diagnostics, but also introduce additional challenges in interpretation and data collection. Contributions are solicited on optical information outside of the usual paradigm of image formation. This can include techniques that incorporate or reconstruct phase information from a signal such as holography, interferometry, and transport of intensity. It encompasses non-imaging diagnostic techniques, such as spectroscopy, novel tomographic techniques and inverse problems, and techniques that use unconventional strategies to extract an image from an otherwise noisy data set, such as acousto-optics imaging, classical ghost imaging and ballistic imaging, and sensing paradigms such as feature specific imaging and compressed sensing. We especially encourage methods involving plasmonics. Hybrid method that combine these emerging methods with conventional imaging are also sought.

4.4 Pupil and Wavefront Engineering

Modern production methods of optical elements and the availability of easily reconfigurable optical elements have made nonconventional optical systems with special or extreme performance readily practicable. This has proved pivotal for designing systems, which rely on a seamless integration of optical hardware and numerical signal post-processing. Pupil engineering for imaging systems with extended depth of field, plenoptic cameras, and sparse optical sensing are important examples of a wide and steadily growing range of optical applications. The importance of novel fabrication techniques is matched by efforts to determine suitable theoretical tools for the description and the design of both hardware and signal processing software. Generalized sampling schemes and phase-space optics exemplify these efforts. Emergent phenomena such as vortices and singularities also provide opportunities made possible by the close integration of theory and wavefront engineering and contributions in these areas are encouraged.

Contributions are solicited on optical information outside of the usual paradigm of image formation. This can include techniques that incorporate or reconstruct phase information from a signal such as holography, interferometry, and transport of intensity. It encompasses non-imaging diagnostic techniques, such as spectroscopy, novel tomographic techniques and inverse problems, and techniques that use unconventional strategies to extract an image from an otherwise noisy data set, such as acousto-optics imaging, classical

ghost imaging and ballistic imaging, and sensing paradigms such as feature specific imaging and compressed sensing. Hybrid method that combine these emerging methods with conventional imaging are also sought.

4.5 Parametric Imaging or Analysis

Novel methods for computing images or data by converting optical signals into parameters related to physical properties of a system. Examples include speckle fluctuation imaging of diffusive properties or cellular motility and function, elastography or strain imaging, refractive index mapping, particle/scatterer sizing.

4.6 Imaging Technologies and System Design, Components and Performance Metrics

Topics that do not fit into the above categories should be submitted to this theme. Representative examples of topics covered in this category include the display of imaging information including human factors, image quality assessment metrics, design of specialized optical components that enable new functions, advances in digital photography, multi-aperture imaging systems and image processing for these systems, and combined optical and focal plane design together with related digital processing for optimized system performance. Contributions are sought in analysis of optical systems in the context of information capacity and quality, image analysis, computed imaging and inverse problems.

FiO 5: Fiber Optics and Optical Communications

5.1 High Power and Agile Lasers

This theme will be devoted to novel trends and developments in high power lasers, as well as fast tunable lasers. Particular topics of interest include: mode combining in high power lasers, oscillators in short wave and mid – infra red region, as well as methods for increasing tuning speed and range of tunable lasers in general.

5.2 Photonic Crystal Fibers and Sensing

This theme covers two distinct, yet, as of recently, converging areas: (i) micro-structured (photonic crystal) fibers and (ii) sensing. While contributions in each of the areas in their own right are absolutely welcome, our intent is to motivate and give an overview of the recent breakthroughs in joint efforts in the two areas.

5.3 Optics in a Cloud (datacenters and the associated transmission)

This theme is devoted to short distant fiber / free space communications related to data-com/chip-communications, data centers and cloud computing. Methods leading to the power efficiency, novel network architectures, and aspects of transmission over multimode fiber are of high interest for this theme.

5.4 Enabling Technologies for High-Capacity Transport

This theme is focused on fiber optic communications. Specifically, it will be concentrated on the approaches and methods to countering the "capacity crunch" in these systems. The particular interest lies in onward looking transmission technologies relying on spatial multiplexing, novel modulation techniques and transmission in non-conventional bands, as well as the methods to increasing the overall system capacity.

5.5 General Fiber Optics and Optical Communications

Topics which do not fit in well with the other specific themes should be submitted to this theme.

FiO 6: Integrated Photonics

6.1 Silicon Photonics

Silicon has emerged as a preeminent platform for photonic devices and photonic integration, offering advantages such as reduced footprint and reduced power consumption, wide functionality, and the possibility of integration with electronics. The focus of the theme will be on silicon active and passive devices, silicon integrated photonics, silicon micro- and nano-photonics and their applications.

6.2 Active and Functional Metamaterials

Varied functionalities such as negative refraction, lensing, chirality, cloaking, and transformation optics have been demonstrated in the artificially structured media known as metamaterials, while plasmonic interactions have been used both for the manipulation of electromagnetic fields on sub-wavelength length scales as well as for the enhancement of linear and nonlinear effects. The theme solicits contributions focused on the design, fabrication, and properties of plasmonic and metamaterial structures or devices.

6.3 Nanophotonics and Integrated Photonics and Plasmonics

Photonic and plasmonic devices designed and fabricated at the nano-scale offer the promise of high-density integrated photonics as well as a variety of novel effects and applications. The theme will focus on active and passive devices and structures at the nano-scale, sub-wavelength optics, micro- and nano-cavities, waveguides, modulators, and emitters. Linear or nonlinear properties and effects, and a range of applications, from sensing to shaping and controlling the behavior of light, are also within the scope of the theme.

6.4 Bioinspired Photonic Devices (Joint FIO 3)

There are numerous examples of photonic devices that have been inspired by biological systems or that utilize biological processes for their fabrication. The most common example is the compound insect eye which are multi-facetted structures that permit wide field of view imaging with lens systems of varying complexity. Biological processes such as self-assembly are present in liquid crystals and lead to many of the important properties exhibited by this class of materials. In more recent times, appreciation of the properties of optical nano-structures have led to pigment in paints, ideas on how to develop nano-lasers and other light emitting devices, and new schemes for photodetectors and image processing schemes. The theme of this session will be an examination of the whole spectrum of photonic devices that have some connection with biological structures and processes.

