Frontiers in Optics 2008
Laser Science XXV

2008 FiO/LS Wrap-Up

FiO/LS 2008 was one of the strongest in recent history. This year's event, led by co-chairs Lukas Novotny of the University of Rochester and Karl Koch of Corning, again brought together the industry leaders who have shaped the field with those who will oversee the breakthroughs of tomorrow.

Conference highlights included several special events, with symposia honoring Arthur Schawlow and Charles Townes for their monumental paper 50 years ago, NASA's 50th Anniversary and Howard Schlossberg of the Air Force Office of Scientific Research. The Plenary and Awards Session was FiO's most highly attended event, and included keynote presentations from Nobel Laureate John Mather, Prof. Anton Zeilinger and award winners Peter Knight and James Bergquist. In addition to these special events, industry leader Emil Wolf gave his 50th consecutive presentation at an OSA Annual Meeting, a milestone that recalled many of the successes of his prestigious career.

The technical conference included 829 paper presentations on hot topics in optics such as 3-D virtual reality on mobile devices, new optics for improved solar power generators, a new optical method using algae to convert sunlight into biofuel and a new non-invasive tool for brain surgeons. Several Nobel Laureates were in attendance to present research and give remarks, including Nicolas Bloombergen, Steven Chu and Charles Townes, among others. Conference events drew a record 2,100 attendees and more than 100 exhibitors, while many sessions were standing-room only.

Next year's event is certain to build on this year's success!

2008 Frontiers in Optics Chairs

Karl Koch, *Corning Inc., USA*
Lukas Novotny, *Univ. of Rochester, USA*

Laser Science XXIV Chairs

John Kitching, *NIST, USA*
Lewis Rothberg, *Univ. of Rochester, USA*

Corporate Sponsors

Coldquanta
Corning Incorporated

JK Consulting
Optikos
Swamp Optics
Sydor Optics
Thorlabs

Grants

Air Force Office of Scientific Research (AFOSR)
National Institute of Standards and Technology (NIST)

About Annual

Join your colleagues in Rochester, New York, USA, for the Frontiers in Optics 2008/Laser Science (LS) XXIV conference uniting the entire optics community.

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

FiO/LS Pre-Conference Schedule

February 14, 2008	Call for Papers Submission Site Opens for FiO/LS 2008
May 27, 2008, 12:00 p.m. noon EDT (16.00 GMT)	FiO/LS Papers Submission Deadline
June 2008	Registration and Housing Open
July 2008	Authors of submitted papers are notified of acceptance/rejection
August 2008	FiO/LS 2008 Conference Program Available Online
October 3, 2008	Postdeadline Paper Submission Deadline
October 14, 2008	Authors of postdealine papers are notified of acceptance/rejection
September 17, 2008	Housing Deadline
September 25, 2008	Pre-Registration Deadline
October 19-23, 2008	FiO/LS held at the Rochester Riverside Convention Center

The Optical Society of America (OSA)

FiO 2008—the 92nd OSA Annual Meeting—and LS XXIV unite the OSA and American Physical Society (APS) communities for five days of quality, cutting-edge presentations, fascinating invited speakers and a variety of special events. The FiO 2008 conference will

also offer a number of Short Courses designed to increase participants' knowledge of a specific subject while offering the experience of insightful teachers. An exhibit floor featuring leading optics companies will further enhance the meeting.

The APS Division of Laser Science (DLS)

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

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

Future Dates

Year	Dates	Location
2009	October 11–15	San Jose, CA
2010	October 24–28	Rochester, NY
2011	October 16-20	San Jose, CA
2012	October 14–18	Rochester, NY

FiO/LS Committees

Frontiers in Optics Chairs

Karl W. Koch, *Corning Inc., USA*, **Conference Co-Chair**
Lukas Novotny, *Univ. of Rochester, USA,* **Conference Co-Chair**

Laser Science XXIV Chairs

John Kitching, *NIST*, *USA*, Conference Co-Chair
Lewis Rothberg, *Univ. of Rochester, USA,* Conference Co-Chair

FiO 1: Optical Design and Instrumentation

R. John Koshel***, Photon Engineering LLC, USA, and College of Optical Sciences, Univ. of Arizona, USA***, Co-Chair
Scott A. Lerner, ***Hewlett-Packard, USA,*** Co-Chair
Lahsen Assoufid, ***Argonne National Lab, USA***
Pablo Benitez, ***Univ. Politecnica de Madrid, Spain***
Peter N. Blake, ***NASA Goddard Space Flight Ctr., USA***

Thomas G. Brown, ***Univ. of Rochester, USA***
Bruce Dean, ***NASA Goddard Space Flight Ctr., USA***
Anurag Gupta, ***Optical Res. Associates, USA***
Alan Kost, ***Univ. of Arizona, USA***
Linda Lingg, ***MLD Technologies, LLC, USA***
Erik L. Novak, ***Veeco Instruments Inc., USA***
Jannick Rolland, ***Univ. of Central Florida, USA***
Regina Soufli, ***Lawrence Livermore Natl. Lab, USA***

FiO 2: Optical Sciences

Barry C. Walker, ***Univ. of Delaware, USA,*** Chair
Andrea Cavalleri, ***Univ. of Oxford, UK***
David H. Reitze, ***Univ. of Florida, USA***
Martin Richardson, ***CREOL, College of Optics and Photonics, Univ. of Central Florida, USA***
Scott T. Sanders, ***Univ. of Wisconsin-Madison, USA***
Azer Yalin, ***Colorado State Univ., USA***
Koichi Yamakawa, ***Japan Atomic Energy Agency, Japan***

FiO 3: Optics in Biology and Medicine

Urs Utzinger, ***Univ. of Arizona, USA,*** Co-Chair
Chris Schaffer, ***Cornell Univ., USA,*** Co-Chair
Joseph P. Culver, ***Washington Univ. in St. Louis, USA***
Hamid Dehghani, ***Dartmouth College, UK***
Andrew K. Dunn, ***Univ. of Texas at Austin, USA***
Seonkyung Lee, ***Physical Sciences Inc., USA***
Carlos López-Mariscal, ***NIST, USA***
Adam Wax, ***Duke Univ., USA***

FiO 4: Optics in Information Science

David Plant, ***McGill Univ., Canada,*** Chair
Alyssa Apsel, ***Cornell Univ., USA***
George Barbastathis, ***MIT, USA***
Uriel Levy, ***Hebrew Univ. of Jerusalem, Israel***
Mark Lucente, ***Zebra Imaging Inc., USA***
Dan M. Marom, ***Hebrew Univ. of Jerusalem, Israel***
Markus Testorf, ***Dartmouth College, USA***

FiO 5: Photonics

Inuk Kang, ***Bell Labs, Alcatel-Lucent, USA,*** Co-Chair
Juerg Leuthold, ***Univ. of Karlsruhe, Germany,*** Co-Chair
Ozdal Boyraz, ***Univ. of California at Irvine, USA***

Mihaela Dinu, ***Bell Labs, Alcatel-Lucent, USA***
Guifang Li, ***Univ. of Central Florida, USA***
Xiang Liu, ***Alcatel-Lucent, USA***
Paul Morton, ***Morton Photonics, USA***
Stanley Pau, ***Univ. of Arizona, USA***
Mark Shtaif, ***Tel Aviv Univ. and Aelis Photonics, Israel***
Chris Xu, ***Cornell Univ., USA***

FiO 6: Quantum Electronics

Colin J. McKinstrie, ***Bell Labs, Alcatel-Lucent, USA,*** Chair
Hui Cao, ***Yale Univ., USA***
Jason W. Fleischer, ***Princeton Univ., USA***
Johan Nilsson, ***Univ. of Southampton, UK***
Gennady Shvets, ***Univ. of Texas at Austin, USA***
Michael Vasilyev, ***Univ. of Texas at Arlington, USA***
Andrew White, ***Univ. of Queensland, Australia***
Nikolay Zheludev, ***Univ. of Southampton, USA***

FiO 7: Vision and Color

Joseph J. Carroll, ***Medical College of Wisconsin, USA,*** Chair
Lawrence Gregory Appelbaum, ***Smith-Kettlewell Eye Res. Inst., USA***
John L. Barbur, ***City Univ., UK***
Melanie C. W. Campbell, ***Univ. of Waterloo., Canada***
Matteo Carandini, ***Smith-Kettlewell Eye Res. Inst., USA***
Bill Geisler, ***Univ. of Texas, USA***
Kathy Mullen, ***McGill Univ., Canada***
Jay Neitz, ***Medical College of Wisconsin, USA***
Alex R. Wade, ***Smith Kettlewell Eye Res. Inst., USA***
Carol Westall, ***The Hospital for Sick Children, Canada***

FiO 2008 Symposia Organizers

David Atchison, ***Queensland Univ. of Technology, Australia***
Peter Blake, ***NASA Goddard Space Flight Ctr., USA***
Thomas G. Brown, ***Univ. of Rochester, USA***
Robert Boyd, ***Univ. of Rochester, USA***
Melanie C. W. Campbell, ***Univ. of Waterloo, Canada***
Mark Clampin, ***NASA Goddard Space Flight Ctr., USA***
Bruce Dean, ***NASA Goddard Space Flight Ctr., USA***
Michael Duncan, ***NRL, USA***
Jay M. Enoch, ***Univ. of California at Berkeley, USA***
Bob Guenther, ***Duke Univ., USA***
Vasudevan Lakshminarayanan, ***Univ. of Waterloo,Canada***

Svetlana Lukishova***, Univ. of Rochester, USA***
Martin Richardson, ***CREOL, College of Optics and Photonics, Univ. of Central Florida, USA***
Harley A. Thronson, ***NASA Goddard Space Flight Ctr.,USA***
Taco D. Visser, ***Vrije Univ., Netherlands***
Pieter Walraven, ***Emeritus TNO Human Factors, Soesterberg, Netherlands***

FiO 2008 Ad Hoc Committee

Per Adamson, ***Univ. of Rochester, USA***
Miguel Alonso, ***Univ. of Rochester, USA***
Andrew Berger***, Univ. of Rochester, USA***
Doug Goodman, ***Univ. of Rochester, USA***
Jonathan Marangos, ***Imperial College London, UK***
Alexis Spilman, ***Bausch & Lomb, USA***
Rosalind Wynne, ***Villanova Univ., USA***

APS Division of Laser Science Executive Committee

Executive Committee Officers

Mark A. Johnson, ***Yale Univ., USA,*** Chair
Nick Bigelow, ***Univ. of Rochester, USA,*** Chair-Elect
Warren S. Warren, ***Duke University, USA, Vice Chair***
Leo W. Hollberg, ***NIST, USA, Past Chair***
John T. Fourkas, ***Univ. of Maryland, USA, Secretary-Treasurer***
Jenny Magnes, ***US Military Acad., USA, Newsletter Editor***
Steven Rolston, ***Univ. of Maryland, USA, Divisional APS Councilor***

Executive Committee Members-at-Large

Steven Thomas Cundiff, ***Univ. of Colorado, USA***
Anne Myers Kelley, ***Univ. of California at Merced, USA***
Kurt Gibble, ***Pennsylvania State Univ., USA***
Roseanne Sension, ***Univ. of Michigan, USA***
Dana Z. Anderson, ***Univ. of Colorado, USA***
Antoinette Taylor, ***Los Alamos National Lab., USA***

Laser Science Session Organizers

Ray Beausoleil, ***HP Labs, USA***
Andrew Berger, ***Univ. of Rochester, USA***
Robin Cote, ***Univ. of Connecticut, USA***
E. J. Heilweil, ***NIST, USA***
Phillip Hemmer, ***Texas A&M Univ., USA***
Tobias Kippenberg, ***Max Planck Inst. for Quantum Optics, Germany***

Todd Krauss, ***Univ. of Rochester, USA***
Harold Metcalf, ***SUNY, USA***
Frank Narducci, ***Naval Air Systems Command, USA***
Lewis Rothberg, ***Univ. of Rochester, USA***
Cass Sackett, ***Univ. of Virginia, USA***
Michael Romalis, ***Princeton Univ., USA***
Nan Yu, ***JPL, USA***

Plenary Session

The FiO 2008/LS XXIV Plenary Session and Awards Ceremony is on Monday, October 20 from 8:00 a.m.–12:00 p.m.

Plenary Speakers
Awards Addresses
Awards Ceremony

John C. Mather
Senior Astrophysicist, NASA Goddard Space Flight Ctr.