6.5 Integrated Photonics for High Capacity Communications (Joint FIO 5)

The integration of numerous photonic devices such as modulators, array waveguide gratings, sources, etc. on a chip promises to provide improved efficiency, reduced size, and lower power and cost for switches, transmitters and receivers and facilitates the realization of multi-channel and multi-function implementations. The silicon platform is attractive not only because of the multitude of optical devices that can be integrated on large substrates but also because of its compatibility with electronic integrated circuits to control the optical devices. InP photonic integrated circuits (PICs) also can host numerous optical components including sources. The need for increased spectral efficiency, improved filtering, lower cost, impairment mitigation, and higher speeds are becoming critical issues satisfying todays bandwidth demands and have required coherent communication links . Si and III-V based PICs represent important technologies needed to expand optical communications bandwidths in the 100, 400, 1000 Gb/s ranges. This session will focus on recent advances in Si and III-V PICs that are aimed at enabling much higher communications bandwidths and presentations will review the current state of the art as well as evolving trends in this area.

FiO 7: Quantum Electronics

7.1 Integrated Quantum Optics (Joint with FIO 6)

Topics covered include: waveguides, couplers, interferometers, phase control, gates, etc.; sources: heralded (SPDC, SFWM, etc.) & triggered (single quantum emitter); single photon detectors, number resolving detectors, state tomography; circuit QED, various other integration schemes; implementation of algorithms using circuits; feedback and error control.

7.2 Hybrid Quantum Systems and Quantum-Enabled Sensors

Topics covered include: quantum optomechanics, NV centers in diamond and other areas of diamond nanoscience, quantum-enabled sensors (e.g., magnetometry), transduction of quantum states for hybrid integration, and quantum simulations.

7.3 Nonlinear Optics in Micro/Nano-Optical Structures

Papers are invited on optics in frequency (up/down) conversion, including infrared and ultraviolet generation, nonlinear devices (for applications such as switching, modulation, memories and logic), nonlinear optics in resonators, including frequency combs, nonlinear optics in metamaterials, and optomechanics.

7.4 Order, Disorder and Symmetry in Photonic Structures

Papers are invited on random lasers, aperiodic structures, quasi-crystals, imaging and transmission through random media, light localization, topologically protected transmission and disorder tolerant structures, and symmetry and optical nonreciprocity in photonic structures.

7.5 Non-plasmonic Polaritonics

This theme is devoted to linear and nonlinear effects due to formation of strongly coupled exciton-photon excitations (polaritons) in structures with modified photon vacuum (photonic resonators, periodic and aperiodic photonic structures). Papers dealing with such phenomena as manipulation of polariton dispersion, stimulated polariton scattering and polariton lasing, Bose-Einstein condensation of polaritons are invited.

7.6 Quantum Computation and Communications

Quantum-enhanced technologies in the photonic realm are showing considerable promise. Likewise, at a more fundamental level, interest in non-locality and non-realism remains high. This is a broad theme, which will accept experimental and theoretical reports ranging in subject from enabling technologies such as detectors and sources to implementations of light-based quantum-information processing and communication protocols. This theme will also accept fundamental studies on non-classical aspects of light.

7.7 General Quantum Electronics

This is a broad theme related to laser physics, quantum mechanics, and light-matter interactions. This includes, but is not limited to, the following specific fields: quantum optics, nonlinear optics, meta-materials, random media, micro cavity design, and laser science and engineering. Submissions of both experimental and

theoretical work are welcome, with an emphasis which can range from fundamental to applied research, and which do not fit in the above-mentioned specific themes.

FiO 8: Vision and Color

8.1 High-Resolution Imaging of the Living Cornea

Understanding cornea structure has become increasingly important in recent years. The research has been driven by the rapid advances in refractive surgery, the treatment of keratoconus, and other cornea complications that can impact transparency, strength, structure and aberrations. This session will review some of the major advances that give valuable new insight into the biomechanics and optics of the cornea including OCT and multiphoton imaging. Contributions of research related to cornea and tear film are solicited. Contributions are solicited that discuss the optical design of eyes and factors in the evolution of eye design.

8.2 The Impact of the Chromatic Aberration on the Visual System

The measurement and correction of the eye's chromatic aberration play an important role in retinal development, retinal imaging and visual performance. This session will discuss our current knowledge of the eye's chromatic aberration along with several areas of renewed research (including improved measurement and correction techniques and the possible role of chromatic aberration in driving accommodation). Contributions are solicited that address chromatic aberration of the eye, including work on methods that measure, model or correct the eye's chromatic aberration, or studies on the impact of chromatic aberration on vision.

8.3 Applications of Physiological Optics to Vision and Color

The role of optics in vision and color science is very broad. Research ranges from optical models of the eye and methods for retinal imaging to the study of color vision and visual perception. Contributions are solicited across all areas of optics applications in vision and color science.

Contributions are solicited that discuss the use of fluorescent markers to study living systems. This may include, but is not limited to, methods of introduction and tracking and novel fluorophores for functional assays.

Laser Science Topics

1. Fundamentals and Applications of Photonic Crystals

The ability to fabricate structures on a nanometer distance scale is leading to exciting new possibilities in the field of photonics. One example is the fabrication of photonics crystals with controllable optical properties, such as the extreme values of the group velocity of light. Photonic crystals of this sort can be used to enhance the strength of nonlinear optical interactions and control the emission properties of quantum emitters located within the crystal. These and related ideas are to be explored.

2. Optical and Laser-Based Approaches in Chemical and Biological Sensing

This session addresses emerging research relevant to optical methods of biological and chemical detection or quantification. Specific focus is upon those techniques which improve detection limits, enable or enhance sensor specificity, improve device response time, and facilitate multi-target detection. Examples of such technologies include, but are not limited to, resonant cavity photonic structures, surface enhanced Raman spectroscopy (SERS), cavity ring-down spectroscopy (CRDS/CRLAS), laser-induced fluorescence or spectroscopy (LIF/LIBS), and on-chip or fiber-based microfluidic systems.

3. Solid-State Quantum Optics

Topic description to be announced.

4. Cold Atoms and Molecules

The study of cold and ultracold molecules has produced many remarkable results in the last few years. It appears that many of the long-sought goals of the work, e.g. dipolar many-body physics, ultracold chemical reactions, high-resolution spectroscopy, etc., are now within reach of experiment. Sessions will highlight these topics as well as explore the next generation of cold molecule experiments, which aim to produce cold molecular systems by entirely new techniques, such as direct molecular laser cooling, sympathetic cooling of molecular ions, and direct association to the ground state.

5. Optics and Alternative Energy Sources

Topic description to be announced.

6. Attosecond and Strong Field Physics

This session will focus on attosecond science and the physics underlying it. Topics include high harmonic sources, xuv and soft x-ray emission, and attosecond metrology. The study of atoms and molecules and solids using these sources, both on the attosecond and femtosecond time scales, will be highlighted.

7. Ultrafast Chemical Dynamics

This session focuses on the use of ultrafast laser sources to study the structure and dynamics of molecules. The sources include femtosecond visible and infrared lasers, high harmonic generation, recolliding electrons, x-ray free electron lasers, etc.

8. Physics with Ultrafast X-rays

The session focuses on the atomic and molecular physics problems that can be studied using novel ultrafast x-ray sources that include x-ray free electron lasers (XFEL) and high-harmonic sources.

9. Precision Measurements and Metrology Using Lasers

The last decade has seen a revolution in the way we can probe the physical world using lasers at the highest resolution and accuracy. Laser sources have now been refined in their frequency stability such that they can furnish phase stable radiation, probe optical transitions at the Hz level, and search for subtle physical phenomena such as the detection of gravitational waves. In addition, the methods of ultra-fast laser science have permitted the construction of absolute, referenced frequency combs of radiation that span large portions of the electromagnetic spectrum and allow a direct connection between currently defined microwave atomic time/frequency references and new reference transitions at optical frequencies. Together with the now established methods of laser cooling and trapping of atoms, precise measurements of physical constants, ultra accurate atom interferometry, and the development of a new generation of optical atomic clocks have now arrived. This session provides a survey of some of the exciting and frontline research being conducted in the area of precision measurements using laser sources applied in a number of areas. These presentations illustrate the realm of new measurements that can be attainable and our ability to advance our understanding of the physics together with opening new technology areas. The session is dedicated to the memory of the late Prof. Norman Ramsey (Harvard) who played a critical role in the development of atomic time standards and precision measurements. He also trained a new generation of scientists who are playing a key role in current laser based precision measurements.

10. Quantum Optics and Quantum Information

This session will focus on the quantum properties of light and the use of quantum systems for information processing and novel technological applications. It includes quantum optics and quantum processing, including applications of single photons, entanglement, and other non-classical effects.

11. Nano-opto-mechanics

The scope of this session is to provide updated progress of experimental realization, theoretical proposal/investigation, and numerical design of optomechanical phenomena in nanophotonic structures and their applications.

12. General Laser Science

Any other topics in laser science that do not fit into the other categories.

Science Educator's Day

EDAY 2012: Special FREE event for Middle and High School Educators

Wednesday, 17 October

5:00 p.m. - 8:00 p.m.

Lilac Ballroom, Rochester River Convention Center

This annual event focuses on effective and innovative approaches to science education, with an emphasis on hands-on, interactive classroom lessons. EDAY 2012 presents:

The Optics Suitcase Classroom Demonstration Kit!

Special Guest Speaker: Stephen D. Jacobs (University of Rochester, Senior Scientist, Professor of Optics and

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In 1999, Dr. Jacobs and the Rochester OSA Local Section developed the Optics Suitcase---a terrific demonstration kit that includes experiments that teach about optics in a fun, hands-on atmosphere. Since its introduction, the Suitcase Program has benefited thousands of students around the world through lessons in polarization, diffraction, selective reflection and "theme packets" which contain the individual experiments for students to take home to share with their friends and family. During this session, Dr. Jacobs will showcase the kit's lessons and demonstrations. This is a great opportunity to see these very popular and successful learning modules in action!

Please contact opticseducation@osa.org for more information.

Space is limited- please register online by Sunday, 7 October to reserve your place!

Download our event flyer to share with your colleagues!

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Most recorded sessions will be available for viewing a few days post presentation. Special presentations such as the Plenary and Special Symposia will be available approximately 7 business days post presentation. *All recordings will contain audio synchronized with the PowerPoint presentation.*

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Access both conference papers and recorded sessions through Optics InfoBase using the same login email address and password provided during the meeting registration process. Select the appropriate session, click on the abstract of the paper and view the video under the multimedia tabs. Access is currently limited to FiO/LS Full Technical Attendees only. If you need assistance with your login information, please use the "forgot password" utility or "Contact Help" link. If you registered onsite, please contact customer service for your password.custserv@osa.org

Technical Attendees

FiO/LS is the premier conference for the presentation and discussion of top quality research in the area of Optics and Laser Science. This highly regarded conference brings together academic experts and rising stars in the field. The conference offers the presentation of significant, cutting-edge research during the technical programming portion and provides tremendous networking opportunities through key professional and social networking events.

Short courses

Short Courses cover a broad range of topic areas at a variety of educational levels (introductory to advanced). The courses are taught by highly regarded industry experts in a variety of specialties. Short Courses are an excellent opportunity to learn about new products, cutting-edge technology and vital information at the forefront of your field. They are designed to increase your knowledge of a specific subject while offering you the experience of knowledgeable teachers.

Certificate of Attendances are available for those who register and attend a course. To request a Certificate of Attendance after the conference, please email cstech@osa.org with your name, the course name, conference name, and year.

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.

Short Courses Schedule

Sunday, 14 October, 9:00-12:30

~~**SC182 - Biomedical Optical Diagnostics and Sensing**~~ **- CANCELED**

SC306 - Exploring Optical Aberrations

~~**SC324 - Plasmonics**~~ **- CANCELED**

~~**SC366 - Coherence and Optical Imaging**~~ **- CANCELED**

Sunday, 14 October, 13:30-17:00

SC189 - Photonic Quantum-Enhanced Technologies

SC235 - Nanophotonics: Design, Fabrication and Characterization

~~**SC302 - MetaMaterials**~~ **- CANCELED**

Short Courses Descriptions

SC182: Biomedical Optical Diagnostics and Sensing - CANCELED

Sunday, 14 October 2012, 9:00 - 12:30

Instructor: Sebastian Wachsmann-Hogiu, *Univ. of California Davis, USA*

SC306 Exploring Optical Aberrations

Sunday, 14 October 2012, 9:00 - 12:30

Instructor: Virendra N. Mahajan, *Aerospace Corp., USA*

Description:

The quality of an optical system is determined by its aberrations. This course will explore the effect of aberrations on image quality. Starting with basic aberrations of optical systems, we will discuss how they affect central irradiance on a target, energy on a detector, and line of sight and resolution of a system. The importance of the use of Zernike polynomials in optical testing and design, spot diagrams in optical system analysis, and Strehl ratio for aberration tolerance will be covered. The chromatic aberrations and the polychromatic PSF and OTF will be explained.