From the Big Bang to the Nobel Prize and on to James Webb Space Telescope (PDF)

Abstract: The history of the Universe in a nutshell, from the Big Bang to now, and on to the future—John Mather will tell the story of how we got here, how the Universe began with a Big Bang, how it could have produced an

Anton Zeilinger
Professor of Physics, Univ. of Vienna
Director, Inst. of Quantum Optics and Quantum Information of the Austrian Acad. of Sciences

Photonic Entanglement and Quantum Information

Abstract: Research on entangled photons, originally motivated by questions on the foundations of quantum physics, gave rise to new experiments in quantum information science. Most recently, this includes long-distance quantum communication,

Earth where sentient beings can live and how those beings are discovering their history. Mather was Project Scientist for NASA's Cosmic Background Explorer (COBE) satellite, which measured the spectrum (the color) of the heat radiation from the Big Bang, discovered hot and cold spots in that radiation and hunted for the first objects that formed after the great explosion. He will explain Einstein's biggest mistake, show how Edwin Hubble discovered the expansion of the universe, how the COBE mission was built and how the COBE data support the Big Bang theory. He will also show NASA's plans for the next great telescope in space, the James Webb Space Telescope. It will look even farther back in time than the Hubble Space Telescope, and will look inside the dusty cocoons where stars and planets are being born today. Planned for launch in 2013, it may lead to another Nobel Prize for some lucky observer.

Biography: Dr. John C. Mather is a Senior Astrophysicist in the Observational Cosmology Laboratory at NASA's Goddard Space Flight Center. His research centers on infrared astronomy and cosmology. As an NRC postdoctoral fellow at the Goddard Institute for Space Studies (New York City), he led the proposal efforts for the Cosmic Background Explorer (1974-1976), and came to GSFC to be the Study Scientist (1976-1988), Project Scientist (1988-1998), and the Principal Investigator for the Far IR Absolute Spectrophotometer

quantum cryptography and all-optical quantum computation. Future trends include integrated micro-optics chips and satellite-based systems.

Biography: Anton Zeilinger works both experimentally and theoretically on the foundations of quantum physics. His central interests are its counterintuitive features and their consequences for experiment and possibly even quantum information technology. An essential focus of his work is entanglement, the deep connectedness of distant systems which Einstein called "spooky" action at a distance. He started the field of multi-particle entanglement, which has become a crucial ingredient for any future quantum computer. Another focus of his work is to investigate quantum features of massive particles and to study the transition between quantum mechanics and classical physics. Most recently, he began studies of the quantum behavior of real mechanical systems, like mechanical oscillators (micro-mirrors). Anton Zeilinger, born 1945 in Austria, has held positions at the University of Innsbruck, the Technical University of Munich, the Technical University of Vienna and at the Massachusetts Institute of Technology (MIT) and distinguished visiting positions at Humboldt University in Berlin, Merton College of Oxford University and the Collége de France in Paris. Among his many awards and prizes are an honorary professorship at the University of

(FIRAS) on COBE. He showed that the cosmic microwave background radiation has a blackbody spectrum within 50 parts per million, confirming the Big Bang theory to extraordinary accuracy. As Senior Project Scientist (1995-present) for the James Webb Space Telescope, he leads the science team and represents scientific interests within the project management. Dr. Mather is also Chief Scientist of the Science Mission Directorate (SMD) at NASA Headquarters, where he provides independent scientific advice on all aspects of the NASA science program. He is the recipient of many awards, including the Nobel Prize in Physics (2006) with George Smoot, for the COBE work.

Science and Technology of China and two honorary doctorates as well as the King Faisal Prize of Science, the German Order of Merit and a fellowship of the American Physical Society. Recently, he received the new international Isaac Newton Medal of the British Institute of Physics. Anton Zeilinger is currently Professor of Physics at the University of Vienna and Scientific Director of the Institute of Quantum Optics and Quantum Information of the Austrian Academy of Sciences.

Awards Addresses

The FiO 2008/LS XXIV Plenary Session and Awards Ceremony is on Monday, October 20 from 8:00 a.m.–12:00 p.m.

James Bergquist
NIST
2008 Arthur L. Schawlow Prize in Laser Science Recipient

Peter Knight
Imperial College London
2008 Frederic Ives Medal/Jarus W. Quinn Endowment Recipient

Single-Atom Optical Clocks

Abstract: Although time is considered a fundamental concept by many physicists, and even though its unit of measure can be constructed from other physical constants, most often time serves as no more than an arbitrary parameter to describe the mechanics of motion. However, the pursuit of better time-keeping devices provides a natural means for studying various aspects of nature, including the fundamental constants and the interaction of radiation and matter. In recent years, several groups throughout the world have initiated research toward the development and systematic evaluation of frequency and time standards based on narrow optical transitions in laser-cooled atomic systems. I will discuss some of the key ingredients to the make-up and operation of single-atom optical clocks and why they offer higher stability and accuracy than the best clocks of today. I will then present some of the results obtained at NIST through comparative studies of the Hg+ single ion optical clock, the Al+ single ion optical clock and the Cs fountain, primary frequency standard (NIST-F1). The most recent frequency comparison between the Hg+ optical clock and NIST-F1 shows an uncertainty of ~9×10–16 limited by the integration time, and recent measurements of the frequency ratio between the Al+ and Hg+ standards show an overall uncertainty of several parts in 10–17. The extremely precise measurements of the frequency ratios of these clocks over time have

Light, Photons and Nonclassicality (PDF)

Abstract: Quantum Optics has focused for many years on uncovering what is specifically nonclassical about light fields, from the early days of quantum mechanics right down to the present day. Much of this work has concentrated on the role of discreteness, of the limits of the uncertainty relation in governing fluctuations and the nature of quantum correlations beyond what is allowed classically. Progress in identifying, generating and characterizing nonclassical states has been spectacular. Quantum Information Science in part has grown out of this progress: the quantum world allows information to be encoded, manipulated and transmitted in ways quite different from classical physics. Parallelism and entanglement, the characteristic features of the quantum world, enable us to perform precise measurements and to undertake information processing tasks which are peculiar to the quantum world: secure encryption, teleportation of quantum states and the speed up of certain classes of algorithms. I will discuss the progress made in studying nonclassicality.

Biography: Peter Knight is Principal of the Faculty of Natural Sciences at Imperial College, where he has been a staff member since 1979, was Head of Physics from 2001 to 2005 and was knighted in 2005. He is a Past President of OSA. After earning his doctorate at Sussex, he was Research Associate

begun to offer more stringent limits on any temporal variation of the fine structure constant as well as other tests of general relativity.

Biography: James C. Bergquist received a bachelor's degree from the University of Notre Dame in 1970 and a Ph.D. degree from the University of Colorado in 1977 (advisor, John Hall). Subsequent to an NRC postdoctoral appointment with David Wineland, he joined his research group at NIST in Boulder. In his research, Bergquist has concentrated on the laser cooling and spectroscopy of trapped atomic ions with applications to atomic clocks and fundamental tests. In 2000, he and his colleagues at NIST demonstrated the world's first optical clock based on a single laser-cooled mercury ion. He is a Fellow of the American Physical Society and the Optical Society of America. He has won the E.U. Condon award (NIST, 2001) for written exposition, the Department of Commerce Gold medal in 1985 for cooled-ion frequency standards (with J.J. Bollinger, W.M. Itano and D.J. Wineland) and again in 2001 for optical frequency standards and the means for relating their output to other frequencies (with S.T. Cundiff, S.A. Diddams, J. Hall, L. Hollberg, C.W. Oates and J. Ye), the William F. Meggers Award (OSA, 2002) for his contributions to "…high-accuracy laser spectroscopy with applications to fundamental metrology and clocks", the Rabi Award (IEEE, 2006) for his contribution to the "…realization of accurate optical frequency standards", and the

in Rochester and held various fellowships in the UK. He is a Fellow of the Institute of Physics, the Optical Society of America and the Royal Society. Knight's research centers on theoretical quantum optics, strong field physics and quantum information. In quantum optics his work focuses on nonclassical light (especially squeezed light); in strong field physics he works especially on high harmonic generation; and in quantum information science his work concentrates on the way quantum gates can be realized by quantum optical systems. He has been instrumental in setting up the new Grantham Institute for Climate Change. He is a Thomson-ISI "Highly Cited Author."

Herbert P. Broida Award (APS, 2007) for his contributions to ultra-high resolution laser spectroscopy and the realization of accurate optical frequency standards.

Awards Ceremony

OSA and APS/Division of Laser Science will present society honors during the award and plenary session on Monday morning, October 20, in the Lilac Ballroom.

- OSA award and fellow presentations
- Ives Medal Lecture: Title TBA, Peter Knight, Imperial College London, UK
- APS/Division of Laser Science award and fellow presentations
- Schawlow Prize Lecture: Single-Atom Optical Clocks, James Bergquist, NIST, USA

Coffee break

- FiO Plenary Speaker: **From the Big Bang to the Nobel Prize and on to James Webb Space Telescope,** John C. Mather, NASA Goddard Space Flight Center, USA
- Laser Science Plenary Speaker: **Photonic Entanglement and Quantum Information,** Anton Zeilinger, University of Vienna, Austria

APS Division of Laser Science Awards to be presented at Laser Science XXIV

Arthur L. Schawlow Prize in Laser Science
Recipient: James Bergquist

OSA Awards to be presented at FiO 2008

Frederic Ives Medal/Jarus W. Quinn Endowment
Recipient: Peter Knight

Esther Hoffman Beller Medal
2007 Recipient: M. J. Soileau

Max Born Award
Recipient: Peter W. Milonni

Distinguished Service Award
Recipient: Bahaa Saleh

Paul F. Forman Engineering Excellence Award
Recipient: TBA

Adolph Lomb Medal
Recipient: L. Cary Gunn

OSA Leadership Award-New Focus/Bookham Prize
Recipient: Barry L. Shoop

David Richardson Medal
Recipient: Kanti Jain

R.W. Wood Prize
Recipients: Jonathan P. Heritage and Andrew M. Weiner

Invited Speakers

FiO Invited Speakers

1.1: Optics and Instrumentation for Next-Generation X-Ray Synchrotron Radiation, ERL and FEL Sources

Invited Speakers:

FWN1, **Optical Metrology Requirements for Coherence-Preserving and Next-Generation X-Ray Mirrors,** *Peter Z. Takacs; Brookhaven Natl. Lab, USA.*

FWN2, **Tranverse Coherence Properties of X-Ray Beams in Third-Generation Light Sources,** *Gianluca Aldo Geloni, Evgeni Saldin, Evgeni Schneidmiller, Mikhail Yurkov; Deutsches Elektronen-Synchrotron, Germany.*

FWN4, **Characterization of Focused Soft X-Ray Laser Beams: Comparing their Ablative Imprints with Other Methods,** *Libor Juha, Jaromir Chalupsky, Vera Hajkova; Acad. of Sciences of the Czech Republic, Czech Republic.*

FWU1, **X-Ray Monochromator Characteristics for a Coherent Energy Recovery Linac Source of Hard X-Rays,** *Donald Bilderback, Alexander Kazimirov; Cornell Univ., USA.*

FWU3, **X-Ray Free-Electron-Laser Interaction with Materials,** *Stefan Hau-Riege; Lawrence Livermore Natl. Lab, USA.*

1.2: Optics for Energy (Joint with Laser Science)

Invited Speakers:

JWB1, **Plasmonic Scattering Enhancement of Quantum Well Solar Cells,** *Edward T. Yu; Univ. of California at San Diego, USA.*

JWB2, **Plasmons and Photovoltaics,** *Kylie Catchpole[1,2], F. Beck[2], R. Schropp[3], A. Polman[1]; [1]AMOLF, Netherlands, [2]Australian Natl. Univ., Australia, [3]Univ. of Utrecht, Netherlands.*

JWB3, **Optically Tandem Solar Cells,** *Alan Kost; Univ. of Arizona, USA.*

JWB4, **Electroluminescence Refrigeration and Ultrahigh Efficiency Solar Cells: Two Grand Challenges to p-n Junction Devices,** *Yong-Hang Zhang; Arizona State Univ., USA.*

JWC1, **Energy Implications of Solid-State Lighting Technology,** *E. Fred Schubert, Jong Kyu Kim; Rensselaer Polytechnic Inst., USA.*