Benefits and Learning Objectives:

This course should enable participants to:

- Acquire a working knowledge of aberrations and their effect on energy on detector, line of sight error and MTF.
- Determine aberration tolerance based on Strehl ratio and Rayleigh's quarter wave rule.
- Specify fabrication and assembly errors based on a certain aberration tolerance.
- Understand the significance and use of the Zernike polynomials in optical design and testing.
- Develop an effective working interface between system engineers/engineering managers and optical designers.
- Communicate effectively with optical engineers and designers.

Audience:
Anyone interested in acquiring a working knowledge of aberrations. Those who have a background in lens and optical system design or optical testing will also benefit from this course. Managers and system engineers will learn to communicate effectively with optical engineers and designers.

Instructor Biography:
Virendra (Vini) N. Mahajan, Ph.D., is a graduate of the College of Optical Sciences, University of Arizona, where he is an adjunct professor teaching courses on aberrations. He has 33 years of experience working on space optical systems, the last 25 with Aerospace Corp. He is a Fellow of OSA, SPIE and the Optical Society of India, and the winner of SPIE's 2006 Conrady award. He is the author of Aberration Theory Made Simple (1991), the editor of Selected Papers on Effects of Aberrations in Optical Imaging (1993), and the author of Optical Imaging and Aberrations, Part I: Ray Geometrical Optics (1998) and Part II: Wave Diffraction Optics (2001), all published by SPIE Press. He is also an associate editor of OSA's Handbook of Optics in the area of classical optics.

SC324 Plasmonics - CANCELED

Sunday, 14 October 2012, 9:00 - 12:30
Instructor: Javier Aizpurua, S*panish Council for Scientific Research CSIC-UPV/EHU and Donostia International Physics Center DIPC*, *Spain*

SC366 Coherence and Optical Imaging - CANCELED

Sunday, 14 October 2012, 9:00 - 12:30
Instructor: Thomas Brown; *Univ. of Rochester, USA*

SC189 Photonic Quantum-Enhanced Technologies

Sunday, 14 October 2012, 13:30-17:00

Instructor: Ian Walmsley; *Univ. of Oxford, UK*

Description:

This course will provide a tutorial overview of the sorts of enhancements that quantum physics can provide for technology, and a short survey of applications and potential applications. These will include quantum interferometry and metrology, microscopy, communications, cryptography, frequency standards and clock synchronization, as well as computation and information processing. The rudiments of quantum mechanics needed to understand the technology will be covered, focusing particularly on quantum interference and entanglement in optics, as well as laboratory measurement methods.

The ideas concerning the application of these principles to the enhancement of important technologies will then be discussed. One of the critical issues in this area is how to design schemes that are robust with respect to unavoidable environmental noise. The critical practical issues that confront real-world implementation of these concepts are many, and important performance parameters that might limit the utility of quantum-enhanced technologies will also be examined.

Benefits:

This course should enable you to:

- Understand some basic ideas of quantum mechanics relevant to technology.
- Describe key issues related to several classes of applications.
- Explain fundamentals of the technological applications that can benefit from quantum enhancement.
- Discuss the limitations to performance.
- Follow the progress of the field in the future.

Audience:

The course is intended for those would like to gain a basic understanding of the ways and means by which quantum mechanics can be used to enhance technologies that are critical to the modern world. Some knowledge (a college course at an intermediate level) of quantum mechanical concepts and optics is recommended.

Instructor Biography:

Ian Walmsley is the Hooke Professor of Experimental Physics and Pro-Vice Chancellor for Research at the

University of Oxford. He was educated at Imperial College, University of London, and the Institute of Optics, University of Rochester. His research is in the area of quantum optics and quantum control, using the tools of ultrafast optics.

SC235 Nanophotonics: Design, Fabrication and Characterization

Sunday, 14 October 2012 13:30 – 17:00
Instructors: Joseph W. Haus, *Univ. of Dayton, USA*

Description:
Nanophotonics is an emerging multidisciplinary field that deals with optics on the nanoscale. Recent progress in nanophotonics has created new and exciting technological opportunities. The interaction of light with nanoscale matter can provide greater functionality for photonic devices and render unique information about their structural and dynamical properties. This nanophotonics course examines the key issues of optics on the nanometer scale. The course covers novel materials, such as photonic crystals, quantum dots, plasmonics, and metamaterials and their applications; it then identifies and explains selected fabrication and synthesis techniques. Photonic devices that exploit nanoscale effects, such as nonlinear optical effects and quantum confinement, will be discussed. Finally, various nanocharacterization techniques used in metrology, nondestructive evaluation and biomedical applications will be explained.

Benefits and Learning Objectives:
This course will enable the participants to:

- Explain the basic linear and nonlinear optical properties of photonic crystals, metals and metamaterials.
- Learn how nanoscale effects are exploited in photonic devices.
- Discuss nanofabrication and design tools.
- Learn the principles of nanocharacterization tools.
- Describe computational and modeling techniques used in nanophotonics.
- Identify the latest advances in the field of nanophotonics.

Audience:
This course is intended for optics professionals who are interested in learning the fundamentals of nanoscale materials and light-matter interactions, nanophotonic devices, fabrication, synthesis and nanocharacterization techniques

Instructor Biography:

Joseph W. Haus is professor and director of the Electro-Optics Program at the Univ. of Dayton. He is an OSA, APS and SPIE fellow. His current research is concentrated on the linear and nonlinear optical properties of heterogeneous materials, especially pulse propagation and nonlinear effects in metamaterials and metallodieletrics, coherent laser radar imaging, and coherent light sources from THz to UV based on electromagnetic parametric conversion and resonance effects.

SC302: MetaMaterials - CANCELED

Sunday, 14 October 2012, 13:30 - 17:00

Instructor: Vladimir M. Shalaev, *Purdue Univ., USA*

Special Events

OSA Division and Technical Group 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. Please check back regularly for more information. If you are interested in organizing an activity at FiO for your respective technical group, please contact your group chair or contact OSA at tgactivities@osa.org.

Confirmed technical group meetings include the following:

Fabrication, Design and Instrumentation Division Meeting

Sunday, 14 October, 19:00 – 20:00
Highland F, Rochester Riverside Convention Center

Refreshments provided.