JWC2, **Optically Powered Networks,** *Juerg Leuthold[1], W. Freude[1], J. Becker[1], M. Roeger[1], M. Hoh[1], G. Boettger[1], M. Hübner[1], J. Hehmann[2], T. Pfeiffer[2]; [1]Univ. of Karlsruhe (TH), Germany, [2]Alcatel-Lucent, Bell Labs Germany, Germany.*

JWC3, **Optics for Solar Cells for Portable Power,** *Duncan Moore; Univ. of Rochester, USA.*

JThA1, **Concentrator Photovoltaics Solar Simulator,** *César Domínguez, Ignacio Antón, Gabriel Sala; Inst. de Energía Solar, Univ. Politécnica de Madrid, Spain.*

JThA2, **Optics for Photon Recycling PV Concentrators and Wireless Power Transmission with Lasers,** *Ugur Ortabasi; United Innovations, Inc., USA.*

JThA3, **Holographic Concepts and Applications for Solar Energy Systems,** *Raymond Kostuk; Univ. of Arizona, USA.*

JThB1, **The Solar Production of Hydrogen,** *Craig Grimes; Penn State Univ., USA.*

JThB3, **Optical Properties of Microalgae for Enhanced Biofuels Production,** *Anatasios Melis; Univ. of California at Berkeley, USA.*

Illumination Modeling Workshop

Invited Speakers:

FMC2, **Modulating and Demodulating Projected Light,** *Oliver Bimber; Bauhaus-Univ. Weimar, Germany.*

FMC6, **Accurate Lit-Appearance Modeling of Illumination Systems,** *R. John Koshel[1,2]; [1]Photon Engineering LLC, USA, [2]College of Optical Sciences, Univ. of Arizona, USA.*

FMJ1, **An Overview of the Non-Visual Effects of Retinal Light Exposure,** *Mark S. Rea, Mariana G. Figueiro; Rensselaer Polytechnic Inst., USA.*

FMJ3, **Vision at Mesopic Light Levels,** *Alan L. Lewis; Electric Power Res. Inst. (EPRI) Lighting Res. Office, USA.*

1.3: Wavefront Sensing and Control

Invited Speakers:

FMM2, **Phase-Diverse Wavefront Sensing and Control,** *Richard Paxman; General Dynamics, USA.*

FMM3, **Recent Topics in Wavefront Sensing and Control,** *James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.*

FMF1, **Perspectives on Image-Based Wavefront Sensing,** *Robert A. Gonsalves; Tufts Univ., USA.*

FMF3, **Advanced Imaging for Space Science,** *Richard Lyon; NASA Goddard Space Flight Ctr., USA.*

FMF4, **Wavefront Sensing and Control for JWST,** *Scott Acton; Ball Aerospace, USA.*

Optical Fabrication and Testing (OF&T)

NASA at 50 (Special Symposium)

Polarized Light: 200 Years since Malus' Discovery (Special Symposium)

2.1: Ultrahigh Fields, High Energy Density on Solid Targets and in Clusters

Tutorial Speaker:

FWX1, Frontiers in Ultrahigh Fields--A Tutorial on Recent Advances, *Thomas Cowan; Forschungszentrum Dresden-Rossendorf, Inst. of Radiation Physics, Germany.*

Invited Speakers:

FMB4, Trapping and Destruction of Long Range High Intensity Optical Filaments by Molecular Quantum Wakes in Air, *S. Varma, Y. H. Chen, Howard Milchberg; Univ. of Maryland, USA.*

FWK2, Energy Deposition Using PW Lasers, *Peter A. Norreys; Rutherford Appleton Lab, UK.*

FWQ5, Novel Matter and Devices in High Energy Density Science with High Power Lasers, ***Ryosuke Kodama; Osaka Univ., Japan.***

2.2: Next Generation of Intense Lasers Including High-Energy PW Lasers and Few-Cycle OPCPA

Invited Speakers:

FWK1, Petawatt Lasers: Status Quo and Perspectives, ***Efim A. Khazanov; Inst. of Applied Physics, Russian Acad. of Science, Russian Federation.***

FWK3, To Be Announced, ***Jean-Claude Kieffer; Inst. Natl. de la Recherche Scientifique (INRS) Énergie, Matériaux et Télécommunications, Canada.***

FWQ1, Technological Challenge and Activation of 10-kJ PW Laser LFEX for Fast Ignition at ILE, ***Noriaki Miyanaga[1], H. Azechi[1], K. A. Tanaka[1], T. Kanabe[2], T. Jitsuno[1], J. Kawanaka[1], Y. Fujimoto[1], R. Kodama[1], H. Shiraga[1], K. Knodo[1], K. Tsubakimoto[1], H. Habara[1], K. Sueda[1], H. Murakami[1], N. Morio[1], S. Matsuo[1], N. Sarukura[1], Y. Izawa[1], K. Mima[1]; [1]Osaka Univ., Japan, [2]Univ. of Fukui, Japan.***

FWQ2, The OMEGA EP High-Energy, Short-Pulse Laser System, ***Leon Waxer, John H. Kelly, B. E. Kruschwitz, J. Qiao, M. J. Guardalben, I. A. Begishev, J. Bromage, C. Dorrer, J. L. Edwards, L. Folnsbee, S. D. Jacobs, R. Jungquist, T. J. Kessler, R. W. Kidder, S. J. Loucks, J. R. Marciante, D. N. Maywar, R. L. McCrory, D. D. Meyerhofer, S. F. B. Morse, A. V. Okishev, J. B. Oliver, G. Pien, J. Puth, A. L. Rigatti; Lab for Laser Energetics, Univ. of Rochester, USA.***

2.3: HHG Generation and Control from Atoms and Molecules

Tutorial Speaker:

FTuO1, From Attoseconds to Controlled Dynamics: Recent Advances in XUV Sources, ***Mauro Nisoli; Politecnico di Milano, Italy.***

Invited Speakers:

FTuBB1, Filamentation-Driven Time-Frequency Gating of Isolated Attosecond Pulses, ***Mette B. Gaarde; Louisiana State Univ., USA.***

FTuBB3, High-Order Harmonic Generation in Laser-Produced Plasma, ***Rashid A. Ganeev; Scientific Assn. Akadempribor, Acad. of Sciences of Uzbekistan, Uzbekistan.***

FTuO3, High-Harmonic Generation from Excited Molecules: X-Ray Spectra Control and Dynamical Imaging, ***Mikhail Yu. Emelin, Arkady A. Gonoskov, Ivan A. Gonoskov, Mikhail Yu. Ryabikin, Alexander M. Sergeev; Inst. of Applied Physics, Russian Acad. of Sciences, Russian Federation.***

FThH1, Optically-Induced Quasi-Phase Matching in High-Harmonic Generation, ***Oren Cohen[1,2], Amy L. Lytle[1], Xiaoshi Zhang[1], Henry C. Kapteyn[1], Margaret M. Murnane[1]; [1]JILA, Univ. of Colorado, USA, [2]Technion-Israel Inst. of Technology, Israel.***

FThH3, Mapping of Attosecond Ionization Dynamics by Recollision-Free Higher-Order Harmonic Generation, ***A. J. Verhoef[1], A. Mitrofanov[1], E. E. Serebryannik[2], D. Kartashov[1], A. M. Zheltikov[2], Andrius Baltuška[1]; [1]Vienna Univ. of Technology, Austria, [2]Physics Dept., Intl. Laser Ctr., M.V. Lomonosov Moscow State Univ., Russian Federation.***

2.4: Femtosecond Surface Science Techniques

Invited Speakers:

FMI1, Ultrafast Spin-Dependent Carrier Dynamics in Ferromagnetic Thin Films, ***Martin Weinelt[1,2]; [1]Max-Born-Inst., Germany, [2]Freie Univ. Berlin, Germany.***

FMI2, Real Time Electronic Structure Investigated by Femtosecond Time- and Angle-Resolved Photoemission Spectroscopy, ***Uwe Bovensiepen; Freie Univ. Berlin, Fachbereich Physik, Germany.***

FMI3, Generation and Time-Resolved Detection of Coherently Controlled Electric Currents at Surfaces, ***J. Gudde[1], M. Rohleder[1], T. Meier[2], S. W. Koch[1], Ulrich Höfer[1]; [1]Philipps-Univ. Marburg, Germany, [2]Univ. Paderborn, Germany.***

FMI4, Ultrafast Dynamics of Electron Transfer at Polar Adsorbate/Metal Interfaces Studied with Time-Resolved Photoelectron Spectroscopy, ***Martin Wolf; Freie Univ. Berlin, Germany.***

3.1: Optical Manipulation of Biological Systems

Invited Speakers:

FTuE1, Application of Femtosecond Laser Surgery for the Treatment of Glaucoma, ***Tibor Juhasz[1,2], Dongyul Chai[1], Gautam Chaudhary[1,3], Hui Sun[1], Bin Rao[3,4], Zhongping Chen[2,3,4], Ron Kurtz[1], James Jester[1]; [1]Dept. of Ophthalmology, Univ. of California at Irvine, USA, [2]Dept. of Biomedical Engineering, Univ. of California at Irvine, USA, [3]Dept. of Electrical Engineering and Computer Science, Univ. of California at Irvine, USA, [4]Beckman Laser Inst., Univ. of California at Irvine, USA.***

FTuE2, Nanoeffects in Cells and Tissues by Femtosecond and Nanosecond Laser Pulses, ***Alfred Vogel[1], Norbert Linz[1], Sebastian Freidank[1], Joachim Noack[1], Gunther Paltauf[2]; [1]Inst. of Biomedical Optics, Univ. of Lübeck, Germany, [2]Physics Inst., Karl-Franzens-Univ. Graz, Austria.***

FTuE5, Ultra-Short Laser Pulses as a Tool to Measure as well as Perturb Neurovascular Activity in the Rodent Brain, ***Philbert S. Tsai, Pablo Blinder, Benjamin Migliori, David Kleinfeld; Univ. of California at San Diego, USA.***

FTuL1, Novel Methods for Cellular Transfection with Femtosecond Laser Pulses, ***Kishan Dholakia, Xanthi Tsampoula, Dave Stevenson, C. T. Brown, Frank J. Gunn-Moore; Univ. of St. Andrews, UK.***

3.2: Imaging of Mice and Men

Tutorial Speaker:

FTuD1, Diffuse Optical Tomography, ***Brian Pogue, Hamid Dehghani; Dartmouth College, USA.***

Invited Speakers:

FTuD2, Diffuse Optical Monitoring of Cerebral Oxygen Metabolism at the Bedside in Cerebrovascular Disorders, ***Turgut Durduran, Meeri N. Kim, Erin M. Buckey, Chao Zhou, Guoqiang Yu, Regine Choe, Joel H. Greenberg, John A. Detre, Arjun G. Yodh; Univ. of Pennsylvania, USA.***

FTuR1, Mouse Organ Imaging, ***Elizabeth M. C. Hillman; Columbia Univ., USA.***

FTuR3, Optical Imaging of Breast Cancer by Spectral and Fluorescence Diffuse Optical Tomography, ***Martin B. van der Mark[1], Anais Leproux[1], Tim Nielsen[2], Marjolein van der Voort[1], Leon Bakker[3], Michiel van Beek[1], Claas Bontus[2], Bernhard Brendel[2], Rik Harbers[1], Thomas Koehler[2], Falk Uhlemann[2], Andrea Wiethoff[4], Ronny Ziegler[2], Andy Ziegler[2], Lueder Fels[5], Martin Pessel[5], Stephanie van de Ven[6], Sjoerd Elias[6], Willem Mali[6], Peter Luijten[6]; [1]Philips Res. Europe, Netherlands, [2]Philips Res. Europe, Germany, [3]Philips Res. Asia, China, [4]King's College London, Div. of Imaging Sciences, UK, [5]Bayer Schering Pharma AG, Germany, [6]Univ. Medical Ctr. Utrecht, Netherlands.***

FTuR4, Time Domain Diffuse Optical Imaging and Spectroscopy: From Lab to Clinic, ***Rinaldo Cubeddu, Antonio Pifferi, Alessandro Torricelli, Paola Taroni, Lorenzo Spinelli; Politecnico di Milano, Italy.***

3.3: Advanced in vivo and in vitro Microscopy

Tutorial Speaker:

FWD1, ***In vivo*** **Reflectance Confocal Microscopy,** ***James M. Zavislan; Inst. of Optics, Univ. of Rochester, USA.***
Invited Speakers:

Invited Speakers:

FTuS1, New Developments in STED Microscopy, ***Stefan W. Hell, Alexander Egner, Roman Schmidt; Max-Planck-Inst. für Biophysik Chemie, Germany.***

FTuS3, Nanoscopic Imaging of Biomolecules, Cells and Tissues with STORM, ***Xiaowei Zhuang; Harvard Univ., USA.***

FTuY1, Femtosecond Laser Pulse Shaping for Molecular Imaging in Biological Tissue, ***Martin C. Fischer[1], Henry C. Liu[2], Dan Fu[2], Prathyush Semineni[1], Thomas Matthews[1], Ivan Piletic[1], Warren S. Warren[1]; [1]Duke Univ., USA, [2]Princeton Univ., USA.***

FWP1, Digital Frequency-Domain FLIM, ***Enrico Gratton; Univ. of California at Irvine, USA.***

3.4: Novel Optical Trapping and Micromanipulation Techniques

Invited Speakers:

FME1, Revisiting Optical Manipulation with Surface Plasmons, ***Romain Quidant[1,2]; [1]Inst. de Ciencies Fotoniques, Spain, [2]Inst. Catalana de Recerca i Estucis Avancat, Spain.***

FME4, Optically Driven Mechanical Systems at Nano- to Micro-Scale, ***Theodor Asavei, Simon Parkin, Timo Nieminen, Norman Heckenberg, Halina Rubinsztein-Dunlop; Univ. of Queensland, Australia.***

FML3, Studying Aerosols Using Optical Traps, ***David McGloin; Univ. of Dundee, UK.***

FML6, Optical Manipulation and Characterization of Aerosol Particles, ***Jonathan Reid; Univ. of Bristol, UK.***

3.5: Molecular Imaging and Targeted Therapeutics

Invited Speakers:

FWJ1, Photoactivated Tissue Repair, ***Robert Redmond; Wellman Ctr. for Photomedicine, Harvard Medical School, Massachusetts General Hospital, USA.***

FWJ2, Receptor Targeted Mono-Molecular Imaging Agents (MOMIAs) for Optical and Nuclear Imaging, ***W. Barry Edwards; Washington Univ. in St. Louis, USA.***

FWJ3, Molecular Imaging of Tumor Responses to Photodynamic Therapy ***in vivo*****,** ***Soumya Mitra, Thomas Foster; Univ. of Rochester, USA.***

FWP2, Fluorescence Lifetime and Spatially Modulated Light for Image-Guided Surgery, ***Sylvain Gioux[1,2], Amaan Mazhar[3], David Cuccia[4], Anthony Durkin[3], Bruce J. Tromberg[3], John V. Frangioni[2]; [1]Boston Univ., USA, [2]Beth Israel Deaconess Medical Ctr., USA, [3]Univ. of California at Irvine, USA, [4]Modulated Imaging Inc., USA.***

4.1: Systems for Optical Manipulation

Invited Speakers:

FTuF1, Photonic Manipulations for Monitoring Cancer, ***S. Esener, I. Ortak, S. Zlatanovic, Y. T. Liu, D. Carson; Moses Cancer Ctr., Univ. of California at San Diego, USA.***

FTuF2, Optical MEMS Technology for Scalable Quantum Information Processor, ***Jungsang Kim[1], Caleb W. Knoernschild[1], Changsoon Kim[1], Justin Migacz[1], Kyle S. McKay[1], Felix Lu[1,2]; [1]Duke Univ., USA, [2]Applied Quantum Technologies, Inc., USA.***

FTuM1, Tiny Hands for Light Work: A Fingertip Interface for Holographic Optical Tweezers, ***Miles Padgett, Graham Gibson, Stephen Keen, Jonathan Leach; Univ. of Glasgow, UK.***

FWI1, From 3-D Optical Tweezers to 3-D Optical Machines: Volumetric Optical Force Control and Imaging by Holographic Methods, ***Yohai Roichman, David G. Grier; New York Univ., USA.***

4.2: Diffractive Micro- and Nanostructures for Sensing and Information Processing

Invited Speakers:

FWT1, Microscopic Model of the Extraordinary Light Transmission, ***Philippe Lalanne[1], H. Liu[1,2]; [1]Lab Charles Fabry de l'Inst. d'Optique, Univ. Paris-Sud, France, [2]Key Lab of Opto-Electronic Information Science and Technology, Ministry of Education, Inst. of Modern Optics, Nankai Univ., China.***

FThR1, Ultrafast Signal Processing Using All-Fiber Grating Technologies, ***Jose Azana; Inst. Natl. de la Recherche Scientifique, Canada.***

FThV1, Infrared Antennas, ***Glenn D. Boreman; College of Optics and Photonics, CREOL, Univ. of Central Florida, USA.***

FThV6, Light Manipulation by Use of Inhomogeneous Anisotropic Nanoscale Structures, ***Erez Hasman; Technion-Israel Inst. of Technology, Israel.***

4.3: Silicon and III-V Based Optoelectronics for Optical Interconnects

Invited Speakers:

FThF1, Optical Interconnects in Supercomputers and High Performance Servers, ***Jeffrey Kash; IBM Res., USA.***

FThL1, Building Blocks for Intrachip Optical Networks, ***J. Michel[1], K. Balakrishnan[1], M. Beals[1], J. Eastep[1], J. Miller[1], T. Konstantakopoulus[1], J. Liu[1], J. Psota[1], M. R. Watts[2], A. Agarwal[1], L. C. Kimerling[1]; [1]MIT, USA, [2]Sandia Natl. Labs, USA.***

FThS1, Silicon Nano-Photonic Interconnection Networks in Multicore Processor Systems, ***Benjamin G. Lee, Keren Bergman; Columbia Univ., USA.***

FThW1, Optical Interconnects in Large Computer Systems, ***Ashok Krishnamoorthy, John E. Cunningham, X. Zheng; Sun Microsystems Inc., USA.***

5.1: Quantum Dot Semiconductor Optical Amplifiers

Invited Speakers:

FTuN1, Semiconductor Optical Amplifiers with Nanostructured Gain Material, ***Johann Peter Reithmaier[1], Gadi Eisenstein[2]; [1]Technische Physik Univ. Kassel, Germany, [2]Technion-Israel Inst. of Technology, Israel.***

FTuN3, Nonlinear Properties of Quantum Dot Semiconductor Optical Amplifiers at 1.3 μm, ***Dieter H. Bimberg, Christian Meuer, Matthias Laemmlin; Technical Univ. Berlin, Germany.***

5.2: Novel Fiber and Fiber Photonic Devices

Invited Speakers:

FWF1, Nonlinear Optics in Gas-Filled Photonic Band-Gap Fibers, ***Alexander Gaeta; Cornell Univ., USA.***

FWR1, Multimode Plastic Fiber for 100G, ***Stephen Ralph; Georgia Tech, USA.***

FWR4, Multimaterial Fibers and Integrated Fiber Photonic Devices, ***Zheng Wang, Ayman F. Abouraddy, Fabien Sorin, Sylvain Danto, Ofer Shapira, John Joannopoulos, Yoel Fink; MIT, USA.***

FThE1, Numerical Simulation of Light Transmission through Optical Fibers: Linear and Nonlinear, ***G. Ronald Hadley; Sandia Natl. Labs, USA.***

FThE4, Designs and Applications of Large Mode Area Optical Fibers, ***Liang Dong, Jun Li, Hugh A. McKay, Brian K. Thomas, Libin Fu; IMRA America Inc., USA.***

5.3: Next Generation Fabric Switching

Tutorial Speaker:

FTuA1, InP-Based Photonic Integrated Circuits, *Thomas L. Koch; Lehigh Univ., USA.*
Invited Speakers:

FTuA3, A Technological Platform for 10Gb/s-100 Gb/s Photonic Sources, *Christophe Kazmierski; Alcatel-Thales III-V Lab, France.*

FTuA4, Photonic Integrated Circuit Enabled Bandwidth Virtualization, *Mehrdad Ziari, Chuck Joyner, Serge Melle, Chris Liou, Radha Nagarajan, Ted Sprage, Ting-Kuang Chang, Drew Perkins, Fred Kish, David F. Welch; Infinera, USA.*

FWB1, A 130 Gb/s Multiwavelength Transparent TDM-WDM Optical Router, *Ioannis Tomkos[1], J. Leuthold[2], A. Ellis[3], G. Zarris[4], P. Petropoulos[5]; [1]Athens Info. Tech., Greece, [2]Inst. of High-Frequency and Quantum Electronics, Univ. of Karlsruhe, Germany, [3]Photonic Systems Group, Univ. College Cork, Ireland, [4]Univ. of Essex, UK, [5]Optoelectronics Res. Ctr., Univ. of Southampton, UK.*

FWB2, Intelligence-Enabled Packet-Centric Metro/Edge Optical Networks, *Song Jiang; Alcatel-Lucent, USA.*

FWB3, Photonic Integrated Devices for Fast Switching, *Pietro Bernasconi; Bell Labs, Alcatel-Lucent, USA.*

5.4: How Will Bits and Bytes Be Encoded in Future Optical Communications Systems?

Invited Speakers:

FTuH1, Design Tradeoffs in Optical OFDM Transmission Systems, *Itsuro Morita, Sander Jansen, Hideaki Tanaka; KDDI R&D Labs, Japan.*

FTuH3, Toward the Shannon Limit Optical Communication, *Masataka Nakazawa; Res. Inst. of Electrical Communication, Tohoku Univ., Japan.*

FWH1, High-Speed Coherent Optical Receivers Realized in DSP, *Noriaki Kaneda, Andreas Leven, Young-Kai Chen; Alcatel-Lucent, USA.*

FWH2, High-Speed Transparent Optical Networks, *Sethumadhavan Chandrasekhar; Bell Labs, Alcatel-Lucent, USA.*

FWH3, Real-Time Measurements of a 40 Gb/s Coherent System, *Han Henry Sun; Nortel Networks, Canada.*

5.5: Silicon Optics

Invited Speakers:

FMG1, Towards Fabless Silicon Photonics, ***Pieter Dumon; Ghent Univ., Belgium.***

FMG6, Silicon-Organic Hybrid (SOH) Devices for Optical Signal Processing, ***Christian Koos[1,2], Jan-Michael Brosi[1], Philipp Vorreau[1], Thomas Vallaitis[1], Pieter Dumon[3], Roel Baets[3], Bweh Esembeson[4], Ivan Biaggio[4], Tsuyoshi Michinobu[5], François Diederich[5], Wolfgang Freude[1], Juerg Leuthold[1]; [1]Inst. of High-Frequency and Quantum Electronics, Univ. of Karlsruhe, Germany, [2]Carl Zeiss AG, Corporate Res. and Technology, Oberkochen Res. Ctr., Germany, [3]Photonics Res. Group, Ghent Univ., IMEC, Belgium, [4]Dept. of Physics, Lehigh Univ., USA, [5]Lab für Organische Chemie, ETH Zürich, Switzerland.***

FTuU3, Slow Light for Switching and Nonlinear Effects on SOI, ***Thomas F. Krauss[1], Daryl Beggs[1], Andrea di Falco[1], Tom White[1], Liam O'Faolain[1], Christelle Monat[2], Michael Lee[2], Benjamin Eggleton[2]; [1]SUPA, Univ. of St. Andrews, UK, [2]CUDOS, School of Physics, Univ. of Sydney, Australia.***

FTuU4, Silicon-on-Insulator Technology as a Platform for Advanced Electronics and Photonics, ***George K. Celler; SOITEC USA, USA.***

6.1: Beam Combining

Tutorial Speaker:

FTuJ1, Beam Combining of Fiber Lasers, ***Tso Yee Fan; MIT Lincoln Lab, USA.***

Invited Speakers:

FTuW1, Advances and Limitations in Fiber Laser Beam Combination, ***Gregory D. Goodno, Joshua E. Rothenberg; Northrop Grumman Space Technology, USA.***

FTuW3, Passive Beam Combining of Fiber Lasers, ***Asher A. Friesem, Nir Davidson; Weizmann Inst. of Science, Israel.***

FWG1, Electronic Beam Combination of Fiber Amplifier Arrays, ***Thomas M. Shay[1], J. T. Baker[2], C. A. Robin[1], C. Vergien[1], Clint Zeringue[1], David Gallant[2], T. J. Bronder[1], D. Pilkington[1], Chunte A. Lu[1], Anthony D. Sanchez[1]; [1]AFRL, USA, [2]Boeing LTS Inc., USA.***