Business Meeting

Chaired by Guoqiang Li, Division Chair, this is an opportunity to discuss issues pertinent to the division, meet the current division leaders, and identify potential areas for growth and volunteer involvement.

Applications of Visual Science Technical Group Development Meeting

Monday, 15 October, 18:00 – 19:00
Highland A, Rochester Riverside Convention Center

Refreshments provided.

The purpose of this meeting is to discuss possible initiatives and an organizational structure that can be used to enhance the visibility and utility of the technical group for its members. This may include online networking, newsletters, student or member awards, social get-together events at OSA meetings, and more. Initially, this forms part of a 6 month pilot trial but it is envisaged that the increased group activities can propel further activities in the future.

Holography and Diffractive Optics Technical Group Meeting

Monday, 15 October, 18:00 – 19:00
Highland F, Rochester Riverside Convention Center

Refreshments provided.

Guest Speaker: Byoungho Lee, Seoul National Univ., Korea; "3D Display and Imaging: Overview of Some Recent Works and Issues."

In this presentation, Lee will overview some recent interesting works of several research groups on 3D display and imaging such as frontal projection parallax barrier technology, see-through 3D display, computational autostereoscopy, human factor issues and reconstruction of wavefronts with low coherent light or scattered media.

In addition, issues pertinent to the technical group will be discussed, including identifying potential areas for growth and volunteer involvement.

Biomedical Optics Division Happy Hour

Monday, 15 October, 18:00 – 19:00
Highland D, Rochester Riverside Convention Center

Refreshments provided.

Interested in finding out about activities in the Biomedical Optics division? Come to this networking reception to meet division and group leaders, get updated on a number of activities, and sign up for a town hall meeting in November.

Photonics and Opto-Electronics Division Social

Monday, 15 October, 18:30 – 20:00
Grand Ballroom B&C, Hyatt Regency

Dinner provided, free but registration required

Interested in finding out about activities in the Photonics and Opto-Electronics division? Come to this networking event to meet division and group leaders, find out more about the division, and get involved with future group activities. If interested in attending, please RSVP at TGActivities@osa.org.

Special Symposia-The Future of Optics: A Perspective at Emil Wolf's 90th Birthday

Sunday, 14 October, 16:00 - 18:00
Lilac Ballroom, Rochester Riverside Convention Center

The year 2012 marks Emil Wolf's 90th birthday. The OSA would like to congratulate Prof. Wolf and wish him well on this occasion. Over his 90 years he has had tremendous impact across all of optics. His service to the community, the OSA, and the University of Rochester has left strengthened institutions and vibrant intellectual communities. In his honor we will have a special symposium with distinguished speakers on the future of four areas where Prof. Wolf has made special impact: inverse problems, coherence and quantum optics, physical optics, and optics at the University of Rochester.

FIO/LS Welcome Reception

Sunday, 14 October, 18:00 - 19:30
Galleria and Riverside Court, Rochester Riverside Convention Center

Complimentary to all Technical Conference Attendees: Get the FiO 2012/LS XXVIII meeting off to a great start by attending the welcome reception! Meet with colleagues from around the world and enjoy light hors d'oeuvres.

Minorities and Women in OSA (MWOSA) Breakfast

Monday, 15 October, 07:00 - 08:00
Grand Ballroom A, B, & C, Hyatt Regency Rochester

Guest Speaker: Mrs. Jennifer Kruschwitz; "The Consultant's Roadmap: How to Start the Journey, Navigate, and Interpret the Important Signs."

Our guest speaker for this event is Mrs. Jennifer Kruschwitz. Fourteen years ago, Jennifer Kruschwitz launched herself into the world of self-employment. Throughout the years she has learned a lot about preparing to leave the corporate nest, networking, dealing with difficult people, time management, failure, success, more failure, more success, tax audits, and everything that has to do with keeping one's sanity when working for yourself. She hopes to share some of her most important tips to help anyone prepare for a similar journey.

Questions? Email mwosa@osa.org.

Plenary Session and Awards Presentation

Monday, 15 October, 08:00 - 12:00

Lilac Ballroom, Rochester Riverside Convention Center

The 2012 Joint FiO/LS Awards Ceremony and Plenary Session will feature two world-renowned speakers, David R. Williams, *Univ. of Rochester, USA* and Paul Corkum, *National Research Council* and *Univ. of Ottawa, Canada*. More information coming soon.

Laser Science Symposium on Undergraduate Research

Monday, 15 October, 12:00 - 18:00

Poster Session - Riverside Court, Rochester Riverside Convention Center

Technical Session Highland B, Rochester Riverside Convention Center

This special DLS annual symposium is rapidly becoming one of the most successful DLS traditions (this year's is the 12th 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.
Organizer: Harold Metcalf, *Stony Brook Univ., USA*

Tours for OSA Members and their Families

Laboratory for Laser Energetics

Monday, 15 October, 15:30 - 18:30

On Monday, 15 October 2012, OSA Members, Families and Friends are invited to join other FiO/LS conference attendees in a special guided tour of the internationally renowned Omega Laser Facility at the University of Rochester's Laboratory for Laser Energetics (LLE). The LLE has conducted inertial confinement fusion experiments since the early 1970's. Participants will hear a presentation about the facility and see the OMEGA and OMEGA EP lasers. Depart from the front of Rochester Riverside Convention Center at 15:30. Registration is closed.

National Museum of Play

Tuesday, 16 October, 10:00 - 12:00

On Tuesday, 16 October 2012, kids of all ages can enjoy the National Museum of Play's highly interactive collections of classic and modern toys, games and electronic games, including the eGameRevolution, an original, highly interactive exhibit produced by The Strong's International Center for the History of Electronic Games (ICHEG). Play your way through the history of video games from the dawn of *Pong* to today's hot gamer trends, join in dodge ball and other games on an LED Lightspace floor, and create artwork on a gigantic Lite Brite-like pixel wall. Depart from the Rochester Riverside Convention Center at 10:00.

Events are sponsored or cosponsored by the OSA Members, Family and Friends Program and are free to OSA members and their families [LLE tour is free to all participants.] Children are welcome at both events.

OSA Network of Entrepreneurs (ONE) Session

Tuesday, 16 October, 10:00 - 13:30
Grand Ballroom C, Hyatt Regency Rochester

If you've ever wondered what it takes to start your own company, or if you have innovative ideas that have business applications, join OSA for the OSA Network of Entrepreneurs Session!