FWG4, Nonlinear Beam Cleanup and Coherent Beam Combining of Fibre Lasers, ***Arnaud Brignon, Jean Pierre Huignard; Thales Res. and Technology, France.***

6.2: Nonlinear Wave Physics

Tutorial Speaker:

FThD1, Nonlinear Waves in Lattices, ***Mordechai Segev; Technion - Israel Inst. of Technology, Israel.***

Invited Speakers:

FWO3, Optical Hydrodynamics, ***Mankei Tsang[1], Demetri Psaltis[2], Jeffrey H. Shapiro[1], Seth Lloyd[1]; [1]MIT, USA, [2]Inst. of Imaging and Applied Optics, Ecole Polytechnique Federale Lausanne, Switzerland.***

FWO6, Lattice Surface Solitons, ***Demetrios N. Christodoulides, George I. Stegeman; College of Optics and Photonics, CREOL and FPCE, Univ. of Central Florida, USA.***

FThC1, Subwavelength Discrete Solitons in Nonlinear Metallic Waveguide Arrays, ***Xiang Zhang, Guy Bartal, Yongmin Liu, Dentcho A. Genov; Univ. of California at Berkeley, USA.***

FThC4, Nonlinear Optics of Structured Photonic Materials, ***Robert W. Boyd, Ksenia Dolgaleva, Giovanni Piredda, Aaron Schweinsberg; Inst. of Optics, Univ. of Rochester, USA.***

6.3: Coherence, Light Localization and Optical Chaos

Tutorial Speaker:

FThJ1, Photon Localization: Wave Interference and Modes in Random Media, ***Azriel Z. Genack[1], Sheng Zhang[1], Jing Wang[1], Andrey A. Chabanov[2], Patrick Sebbah[3], Zhao-Qing Zhang[4], Valentin Freilikher[5]; [1]Queens College of CUNY, USA, [2]Univ. of Texas at San Antonio, USA, [3]CNRS, Univ. de Nice-Sophia Antipolis, France, [4]Hong Kong Univ. of Science and Technology, Hong Kong, [5]Bar-Ilan Univ., Israel.***

Invited Speakers:

FWC1, Spatio-Temporal Complexity in Broad-Area Photonics, ***William J. Firth; Univ. of Strathclyde, UK.***

FWC4, Nonlinear Dynamics in Deformed Microcavity Lasers, ***Takahisa Harayama; Dept. of Nonlinear Science, ATR Labs, Japan.***

FWS3, Making Random Lasers Useful for Practical Applications, ***Siu-Fung Yu; Nanyang Univ., Singapore.***

6.4: Non-Classical States and Quantum Information

Tutorial Speaker:

FMA1, Nonclassical Light for Quantum Information Science, ***H. Jeff Kimble; Caltech, USA.***

Invited Speakers:

FMH3, From a Single-Photon Source to a Single-Ion Laser, ***Francois Dubin, Carlos Russo, Helena G. Barros, Andreas Stute, Piet Schmidt, Rainer Blatt; Univ. of Innsbruck, Austria.***

FTuC1, Tools and Technology for Optical Quantum Information Processing, ***Paul G. Kwiat, Scott Jobling, Kevin T. McCusker, Radhika Rangarajan; Univ. of Illinois at Urbana-Champaign, USA.***

FTuQ1, Quantum Measurement and Cloning with Continuous Variables, ***Christoffer Wittman[1], Ruifang Dong[1], Metin Sabuncu[1,2], Mikael Lassen[1,2], Ulrik Andersen[1,2], Gerd Leuchs[1]; [1]Inst. für Optik, Information und Photonik, Univ. Erlangen-Nuernberg, Germany, [2]Technical Univ. of Denmark, Denmark.***

FTuQ4, Dispersion Cancellation and Manipulation in Quantum Interferometry, ***Alexander Sergienko[1], Olga Minaeva[1,2], Cristian Bonato[1,3], Bahaa E. A. Saleh[1], Paolo Villoresi[3]; [1]Boston Univ., USA, [2]Moscow State Pedagogical Univ., Russian Federation, [3]Univ. of Padova, Italy.***

6.5: The Rise of Quantum Telecom

Tutorial Speaker:

FWA2, Devices, Protocols and Architectures for Quantum Communication, ***Yoshihisa Yamamoto; Stanford Univ., USA.***

Invited Speakers:

FWA1, Long-Distance QKD with Superconducting Single-Photon Detectors, ***Richard Hughes; Los Alamos Natl. Lab, USA.***

FWA3, Superconducting Photon Detectors for Quantum Information and Communication, ***Sae Woo Nam; NIST, USA.***

FWM1, Quantum Cryptography in Practical Networks, ***Misha Brodsky; AT&T Labs, USA.***

FWM2, Low-Cost Devices for Quantum Cryptography, ***John G. Rarity[1], D. Lowndes[1], M. S. Godfrey[1], J. L. Duligall[1,2], A. M. Lynch[1]; [1]Univ. of Bristol, UK, [2]Hewlett-Packard Labs, UK.***

FWM3, Quantum Key Distribution and Optical Networking, ***Paul Toliver[1], T. E. Chapuran[1], R. J. Runser[2], N. A. Peters[1], M. S. Goodman[3], J. Jackel[1], S. McNown[2], R. J. Hughes[4], C. G. Peterson[4], K. McCabe[4], J. E. Nordholt[4], K. Tyagi[4], D. Rosenberg[4], N. Dallman[4]; [1]Telcordia Technologies, Inc., USA, [2]Lab for Telecommunication Sciences, USA, [3]Defense Advanced Res. Projects Agency (DARPA), USA, [4]Los Alamos Natl. Lab, USA.***

FWM4, Quantum-Noise Randomized Encryption for Telecommunication Networks, ***Gregory Kanter; NuCrypt, USA.***

6.6: Photonic Bandgap Engineering, Nonlinearity and QED Effects

Invited Speakers:

FTuB1, Cavity QED, Single-Photon Nonlinear Optics and Quantum Information Processing with Quantum Dots in Photonic Crystals, ***Jelena Vuckovic, Andrei Faraon, Ilya Fushman, Dirk Englund; Edward L. Ginzton Lab, Stanford Univ., USA.***

FTuB6, Slow Wave Resonance in Photonic Crystals, ***Alexander Figotin, Ilya Vitebskiy; Univ. of California at Irvine, USA.***

FTuP3, Photonic Quasicrystals, Some Properties and Applications, ***Stefan Enoch[1], Alessandro Della Villa[2,1], Gérard Tayeb[1], Filippo Capolino[2], Vincenzo Pierro[3], Vincenzo Galdi[3]; [1]CNRS, Inst. Fresnel, France, [2]Univ. of Siena, Italy, [3]Univ. of Sannio, Italy.***

FTuP4, Fabrication of Three-Dimensional Photonic Crystals by Templated Atomic Layer Deposition, ***Christopher J. Summers, Elton Graugnard, Davy P. Gaillot, John Blair; Georgia Tech, USA.***

7.1: Optical Models of the Eye

Tutorial Speaker:

FThA1, Optical Models of the Eye, ***Larry N. Thibos; Indiana Univ., USA*** **Invited Speakers:**

Invited Speakers:

FThA2, The Eye as an Aplantic Design, ***Pablo Artal; Univ. of Murcia, Spain.***

FThG1, Measuring and Modeling the Refractive Index Gradients in Animal Crystalline Lenses, ***Ronald H. H. Kröger; Lund Univ., Sweden.***

FThG3, Eye Models for the Design and Performance Assessment of New-Technology Intraocular Lenses, ***Patricia Piers[1], Henk Weeber[1], Pablo Artal[2]; [1]AMO Groningen BV, Netherlands, [2]Ctr. de Investigacion en Optica y Nanofisica, Univ. de Murcia, Spain.***

7.2: Virtual Displays and Natural Tasks

Invited Speakers:

FThN1, Investigating the Visual Functions of Fixational Eye Movements, ***Michele Rucci; Boston Univ., USA.***

FThN2, Incorrect Focus Cues in Stereo Displays: Effects on Visual Performance and Viewer Fatigue, ***Martin Banks; Univ. of California at Berkeley, USA.***

FThN3, Using Virtual Environments to Investigate Natural Visually Guided Behavior, ***Mary M. Hayhoe; Univ. of Texas at Austin, USA.***

FThN4, Using Ambulatory VR to Break the Laws of Physics and Optics, ***William H. Warren; Brown Univ., USA.***

Laser Science

LS 1: Lasers and Their Applications in Space and Fundamental Physics

Invited Speakers:

LTuB1, A Modern Michelson-Morley Experiment Using Optical Resonators, ***S. Herrmann, A. Senger, K. Möhle, N. Nagel, E. V. Kovalchuk, Achim Peters; Humboldt Univ., Germany.***

LTuB2, Measuring the Fine Structure Constant Using Multiphoton Atom Interferometry, ***Holger Müller, Sheng-wey Chiow, Sven Herrmann, Steven Chu; Stanford Univ., USA.***

LTuD1, New Results from the Fundamental-Physics Tests at Berkeley: Atomic Parity Violation, Searches for Variation of α and a Bose-Einstein-Statistics Violation by Photons, ***Dmitry Budker[1,2]; [1]Univ. of California at Berkeley, USA, [2]Nuclear Science Div., Lawrence Berkeley Natl. Lab, USA.***

LTuD2, An Electron Electric Dipole Moment with Atoms in Optical Lattices, ***Neal Meyer, Kunyan Zhu, Fang Fang, David Weiss; Penn State Univ., USA.***

LTuF2, Optical Frequency Comb Generation in HNLF Cavities, ***Danielle A. Braje[1], Tobias Kippenberg[2], Pascal Del'Haye[2], Leo Hollberg[1], Scott Diddams[1]; [1]NIST, USA, [2]Max-Planck-Inst. fur Quantenoptik, Germany.***

LWA1, The Near-Field Infrared Experiment (NFIRE) Satellite Program Laser Communication Terminal (LCT): International Cooperation for Joint LCT Experiments, ***Renny A. Fields; Aerospace Corp, USA.***

LWA2, Planetary Laser Communications, ***Hamid Hemmati; JPL, USA.***

LWA3, "Astro-comb": A Femtosecond Laser Frequency Comb for Precision Astrophysical Spectroscopy, ***Chih-Hao Li; Harvard Univ. & Harvard-Smithsonian Ctr. for Astrophysics, USA.***

LWA4, Coherent Optical Transponder at Femto-Watt Light Levels, ***John Dick[1], Meirong Tu[1], Kevin Birnbaum[1], Dmitry Strekalov[1], Ertan Salik[2], Nan Yu[1]; [1]JPL, USA, [2]California State Polytechnic Univ., USA.***

LS 2: Laser-Cooled Atoms and Molecules

Invited Speakers:

LWE1, Cold and Ultracold Polar Molecules, ***Jun Ye; JILA, Univ. of Colorado and NIST, USA.***

LWE2, Coherent Control of Ultracold Molecules, ***Christiane Koch; Freie Univ. Berlin, Germany.***

LWE3, Cold Heteronuclear Dimers in Electric Fields: Rovibrational Dynamics and Photoassociation, ***Rosario Gonzalez Ferez; Univ. of Granada, Spain.***

LWG1, Quantum Control of Ultracold AMO Systems by Nanomechanical Resonators, ***M. Bhattacharya, O. Dutta, S. Singh, Pierre Meystre; Univ. of Arizona, USA.***

LWG2, Atom Interferometry with a Weakly Interacting Bose Einstein Condensate, ***Marco Fattori[1,2], C. D'Errico[1,2], G. Roati[1,2], M. Zaccanti[1,2], M. Jona Lasinio[1,2], M. Modugno[1,2], G. Modugno[1,2], M. Inguscio[1,2]; [1]Univ. of Florence, Italy, [2]Museo Storico della Fisica, Ctr. Studi e Ricerche Enrico Fermi, Italy.***

LWJ1, Manipulating Polar Molecules: Traps, Synchrotrons and Chips, ***Gerard Meijer; Fritz-Haber Inst., Germany.***

LWJ2, Experiments with Trapped Ultracold RbCs Molecules, ***Eric Hudson; Yale Univ., USA.***

LWJ3, Dynamics of Ultracold Polar Molecules in a Thin Wire Electrostatic Trap (TWIST), ***Patrick J. Zabawa, Amy E. Wakim, Jan Kleinert, Christopher Haimberger, Nicholas P. Bigelow; Univ. of Rochester, USA.***

LS 3: Quantum Information

Invited Speakers:

LWB1, Quantum Control of Spins and Photons in Diamond, ***Mikhail Lukin; Harvard Univ., USA.***

LWB2, Chip-Scale Non-Linear Optics, ***Michal Lipson; Cornell Univ., USA.***

LWD1, All-Optical Delay of Images Using Slow Light, ***J. C. Howell, R. M. Camacho, C. J. Broadbent, P. Vudya Setu; Univ. of Rochester, USA.***

LThC1, From Phase Diagrams to Quantum Simulations with Neutral Atoms, ***Carl J. Williams; NIST, USA.***

LThC2, Quantum Metrology with Cold Atoms, ***Anthony E. Miller, Andrew Silberfarb, Orion Crisafulli, Hideo Mabuchi; Stanford Univ., USA.***

LThC3, Progress towards Scalable Quantum Information Processing with Trapped Ions, ***Jonathan Home[1], J. D. Jost[1], J. M. Amini[1], M. J. Biercuk[1], R. B. Blakestad[1], J. J. Bollinger[1], J. W. Britton[1], K. R. Brown[1], D. Hanneke[1], D. Hume[1], W. M. Itano[1], E. Knill[1], C. Langer[2], D. Leibfried[1], C. Ospelkaus[1], R. Ozeri[3], T. Rosenband[1], S. Seidelin[4], H. Uys[1], A. P. VanDevender[1], N. Walrath[1], J. Wesenburg[5], D. J. Wineland[1]; [1]NIST, USA, [2]Lockheed Martin, USA, [3]Weizmann Inst., Israel, [4]Univ. of Grenoble, France, [5]Oxford Univ., UK.***

LThE1, Quantum Information Processing in Optical Fibers, ***Prem Kumar, Joseph B. Altepeter, Milja Medic, Matthew A. Hall, Monika S. Patel; Northwestern Univ., USA.***

LS 4: Novel Applications of Lasers

Invited Speakers:

LMA1, Cavity Optomechanics on a Silicon Chip, ***Kerry Vahala; Caltech, USA.***

LMA2, Radiation-Pressure Effects upon a Micro-Mirror in a High-Finesse Optical Cavity, ***Antoine Heidmann, Chiara Molinelli, Olivier Arcizet, Tristan Briant, Pierre-Francois Cohadon; Lab Kastler-Brossel, France.***

LMA3, Detecting Quantum Behavior in Cavity-Based Electromechanical and Optomechanical Systems, ***Aashish Clerk; McGill Univ., Canada.***

LMC1, Measuring and Cooling the Motion of a Nanomechanical Oscillator with a Microwave Cavity Interferometer, ***Konrad W. Lehnert, John D. Teufel; JILA, Univ. of Colorado, USA.***

LMC2, Quantum-Optical Control of Micromechanics, ***Markus Aspelmeyer; Austrian Acad. of Sciences, Austria.***

LMC3, A Radio Wave Analog of Laser Cooling for Macroscopic Systems, ***Kenton Brown, J. Britton, R. J. Epstein, J. Chiaverini, D. Leibfried, D. J. Wineland; NIST, USA.***

LTuA1, Alkali Vapor Lasers, ***Randall Knize, Boris Zhdanov; Laser and Optics Res. Ctr., US Air Force Acad., USA.***

LTuA2, Atomic Spectroscopy and Quantum Interference in On-Chip Hollow-Core Waveguides, ***Holger Schmidt; Univ. of California at Santa Cruz, USA.***

LTuF1, Physics and Applications of Laser-Atomic Oscillator, ***Yuan-Yu Jau; Princeton Univ., USA.***

LTuG1, Atom Chip Technology, ***Dana Anderson; Univ. of Colorado at Boulder, USA.***

LTuG2, Optical Microcavities on Atom Chips, ***Ed Hinds; Imperial College London, UK.***

LTuG3, Single Atoms and Condensates Strongly Coupled to an Optical Cavity on an Atom Chip, *Yves Colombe[1,2]; [1]Lab Kastler-Brossel, France, [2]NIST, USA.*

LS 5: Terahertz Spectroscopy

Invited Speakers:

LMB1, Photocarrier Dynamics of Semiconducting Single-Walled Carbon Nanotubes Probed by Terahertz Time-Domain Spectroscopy, *Hugen Yan, Yang Wu, Tony Heinz; Columbia Univ., USA.*

LMB2, Ultrafast Dynamics of Carrier Localization Probed via Time-Resolved Terahertz Spectroscopy, *Susan L. Dexheimer; Washington State Univ., USA.*

LMB3, The Effect of Spin-Polarized Electrons on THz Emission from Photoexcited GaAs(111), *Charles Schmuttenmaer, James M. Schleicher, Shayne M. Harrel; Yale Univ., USA.*

LMD1, Terahertz Technology for Defense Related Applications, *Megan R. Leahy-Hoppa, Michael J. Fitch, Robert Osiander; Johns Hopkins Univ. Applied Physics Lab, USA.*

LMD2, Method and Applications of Intense Terahertz Wave Radiation from Laser-Induced Air Plasma, *Jianming Dai, Xi Cheng Zhang; Rensselaer Polytechnic Inst., USA.*

LThB1, Origin of Terahertz Sensitivity to Heme Oxidation State, *Jing Yin Chen, J. R. Knab, Andrea Markelz; Univ. at Buffalo, USA.*

LThB2, Terahertz Spectroscopy of Illicit Drugs: Experiment and Theory, *Damian G. Allis, Patrick M. Hakey, Timothy Korter; Syracuse Univ., USA.*

LS 6: Laser Spectroscopy of Nanostructured Materials

Invited Speakers:

LTuC1, Multi-Exciton Generation by a Single Photon in Nanocrystals, *Alexander Efros; NRL, USA.*

LTuC2, Electron Injection from Colloidal Lead-Salt Quantum Dots into Oxide Nanoparticles, *Frank Wise; Cornell Univ., USA.*

LTuE1, Continuous Fluorescence from Single Colloidal Semiconductor Nanocystals, *Xiaoyong Wang[1], Megan Hahn[1], Todd Krauss[1], Keith Kahen[2], Xiaofan Ren[2], Manju Rajeswaran[2], Alexander L. Efros[3]; [1]Univ. of Rochester, USA, [2]Eastman Kodak Co., USA, [3]NRL, USA.*

LTuE2, Exciton Dynamics in (6,5) Carbon Nanotubes, ***Anna Swan[1], A. G. Walsh[1], J. Schneck[1], A. A. Green[2], M. C. Hersam[2], L. D. Ziegler[1]; [1]Boston Univ., USA, [2]Northwestern Univ., USA.***

LTuI1, Photoinduced Dynamics in Carbon Nanotubes and Colloidal Quantum Dots, ***Sergei Tretiak; Los Alamos Natl. Lab, USA.***

LTuI2, Measurement and Control of Ultrafast Relaxation in the Fine Structure of Nanocrystal Excitons, ***Cathy Y. Wong, Jeongho Kim, Gregory D. Scholes; Univ. of Toronto, Canada.***

LWH1, Optical Imaging of Carbon Nanotubes, ***Paul Finnie[1,2], Kate Kaminska[1], D. Guy Austing[1], Andrew Li-Pook-Than[1,2], Jacques Lefebvre[1]; [1]Natl. Res. Council Canada, Canada, [2]Dept. of Physics, Univ. of Ottawa, Canada.***

LWK1, Optical Spectroscopy of Individual Single-Walled Carbon Nanotubes and Graphene, ***Tony Heinz; Columbia Univ., USA.***

LWK2, Excited States Decay in Carbon Nanotubes, ***Vasili Perebeinos; IBM, USA.***

LWK3, Magnetophotoluminescence Spectroscopy of Excitons in Individual Carbon Nanotubes, ***Ajit Srivastava[1], Han Htoon[2], Victor I. Klimov[2], Junichiro Kono[1]; [1]Rice Univ., USA, [2]Ctr. for Integrated Nanotechnology, Los Alamos Natl. Lab, USA.***

LS 7: Lasers in Biomedical Optics

Invited Speakers:

LThA1, Studying Single Cells Using Integrated Raman and Angular-Scattering Microscopy, ***Andrew J. Berger, Zachary J. Smith; Inst. of Optics, Univ. of Rochester, USA.***

LThA3, Confocal Light Absorption and Scattering Spectroscopic Microscopy, ***Lev Perelman; Harvard Medical School, USA.***

LThD1, Analyzing Light Scattering from Aspherical Nuclei for Cell Biology and Clinical Applications, ***Adam Wax; Dept. of Biomedical Engineering, Duke Univ., USA.***

LThD2, Optical Fourier Processing of Subcellular Structure, ***Nada N. Boustany, Jing-Yi Zheng, Robert M. Pasternack, Zhen Qian; Rutgers Univ., USA.***

LThD3, Detecting Alterations in Cell Nanoarchitecture with Optical Imaging: Implications for Cancer Detection, ***Vadim Backman, Hariharan Subramanian, Prabhakar Pradhan, Yang Liu, Ilker Capoglu, Jeremy Rogers; Northwestern Univ., USA.***

LS 8: Transient Spectroscopy of Conjugated Polymers

Invited Speakers:

LWC1, Ultrafast Dynamics of Photoexcitations in pi-Conjugated Polymers and Polymer/Fullerene Blends, ***Valy Vardeny; Univ. of Utah, USA.***

LWC2, Ultrafast Photonics in Polymers, ***Guglielmo Lanzani, Jenny Clark, Tersilla Virgili, Juan Cabanillas-Gonzales; Dept. di Fisica, Politecnico di Milano, Italy.***

LWC3, Time-Resolved Spectroscopy of Exciton Dynamics and Fission in Organic Molecular Crystalline Materials, ***Chris Bardeen, Frank C. Spano, Tai-Sang Ahn, Astrid M. Muller, Yuri S. Avlasevich, Wolfgang W. Schoeller, Klaus Müllen; Univ. of California at Riverside, USA.***

LWF1, Coherent Aspects of Energy Transfer Dynamics in Conjugated Polymers, ***Gregory Scholes, Elisabetta Collini; Univ. of Toronto, USA.***

LWF2, Essential Optical States in π-Conjugated Polymer Films, ***Sumit Mazumdar[1], Zhendong Wang[1], Demetra Psiachos[1], Alok Shukla[2]; [1]Univ. of Arizona, USA, [2]Indian Inst. of Technology, India.***

LWF3, Implications of Delayed Luminescence for Conjugated Polymer Photophysics, ***E. J. Wesely, A. P. Marchetti, Y. H. Geng, S. H. Chen, Lewis Rothberg; Univ. of Rochester, USA.***

PRL 50th Anniversary Celebration

LTuH1, 50 More Years of PRL: How to Gauge a Journal's Success? ***Deniz van Heijnsbergen; American Physical Society, USA***

LTuH2, ***Physical Review Letters*****, AMO, and the Law of Unintended Consequences,** ***Daniel Kleppner; MIT, USA***

LTuH3, Highlights from 50 Years of PRL, ***Wolfgang Schleich; Dept. of Quantum Physics, Univ. of Ulm, Germany***

Special Symposia at Frontiers in Optics 2008/Laser Science XXIV

Laser Science Symposium on Undergraduate Research

Monday, October 20, 2008, 1:30 p.m.–6:00 p.m
Symposium organizer: Harold Metcalf, SUNY, Stony Brook, USA

This special DLS annual symposium is rapidly becoming one of the most successful DLS traditions (this year's is the eighth 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 fewer than 20 to more than 30, 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.

Schawlow-Townes Symposium on 50 Years of the Laser

Monday, October 20, 2008, 1:30 p.m.–6:00 p.m.
Symposium organizers: Robert Boyd[1], Martin Richardson[2], [1]Univ. of Rochester., USA, [2]CREOL, Univ. of Central Florida, USA

This year marks the 50th anniversary of the publication of the classic paper by Arthur Schawlow and Charles Townes [Infrared and Optical Masers, Phys. Rev. 112, 1940 (1958)] that ushered in the age of the laser. In celebration of this occasion, a special symposium is being held in conjunction with the 2008 OSA Annual Meeting, Frontiers in Optics. The symposium will be held on the afternoon of Monday, October 20. Professor Townes will be present at this event and will deliver a talk on the early history and the development of the laser. We have also arranged to have invited presentations by some of the early pioneers in laser science.

Invited Speakers:

SMB1, **Initiation and Development of the Laser,** *Charles H. Townes; Univ. of California at Berkeley, USA*

SMB2, **The World in a New Light,** *Steven Chu[1,2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of California at Berkeley, USA*

SMD1**, From Millisecond to Attosecond Laser Pulses,** *Nicolaas Bloembergen; Univ. of Arizona, USA*

SMD2**, From Gas Lasers and Tunable Raman Lasers to Quantum Cascade Lasers,** *Kumar Patel; Pranalytica Inc, USA*

SMD3, **How the Maser and Laser Came to Be,** *Anthony E. Siegman; Stanford Univ., USA*

SMD4, **Looking Back to the Laser of Schawlow and Townes, and Looking forward to the Generation of Gravitational Radiation,** *Raymond Chiao; Univ. of California at Merced, USA*

NASA at 50

Tuesday, October 21, 2008, 8:00 a.m.–5:30 p.m.
Symposium organizers: Peter Blake, Mark Clampin, Bruce Dean, NASA Goddard Space Flight Ctr., USA

It's been 50 years since the creation of NASA. The resulting extension of mankind's vision and presence into space has transformed our conception of the universe and of ourselves. This symposium will celebrate the iconic achievements: the challenges, failures and discoveries that optical science and engineering have encountered in NASA's missions. In human exploration, astronomy and earth science, participants deeply involved in past and future missions will engage us with their stories, lessons and achievements in technology and science. We expect to hear science history, background tutorial, personal history and inspirational lessons; and we hope to get a glimpse of our future.

Invited Speakers:

STuA1, **Recovery of the Hubble: Discovery, Cause, Characterization and Mitigation of the Aberration**
James B. Breckinridge[1,2]; [1]JPL, USA, [2]Caltech, USA

STuA2, **Wavefront Sensing for Hubble Recovery**, *James R. Fienup; Inst. of Optics, Univ. of Rochester, USA*

STuA3, **Advancing Science with the Hubble Space Telescope,** *Ken Sembach; Space Telescope Science Inst., USA*

STuB1, **Large Space Optics: From Hubble to JWST and Beyond**, *H. Philip Stahl; NASA Marshall Space Flight Ctr., USA*

STuB2, **Sparse Aperture Space Telescopes, Interferometry and Astrometry**, *Michael Shao; JPL, USA*

STuB3, **NASA High Contrast Imaging for Exoplanets**, *Richard Lyon; NASA Goddard Space Flight Ctr., USA*

STuC1, **Evolution of Optical Systems for Planetary Science from Ranger to the Present**, *Fred E. Vescelus[1,2]; [1]JPL, USA, [2]Caltech, USA*

STuC2, **Spitzer and Other Planetary Systems**, *George H. Rieke; Univ. of Arizona, USA*

STuC3, **The James Webb Space Telescope**, *Mark Clampin; NASA Goddard Space Flight Ctr., USA*

STuC4, **The Future of Astronomy in Space**, *Lee D. Feinberg; NASA Goddard Space Flight Ctr., USA*

STuD1, **Historical Overview of Earth Science from Space**, *Stanley Q. Kidder; Cooperative Inst. for Res. in the Atmosphere (CIRA), Colorado State Univ., USA*

STuD2, **Laser Measurement of Atmospheric Components**, *Norman P. Barnes; NASA Langley Res. Ctr., USA*

STuD3, **Global Observations: One Perspective on the Future**, *Berrien Moore; Climate Central, USA*

Polarized Light: 200 Years since Malus' Discovery

Wednesday, October 22, 2008, 8:00 a.m.–12:00 p.m
Symposium organizers: Thomas G. Brown[1], Taco D. Visser[2], [1]Univ. of Rochester, USA, [2]Vrije Univ., Netherlands

Two hundred years after Malus' discovery, the study of polarization and polarization-driven optical phenomena is as active as ever. Increasingly accurate control of polarization, combined with expanded thinking about the role of polarization in imaging, laser beam propagation, focusing and coherence, has spawned an interest in new phenomena that may lie hidden in our established understanding of the fundamentals of polarized light. This symposium highlights the wide range of polarization-related research in optical science and engineering.

Invited Speakers:

SWA1, **Recent Developments in Theory of Polarization of Stochastic Light Beams**, *Emil Wolf; Univ. of Rochester, USA*

SWA2, **Polarization Effects in High Field Interactions**, *Chunlei Guo; Univ. of Rochester, USA*

SWA3, **Singularities in the Near Field of a Photonic Crystal**, *L. (Kobus) Kuipers; Ctr. for Nanophotonics, FOM Inst. AMOLF, Netherlands*

SWA4, **Polarization Patterns in the Daylight and Cosmic Skies**, *Mark R. Dennis; Dept. of Physics, Univ. of Bristol, UK*

SWB1, **Polarization in Hyper-NA Lithography**, *Bruce Smith; Dept. of Microelectronic Engineering, Rochester Inst. of Technology, USA*

SWB2, **Polarization and Coherence Optics: Historical Perspective, Status and Future Directions**, *Christian Brosseau; Univ. de Bretagne Occidentale, France*

SWB3, **The Evolution of Polarization Calculi,** *Russell Chipman; Univ. of Arizona, USA*

A Tribute to Howard Schlossberg

Wednesday, October 22, 2008, 1:30 p.m.–5:30 p.m.
Symposium organizer: Bob D. Guenther, Duke Univ., USA

Howard Schlossberg, in his capacity at the Air Force Office of Scientific Research, has provided support for research that led to major technological and scientific discoveries over several decades. This special symposium will honor Dr.Schlossberg's contributions through presentations by invited speakers. The speakers owe their entry as students into the field of optics to the support of Dr. Schlossberg. It is our hope that this historical look back on Federal research funding will not only honor the contributions made by Dr. Schlossberg, but will allow those in attendance to appreciate the contribution the Federal Government has made to the progress of science.

Invited Speakers:

SWC1, **Ultrafast Spectroscopy of Semiconductors**, *Steven Cundiff; JILA, NIST and Univ. of Colorado, USA*

SWC2, **A New Generation of Ultrafast X-Ray Sources**, *Roger W. Falcone[1,2]; [1]Dept. of Physics, Univ. of California at Berkeley, USA, [2]Advanced Light Source, Lawrence Berkeley Natl. Lab, USA*

SWC3, **Optical Coherence Tomography for Biomedical Imaging**, *James Fujimoto; MIT, USA*

SWC4, **Proton and Ion Acceleration by an Ultrafast TW CO2 Laser: Proof-of-Principle Experiments**, *Peter Shkolnikov[1], I. Pogorelsky[2], V. Yakimenko[2], M. Babzien[2], P. McKenna[3], D. Carroll[3], D. Nealy[4], A. Pukhov[5], Z. Najmudin[6], L. Willingdale[6], E. Stolyarova[7], G. Flynn[7]; [1]Stony Brook Univ., USA, [2]Brookhaven Natl. Lab, USA, [3]Univ. of Strathclyde, UK, [4]Rutherford Appleton Lab, UK, [5]Univ. of Darmstadt, Germany, [6]Imperial College, UK, [7]Columbia Univ., USA*

SWD1, **Applications of Molecular Coherence**, *Alexei Sokolov; Texas A&M Univ., USA*

SWD2, **Nanoscale Stratification of Local Field and Related Effects of Giant Resonances, "Magic Numbers" and Hystereses**, *Sergei N. Volkov, Alexander E. Kaplan; Dept. of Electrical and Computer Engineering, Johns Hopkins Univ., USA*

SWD3, **Nonlinear Optics of Electron Spin Coherences in Semiconductors**, *Hailin Wang; Univ. of Oregon, USA*

Best of Topicals

Thursday, October 23, 2008, 8:00 a.m.–12:00 p.m.
Symposium organizer: Michael Duncan, NRL, USA

The OSA offers a wide variety of topical meetings where cutting-edge research is presented. In an effort to bring some of the outstanding presentations that are given at these meetings to a broader audience, the committee has chosen, for the third year in a row, to offer a special session devoted to important papers from many of the topical meetings. One select presentation from each of a number of topical meetings held in 2008 (or late 2007) will be highlighted so that FiO attendees may see the type of exciting research being reported. The papers in this special session have been chosen by topical meeting attendees and by the topical meeting chairs. They certainly deserve the title Best of Topicals.

Invited Speakers:

SThA1, **Coherence Holography and Spatial Frequency Comb for 3-D Coherence Imaging and Coherence Vortex Generation**, *Mitsuo Takeda[1], Wei Wang[2], Zhihui Duan[1], Yoko Miyamoto[1], Joseph Rosen[3]; [1]Univ. of Electro-Communications, Japan, [2]Heriot-Watt Univ., UK, [3]Ben-Gurion Univ. of the Negev, Israel.*

SThA2, **Factorisation of Numbers, Schrödinger Cats and the Riemann Hypothesis**, *Wolfgang Schleich; Dept. of Quantum Physics, Univ. of Ulm, Germany.*

SThA3, **Multidimensional Functional Optical Imaging of the Brain**, *Elizabeth M. Hillman[1], Brenda Chen[1], Sean A. Burgess[1], Andrew J. Radosevich[1], Matthew B. Bouchard[1], Amir K. Iranmahboob[1], Aniruddha Das[2], Bruno Cauli[3]; [1]Columbia Univ., USA, [2]Ctr. for Neurobiology and Behavior, Columbia Presbyterian Medical Ctr., USA, [3]Univ. Pierre et Marie Curie, France.*

SThA4, **Volume Bragg Gratings in PTR Glass–New Optical Elements for Laser Design**, *Leonid B. Glebov; CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA.*

SThC1, **Holographic Bragg Reflectors and Other Planar Waveguide Devices Enabled by Deep UV Photolithographic Patterning**, *Thomas Mossberg, Christoph Greiner, Dmitri Iazikov; LightSmyth Technologies, Inc., USA.*

SThC2, **Kilohertz-Rate, Collision-Free, Gas-Phase Thermometry with Femtosecond CARS**, *James R. Gord[1], Daniel R. Richardson[2], Robert P. Lucht[2], Sukesh Roy[1]; [1]AFRL, USA, [2]Dept. of Mechanical Engineering, Purdue Univ., USA.*

SThC3, **3-D Micro-Optic Circuits in Holographic Photopolymers**, *Amy C. Sullivan[1,2], Robert R. McLeod[1], Matthew S. Kirchner[1]; [1]Univ. of Colorado, USA, [2]Agnes Scott College, USA*

Quantum Optics and Quantum Engineering for Undergraduates Symposium

Thursday, October 23, 2008, 8:00 a.m.–12:00 p.m.
Symposium organizer: Svetlana G. Lukishova, Univ. of Rochester, USA

The goal of this symposium is to share the experience among universities and four-year colleges on teaching quantum optics and quantum engineering. The main subject of our discussion will be how to motivate and reduce to practice some of the most abstract components of quantum theory.

Both lecture courses and experiments on modern applications of photon quantum mechanics for undergraduates will be discussed. This symposium will build a network in developing a series of laboratory experiments and educational methods illustrating the basic principles on which applications of quantum engineering are based, and at the same time will be understandable to a wide range of undergraduate students. The symposium will consist of five invited talks and contributed oral and poster presentations.

Invited Speakers:

SThB1, **Writing a Successful Education Proposal to the NSF**, *Warren W. Hein1,2, Duncan E. McBride[1]; [1]Natl. Science Foundation, USA, [2]American Association of Physics Teachers, USA*

SThB2, **The Challenges of Quantum Physics as Pedagogical Tools**, *Arthur G. Zajonc; Amherst College, USA*

SThB3, **Undergraduate Quantum Optics: The Challenge and the Excitement**, *Mark Fox; Univ. of Sheffield, UK*

SThD1, **A Quantum Optics Laboratory for Teaching Quantum Mechanics**, *Enrique J. Galvez; Colgate Univ., USA*

SThD2, **Teaching Quantum Mechanics with Photon Counting Instrumentation**, *Carlos R. Stroud, Jr., Svetlana G. Lukishova; Univ. of Rochester, Inst. of Optics, USA*

The Stiles-Crawford Effects of the First and Second Kinds, 75 Years of Scientific Achievements

Thursday, October 23, 2008, 4:00 p.m.–6:00 p.m.
Symposium organizers: Jay M. Enoch[1], David Atchison[2], Vasudevan Lakshminarayanan[3], Pieter Walraven[4], [1]Univ. of California at Berkeley, USA, [2]Queensland Univ. of Technology, Australia, [3]Univ. of Waterloo, Canada, [4]Emeritus TNO Human Factors, Soesterberg, Netherlands

In 1933 Drs. Walter Stanley Stiles, F.R.S., O.B.E., and Brian H. Crawford described a new phenomenon, known as "the directional sensitivity of the retina," later referred to as the Stiles-Crawford Effect of the first kind (SCE-I). Stiles and Crawford deduced that rays entering the eye pupil off-center were less effective at stimulating vision. Also, varying angle of incidence of light at the retina altered perceived hue and saturation, now known as SCE-II. These effects arise from the waveguide properties of retinal receptors. We celebrate the discovery of these effects, the scientists who have contributed to and defined these properties, and more recent advances in the field.