OSA Network of Entrepreneurs events provides students and young professionals from around the globe with a forum to discuss the challenges and opportunities of start-up enterprises and to hear first-hand from successful optics entrepreneurs. This meeting will feature high-powered speakers, a panel session and lots of time for attendee participation!

Confirmed presenters include Dr. Milton Chang, Managing Director of *Incubic Management, LLC*, Dr. Laura Ann Weller-Brophy, Chief Executive Officer of *FluoroLogic, Inc*. and Dr. Michael G. Morris, Chief Executive Officer of *Apollo Optical Systems, Inc.*

FIO Poster Sessions

Tuesday, 16 October, 12:00 - 13:30
Wednesday, 17 October, 12:00 - 13:30
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. Plan on attending these interactive and exciting sessions.

OSA Fellow Members Luncheon

Tuesday, 16 October, 12:30 - 14:00

Regency Ballroom, Hyatt Regency Rochester

All OSA Fellow, Fellow Emeritus and Honorary Members will receive invitations to this annual event. A reply will be needed by Friday, 5 October 2012 to reserve a place at the luncheon. We hope that you will be able to join us!

Town Hall Discussion U.S. National Academy of Sciences Report: Optics and Photonics: Essential Technologies for Our Nation

Tuesday, 16 October, 13:30 - 14:30

Empire Hall, Rochester Riverside Convention Center

Sponsored by the OSA Public Policy Committee

In August, the National Academy of Sciences (NAS) released the report, Optics and Photonics: Essential Technologies for Our Nation by the Committee on the Harnessing Light. Please join the OSA Public Policy Committee for a town hall discussion with representatives from the NAS and National Science Foundation as well as Harnessing Light 2 Committee members to hear first-hand the need for the report, the findings, as well as current and future global innovations and technological opportunities enabled by optical science. Audience members will have an opportunity to ask questions of the panelists.

Meet the Editors of the APS Journals

Tuesday, 16 October, 15:30 - 17:00

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.

Corporate Networking Reception and Special Business Presentations

Tuesday 16 October 16:00-18:00

Empire Hall, Rochester Riverside Convention Center

Sponsored by Corning, Inc.

Presented by OSA Corp Associates and OIDA

Complimentary to attendees!

After the exhibit hall closes on Tuesday, join your colleagues for a 2 hour complimentary networking reception and business program. The session starts with a networking reception – drinks and hors d'oeuvres will be served – followed by a special presentation focusing on Harnessing Light II and Market Overviews. The program concludes with the Executive Speaker Series featuring an interview with Michael J. Cumbo, Ph.D., President, IDEX Optics & Photonics.

The program concludes with the Executive Speaker Series, an interview program with a prominent leader in our industry, Michael J. Cumbo, Ph.D., President, IDEX Optics & Photonics.

Schedule as follows:

16:00 – 16:20 – Corporate Networking Reception
16:20 – 17:00 – Update and Outlook for the Optics Market
17:00 – 17:10 – Networking Break
17:10 – 18:00 – Executive Speaker Series

Update and Outlook for the Optics Market

Tuesday 16 October, 16:20 - 17:00
Empire Hall, Rochester Convention Center

OIDA will present some highlights of the optics and optoelectronics market, and what to expect in the market in the coming year. The presentation will also discuss the market opportunities described in the newly released report from the Harnessing Light Committee from the National Academies. How big are the opportunities and what should companies expect now that the report is complete?

Executive Speaker Series and Reception

Interview with Michael J. Cumbo, Ph.D., President, IDEX Optics & Photonics
Tuesday, 16 October, 17:00 –18:00
Empire Hall, Rochester Riverside Convention Center

Join us for the Executive Speaker Series, featuring Michael J. Cumbo, President of IDEX Optics & Photonics (IOP). IOP currently consists of three business units that are enabled by high performance thin-film optical coating technologies: ATFilms (Boulder, CO), CVI Melles Griot (13 international sites; headquartered in Albuquerque, NM), and Semrock (Rochester, NY). Prior to joining IDEX in 2009, Dr. Cumbo held executive management positions at three venture capital funded high tech startup companies (NanoGram Solar, Raydiance, and BinOptics) and at three publicly traded California optics companies: Coherent (COHR), JDS Uniphase (JDSU), and Optical Coating Laboratory, Inc. (OCLI). In the early stages of his career, he served in engineering positions at Bausch & Lomb and Eastman Kodak. Dr. Cumbo earned a BS in physics, an MS in optical engineering and a PhD in optics from the University of Rochester, and an MS in electrical engineering from Rochester Institute of Technology.

Register now!

Division of Laser Science Annual Business Meeting

Tuesday, 16 October, 18:00 - 19:00
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, 16 October, 18:00 - 19:00
Highland F, Rochester Riverside Convention Center

Learn more about OSA and join the OSA Board of Directors for the Society's annual business meeting. The 2011 activity reports will be presented and the results of the Board of Directors election will be announced.

OSA "DISCO" Member Reception

"Let's Get Groovy Baby"
Tuesday, 16 October, 19:00 - 20:30
Lilac Ballroom, Rochester Riverside Convention Center

Complimentary for all OSA Members

"Grab your love beads, your old forty-fives.
Dust off your bell bottoms, for a party that jives.
Let's recall the good times, the memories that last.
Join us at the DISCO Member Reception for a BLAST FROM THE PAST!"

The hip and funky crew at OSA cordially invites all OSA Members to attend the OSA "DISCO" Member Reception. Enjoy a special evening of beverages, music, appetizers and dancing the night away with your friends and colleagues. Costumes and/or accessories are encouraged—the funkier, the better!

Please bring your conference registration badge or OSA Membership card; if you join OSA on-site, please bring your receipt.

Laser Science Banquet

Tuesday, 16 October, 19:00 - 22:00
Max of Eastman Place

Join your colleagues for the annual LS Banquet. Tickets are required for this event and can be purchased when you register for the meeting. There will be an after dinner lecture, "The Unreasonable Photon", presented by Professor Ian Walmsley of the Univ. of Oxford, UK.

FIO Postdeadline Papers
Wednesday, 17 October, 18:30 - 20:00
Locations: TBD

The FiO 2012 Technical Program Committee will accept 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.

Science Educators' Day (EDAY)
Wednesday, 17 October, 17:00 - 20:00
Lilac Ballroom, Rochester Riverside Convention Cetner

This annual event focuses on effective and innovative approaches to science education, with an emphasis on hands-on, interactive classroom lessons. EDAY 2012 presents:

The *Optics Suitcase* Classroom Demonstration Kit!
Special Guest Speaker: Stephen D. Jacobs (University of Rochester, Senior Scientist, Professor of Optics and Chemical Engineering)

In 1999, Dr. Jacobs and the Rochester OSA Local Section developed the *Optics Suitcase*---a terrific demonstration kit that includes experiments that teach about optics in a fun, hands-on atmosphere. Since its introduction, the Suitcase Program has benefited thousands of students around the world through lessons in polarization, diffraction, selective reflection and "theme packets" which contain the individual experiments for students to take home to share with their friends and family. During this session, Dr. Jacobs will showcase the kit's lessons and demonstrations. This is a great opportunity to see these very popular and successful learning modules in action!

Pre-registration is required. Please contact opticseducation@osa.org for more information.

Student Information

VIP Industry Leaders Networking Event: Connecting Corporate Executives, Young Professionals and Students

Tuesday, 16 October, 08:00 - 09:30
Grand Ballroom A/B, Hyatt Regency Rochester
No charge and includes a Hot Buffet Breakfast.

This session brings together Industry Executives to share their business experience – from how they started their careers and lessons learned along the way, to using their degree in an executive position – with Young Professionals and Students. The program starts with informal networking during breakfast and then transitions into "speed meetings" – small, brief visits with 5-6 executives to discuss careers, industry trends or other career topics.

Corporate Executives:
Rick Corey, *President, OpticsProfessionals*
Turan Erdogan, *CTO, IDEX Optics and Photonics*
Jennifer Kruschwitz, *President & Principal Engineer, JK Consulting*
Brian Samoriski, *President, Bristol Instruments*
Andy Germanow*, President, Germanow-Simon Companies*
Bill Hurley*, President, Rochester Precision Optics*
Paul Then, *Commercial Technology Director, Advanced Optics, Corning Incorporated*
Mark Tolbert*, President/CEO, TOPTICA Photonics Inc.*
Rick Plympton*, CEO and VP of Sales and Marketing, Optimax Systems, Inc.*

Check back often for updates.

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

To join the Young Professionals program, email yp@osa.org.

Sponsored by:

OSA Network of Entrepreneurs (ONE) Workshop

Tuesday, 16 October, 10:00 - 13:30
Grand Ballroom C, Hyatt Regency Rochester
Free of Charge - immediately following the VIP Industry Leaders Networking Event

If you've ever wondered what it takes to start your own company, or if you have innovative ideas that have business applications, join OSA for the 2nd Annual Network of Entrepreneurs (ONE) Workshop!

OSA Network of Entrepreneurs (ONE) events provide young professionals from around the globe with a forum to discuss the challenges and opportunities of start-up enterprises and to hear first-hand from successful optics entrepreneurs. This inaugural meeting will feature high-powered speakers, a panel session and lots of time for attendee participation!

View the confirmed speakers!

To join the Young Professionals program, email yp@osa.org.

FiO Poster Sessions

Tuesday, 16 October, 12:00 - 13:30
Wednesday, 17 October, 12:00 - 13:30
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

Student Activities

International OSA Network of Students North America Conference (IONS NA-4)

Wednesday, 10 - Friday, 12 October
City College of New York & Columbia University
New York City, NY, USA

IONS brings together students from all over the world to discuss the latest results in their research and to share their experiences in student chapter activities. IONS NA-4 will feature talks and activities geared towards entrepreneurship, one of the most unique and successful aspects of the Bay Area! Registration is free, but a deposit is required. Most meals are included!

Submit your abstracts and register today! The registration deadline is 1 August 2012.
NOTE: All attendees are required to submit an abstract and present a poster.

Visit the website for more information on speakers, events and programs. You can also find us on Facebook- IONS NA-4 2012 New York City group.

Annual OSA Student Leadership Conference

Sunday, 14 October, 7:00 – 16:30
Grand Ballroom, Radisson Hotel Riverside Rochester

The invitation-only Student Leadership Conference brings together OSA Student Chapter leaders from around

the globe to network, present posters and learn about successful chapter management and the popular International OSA Network of Students (IONS).

Questions? Email chaptersandsections@osa.org.

Short Courses for Students!

Short Courses are designed to increase your knowledge of a specific subject while offering you the experience of experts in industry and academia. Register now to guarantee your seat. Please note that Student Leadership Conference attendees cannot attend short courses.

OSA/SPS Student Member Reception

Monday, 15 October, 18:30 - 20:00
Abilene, 153 Liberty Pole Way, Rochester, NY
Free of Charge

The OSA & SPS student member reception is free of charge and open to all OSA Student Members and all members of the Society of Physics Students. Attendees can enjoy refreshments and get to know colleagues from around the world during this fun social event.

Sponsored by:

Minorities and Women in OSA (MWOSA) Breakfast

Monday, 15 October, 07:00 - 08:00
Grand Ballroom A/B/C, Hyatt Regency Rochester
Free of Charge

Please join us for the annual Minorities and Women in OSA (MWOSA) Breakfast! This event is free for all who are interested in attending. Register and view the esteemed list of speakers. Questions?

Email mwosa@osa.org.

"Mission: Optibox" Student Chapter Competition

Tuesday, 16 October, 12:00 - 14:00
Exhibit Hall, Empire Hall, Rochester Riverside Convention Center

Every year, OSA challenges its Student Chapters to showcase their best ideas for youth education outreach during Frontiers in Optics. This year, chapters can earn a prize of $500 for participating in Mission: Optibox..

Use simple household items to create and present as many optics education demonstrations for children ages 10 to 14. All demonstration materials must be able to fit inside a standard size shoe box (11.5" x 7" x 3.75") at one time.

All FiO attendees are welcome to observe! Email chaptersandsections@osa.org for more information.

OSA Student Party

Tuesday, 16 October, 21:00 – 23:00
The Scotland Yard Pub, 187 St. Paul St., Rochester, NY
Free of Charge

All FiO student attendees are welcome to join in the fun! Tickets are first come, first served at the door.

Follow Student Events on Twitter

Watch for OSA's own student members tweeting and blogging on events and their own experiences at FiO! Blogs and tweets will be shared via the Conference Twitter stream #FiO12 and on the FiO Social Media Hub.

If you are interested in officially tweeting for FiO/LS, contact chaptersandsections@osa.org for more information.

Student Awards and Grants

Emil Wolf Outstanding Student Paper Competition

Submission Deadline: 15 May 2012

The Emil Wolf Outstanding Student Paper Competition recognizes the innovation and research excellence of students presenting their work during Frontiers in Optics (FiO) and honors Emil Wolf for his many contributions to science and the Optical Society. This program is administered by the OSA Foundation and sponsored by *Optics Communications* published by Elsevier. Additional support has also been provided by Physical Optics Corporation, the University of Rochester Physics Department, the Institute of Optics, and individual contributors.

Finalists are selected based on scores received during the standard FiO Technical Program Committee review. Status notification will be sent via email following the Committee's decision. A separate notification regarding paper acceptance will also be sent.

Finalists are judged based on their work's technical advances and value to the technical community of interest, and their skill of public presentation. The Review Committee will select one winner per submission category. Each winner will receive a complimentary OSA student membership, an award stipend of $300 USD and an award certificate. Results are announced after the conference.

Criteria for Eligibility

- The submitting author must opt-in to the competition during the regular submission process and follow all the instructions provided on the submission site.
- The presenting author must be an undergraduate or graduate student of an educational institution of collegiate grade who is devoting more than half-time to studies within the institution, at the time the paper was written.
- The paper must be submitted and accepted during the regular "call for papers" process. (Note: postdeadline papers are not part of this competition.)
- The paper must be presented orally by the student during the conference.

Review/Selection Process

All papers submitted to the competition will be reviewed during the standard Technical Program Committee (TPC) review process.

- Each subcommittee will select 2–3 finalists.
- The Competition Review Committee will attend the presentations of finalists in each subcommittee and select one winner per subcommittee.
- Announcement of the winners will be posted on the OSA Foundation website and in a press release following the conference.

Incubic/Milton Chang Travel Grant

Application Deadline: 6 August 2012 - EXTENDED TO 12 August 2012

Funded by an endowment from Milton and Rosalind Chang, this program provides 10 grants of up to $500 USD to students presenting papers at FiO. Grants are usually awarded to the presenter and/or first author of the paper.

All of the following information MUST be included in the grant application:

1. Letter of support from the student
2. Letter of support from the student's advisor
3. Estimated budget for the trip
4. Copy of the paper abstract
5. Mailing address and email address

Please note: Both letters of support should describe the importance of the applicant's work and must clearly demonstrate the need for the grant. Incomplete applications will not be accepted (sample application for reference).

Please email your application to: incubicmiltonchangtravelgrant@osa.org

If you do not have email access, you may mail your application to:
Incubic/Milton Chang Student Travel Grant Committee
The Optical Society
2010 Massachusetts Ave., NW
Washington, DC 20036

For more information: Member Services at +1 202.416.1430 or chaptersandsections@osa.org.

Jean Bennett Memorial Student Travel Grant

Submission Deadline: 10 August 2012

This program was established in memory of Jean M. Bennett, a highly decorated research physicist who was recognized for her contributions to the studies of optical surfaces and served as OSA's first female president. One grant of $1,000 USD will be awarded to a student presenting their work at FiO in recognition of their research excellence. This program is administered by the OSA Foundation and made possible through the generous support of Nanoptek Corporation, the Pennsylvania State University Department of Physics and individual contributors.

Criteria for Eligibility

- Applicant must be the presenter of a paper accepted at FiO
- Applicant must be an undergraduate or graduate student of an educational institution of collegiate grade who is devoting more than half-time to studies within the institution, at the time the paper was written.

Application Requirements

- Copy of the paper abstracted submitted to FiO
- Letter of support from your advisor or professor
- Statement explaining the value of attending FiO
- Your resume/CV

Applications for the program were due by 10 August 2012. Please email all the required documents to BennettGrant@osa.org

Robert S. Hilbert Memorial Student Travel Grants

Application Deadline: 10 August 2012

Established in 2009 by Optical Research Associates (ORA), now the Optical Solutions Group at Synopsys, as a memorial to ORA's former President and Chief Executive Officer Robert S. Hilbert, this program recognizes the research excellence of students in the areas of optical engineering, lens design and illumination design. One grant of $1,100 USD will be awarded to a student presenting their work at FiO. This program is administered by the OSA Foundation.

Applicant Criteria

- Applicant must be the presenter of an accepted paper; preference is given to oral presentations, but posters are eligible as well.
- Applicant must be an undergraduate or graduate student of an educational institution of collegiate grade who is devoting more than half-time to studies within the institution, at the time the paper was written.
- Accepted paper/poster must include research in the areas of optical engineering, lens design and/or illumination design.
- Applicants are encouraged to include graphics created using either CODE V® or LightTools®

Application Requirements

- Copy of the paper abstract submitted to FiO
- Letter of support from advisor or professor
- Statement explaining the value of attending FiO
- Your resume/CV

Applications for the program were due by 10 August 2012. Please email all the required documents to HilbertGrant@osa.org.

OSA Foundation Student Travel Grants

Application Deadline: 10 August 2012

The OSA Foundation is pleased to offer travel grants of $1,000 USD each to students working or studying in a qualifying developing nation who plan to attend FiO.

All grant program applicants must:

1. Work or study in a qualifying developing nation.
2. Be enrolled in an accredited undergraduate or graduate program
3. Demonstrate need for travel support and state the value of attending the conference
4. Agree that if they are selected as a grant recipient the OSA Foundation (OSAF) may use their name, photo and the information provided in their trip report to promote OSAF programs and solicit donations. This information may be used online, in print and email, and in other OSAF communication vehicles.

It is not required that the applicant is a conference presenter, but we encourage interested students to submit a paper for oral or poster presentation. Please visit the Submissions page for additional information and to submit your paper. You are not required to be an OSA Student Member to apply for a grant, but preference is given to members. View more information on OSA Membership.

Click here to apply for an OSA Foundation Travel Grant. Applications are due by 10 August 2012.

Please note: Applicants must apply for a visa, if required. OSA can send a letter of invitation for US meetings, but has no influence on the process. To request a letter of invitation please visit the invitation letters page and follow the instructions. Requests may be made online, via fax, or mail.

If you have any questions please contact us at foundationgrants@osa.org.