Invited Speakers:

SThE1,**The Stiles-Crawford Effects, 75 Years: A Brief History and Experiences at the National Physical Laboratory (Teddington, UK) with W. S. Stiles and B. H. Crawford**, *Jay M. Enoch; Univ. of California at Berkeley, USA*

SThE2, **Photometric and Radiometric Issues Associated with Measurements of the Integrated Stiles-Crawford Effect and Specification of the Visual Stimulus**, *Vasudevan Lakshminarayanan[1], J. M. Enoch[2]; [1]Univ. of Waterloo, Canada, [2]Univ. of California at Berkeley, USA*

SThE3, **Effect of Accommodation on the Stiles-Crawford Effect**, *David Andrew Atchison, Nisha Singh, Sanjeev Kasthurirangan, Huanqing Guo; Queensland Univ. of Technology, Australia*

SThE4, **Optical Properties of Human Cone Photoreceptors Revealed with Adaptive Optics**, *Austin Roorda[1], David R. Williams[2]; [1]Univ. of California at Berkeley, USA, [2]Univ. of Rochester, USA*

SThE5, **Waveguide Models and the Stiles-Crawford Effects**, *Brian Vohnsen; Univ. College Dublin, Ireland*

SThE6, **Studies of the Stiles-Crawford Effect of the First Kind in Myopic Conditions**, *Stacey S. Choi[1,2,3]; [1]Univ. of California at Berkeley, USA, [2]Univ. of Auckland, New Zealand, [3]Current affiliation: The New England College of Optometry, USA*

Science Educators Day

Special FREE event for Middle and High School Educators

2008 OSA Science Educators' Day
Thursday, October 23, 2008
4:30 PM -8:00 PM (includes complimentary dinner)
Rochester Riverside Convention Center, Rochester, New York

OSA Science Educators' Day'08 will be held in conjunction with Frontiers In Optics (FiO), the Optical Society of America's Annual Meeting. This free event is co-hosted by the OSA Rochester Local Section and OSA's national organization.

The Educators' Day program is designed for middle and high school science teachers from the greater Rochester, NY area and features:

- Presentations by optics experts
- Interactive, "hands-on" activities--*with a special emphasis on experiments that teachers can replicate in their classrooms*
- Approximately 15 classroom demonstrations--*including lesson plans (PDF file)*
- A complimentary dinner

Special Events

Student Chapter New Officers Orientation

Sunday, October 19, 7:00 a.m.–8:00 a.m.
Highland D, E, F, G, Rochester Riverside Convention Center

Student Chapter officers should plan to attend this special orientation session that will provide an overview of OSA Student Chapter benefits and guidance on applying for funding, requesting Traveling Lecturers and submitting annual reports. This meeting will precede the Annual Student Chapter Leadership Meeting and those chapter leaders wishing to attend should RSVP to KiKi L'Italien at klital@osa.org.

Annual Student Chapter Leadership Meeting – Invitation Only

Sunday, October 19, 8:00 a.m.–3:30 p.m.
Highland D, E, F, G, Rochester Riverside Convention Center
Moderator: KiKi L'Italien, OSA Chapter & Student Services Manager
Student Chapter leaders from around the globe are invited to attend this annual meeting focused on best practices for Student Chapter management. This year's agenda will include special visits from optics luminaries, a special session on mentoring, case studies on education outreach, the presentation of the 2008 Excellence Awards and much more! Additionally, we will highlight a new OSA program designed for OSA members who have recently completed their academic studies, the OSA Young Professionals Program. To attend this event, Chapter leaders must be invited or request approval to attend by contacting KiKi L'Italien at klital@osa.org.

What's Hot in Optics Today?

Sunday, October 19, 4:00 p.m.–6:00 p.m.
Lilac Ballroom North and South, Rochester Riverside Convention Center

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

- **Frontiers in Biomedical Optics: Nanometer-Scale Optical Imaging inside Cells**, *Chris Schaffer, Cornell Univ., USA*
- **What's Hot in Fabrication, Design and Instrumentation: The Optics in Energy and Imaging Systems**, *R. John Koshel[1,2], [1]Photon Engineering LLC,USA, [2]College of Optical Sciences, Univ. of Arizona, USA*
- **What's Hot in Optical Interaction Science**, *Martin Richardson, CREOL, College of Optics and Photonics, Univ. of Central Florida, USA*
- **What's Hot in Photonics and Opto-Electronics,** *Juerg Leuthold, Univ. of Karlsruhe, Germany*
- **What's Hot in Vision and Color,** *Daphne Bavelier, Univ. of Rochester, USA*

Participants' presentations will also be placed on the OSA website (www.osa.org) for viewing by the general public. Go to the technical groups area of the membership section of the website to view the technical overviews from this conference.

Welcome Reception and Joint FiO/LS Poster Session I

Sunday, October 19, 6:00 p.m.–7:30 p.m.
Riverside Court and Galleria Lobby, Rochester Riverside Convention Center

Free to all Technical Conference Attendees: Get the FiO 2008/LS XXIV meeting off to a great start by attending the welcome reception and opening poster session! Meet with colleagues from around the world and tour the wide range of poster displays. Light hors d'oeuvres will be served.

FiO/LS Poster Presentations

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.

Joint FiO/LS Poster Session I

Sunday, October 19, 6:00 p.m.–7:30 p.m.
Galleria Lobby, Rochester Riverside Convention Center

Held during the welcome reception, the opening poster session includes 25 FiO and five LS posters.

Joint FiO/LS Poster Session II

Wednesday, October 22, 12:00 p.m.–1:30 p.m.
Empire Hall, Rochester Riverside Convention Center

This year there are 70 FiO and 12 LS posters scheduled for presentation during Wednesday's poster session.

Vision and Color Poster Session

Thursday, October 23, 12:00 p.m.–1:30 p.m.
Riverside Court, Rochester Riverside Convention Center

Fourteen posters submitted to FiO's Vision and Color subcommittee will be presented.

OSA Division and Technical Group Meetings

OSA has re-organized its Technical Divisions and Groups and is providing new (online and in-person) opportunities to network with colleagues worldwide. Find out more about these new

opportunities, network with peers and meet group leaders by attending a technical group meeting at FiO. Confirmed technical group meetings include the following:

The Institute of Optics at the University of Rochester is pleased to host a meeting of the **Fabrication, Design, and Instrumentation Division** of the OSA on October 19, 2008. The meeting represents an opportunity to visit with other members of the Division and to hear about some of the most recent educational initiatives at The Institute. The activities will include an overview of the division and two short presentations along with tours of the teaching laboratories at the Institute. It will also feature a glimpse into the Robert E. Hopkins Center for Optical Design and Engineering, an educational initiative aimed at bringing a new level of design experience to students at The Institute of Optics.

Schedule:
7:00 p.m.–7:30 p.m.: Transportation from the Convention Center
7:30 p.m.–8:15 p.m.: Program

- **Overview of the Fabrication, Design, and Instrumentation Division,** *John Koshel; Photon Engineering and Univ. of Arizona, USA*
- **Optical Design and Engineering at the Institute of Optics,** *Thomas G. Brown; Univ. of Rochester, USA*
- **The Highs and Lows of Student Design Projects,** *Prof. Julie Bentley; Corning Tropel and Univ. of Rochester, USA*

8:15 p.m.–9:00 p.m.: Laboratory Tours
9:00 p.m.–9:30 p.m.: Return Transportation to the Convention Center

The bus will depart outside the North Promenade of the Rochester Riverside Convention Center on Main Street at 7:00 p.m. To ensure we have adequate transportation, please RSVP to Sara Wendell at swende@osa.org if you plan to participate.

Vision and Color Division
Saturday, October 24, 4:45 p.m.–5:45 p.m.
Ctr. for Visual Science, Univ. of Rochester

Be sure to check back for updates as the technical groups finalize their plans. A complete list of technical group meetings will also be included in the Conference Update Sheet, distributed at the meeting.

Plenary Session and Awards Presentation

Monday, October 20, 8:00 a.m.–12:00 p.m.
Lilac Ballroom North and South, Rochester Riverside Convention Center

The 2008 Joint FiO/LS Awards Ceremony and Plenary Session will feature two world-renowned speakers. See the plenary page for detailed descriptions of the speakers and their presentations.

Illumination Modeling Workshop

Monday, October 20, 1:30 p.m.–6:00 p.m.
Highland D, Rochester Riverside Convention Center

There are an increasing number of applications that require a good understanding of ambient lighting and illumination of objects or scenes to create a desired effect or appearance. Applications such as 3-D virtual environment visualization, architectural lighting, computer animation and automotive lighting are some of the areas that deal with the effect of ambient lighting and a lit model's appearance. Complimentary to understanding such effects is the need for sources and optical designs to create the desired illumination while understanding human perceptual characteristics.

The Illumination Modeling Workshop aims at bringing together communities such as lighting, computer graphics, color technologists, optical designers, light sources and virtual reality toward the common goal of design, production and understanding of ambient lighting and a lit model's appearance.
In addition to featuring three posters in the Joint FiO/LS Poster Session II, the workshop includes two oral sessions: Illumination I: Modeling, Ray Tracing and Rendering (FMC), 1:30 p.m.–3:30 p.m.; and Illumination II: Vision and Measurement (FMJ), 4:00 p.m.–6:00 p.m. Invited speakers include:

FMC2, **Modulating and Demodulating Projected Light,** *Oliver Bimber, Bauhaus-Univ. Weimar, Germany*
FMC6, **Accurate Lit-Appearance Modeling of Illumination Systems**, *R. John Koshel[1,2], [1]Photon Engineering LLC, [2]College of Optical Sciences, Univ. of Arizona, USA*
FMJ1, **An Overview of the Non-Visual Effects of Retinal Light Exposure**, *Mark S. Rea, Mariana G. Figueiro, Rensselaer Polytechnic Inst., USA*
FMJ3, **Vision at Mesopic Light Levels,** *Alan L. Lewis, Electric Power Res. Inst. (EPRI) Lighting Res. Office, USA*

Illumination Modeling Workshop Committee

Anurag Gupta, *Optical Res. Associates, USA*, **Co-Chair**
Hong Hua, *Univ. of Arizona, USA*, **Co-Chair**
Groot Gregory, *Optical Res. Associates, USA*
Jannick Rolland, *CREOL, College of Optics and Photonics, Univ. of Central Florida, USA*
R. John Koshel, *Photon Engineering LLC, USA, and College of Optical Science, Univ. of Arizona, USA.*

OSA Student Member Welcome Reception

Monday, October 20, 6:30 p.m.–8:30 p.m.
Abilene, 153 Liberty Pole Way, Downtown Rochester, New York, 14604, Phone: 585.232.3230
Free to all OSA Student Members: This reception is a fun event that encourages students to

meet, enjoy refreshments and have a good time! *Please note: Membership will be verified at the entrance.*

Building Your Future in Optics (sponsored by the OSA Foundation)

Tuesday, October 21, 9:30 p.m .–12:00 p.m.
Grand Ballroom C, Hyatt Rochester Regency

Students will receive valuable tips and advice from back-to-back presentations geared toward students and young professionals interested in publications and enhancing their careers.

9:30 a.m.–10:15 a.m.
All You Ever Wanted to Know about Publications but Were Afraid to Ask
Bahaa Saleh, Boston Univ., USA

Dr. Saleh has been an active contributor to OSA journals for over 20 years and has held positions including Editor-in-Chief of the Journal of the Optical Society of America (JOSA A), Chair of the OSA Board of Editors, and now Editor of Advances in Optics and Photonics (AOP). His insight on scientific publishing, including how to write a useful review, will be invaluable to any student seeking publication in optics/physics journals.

10:15 a.m.–11:00 a.m.
Ethics in Publishing
Anthony Campillo, The Optical Society, USA

Dr. Campillo, Chair of OSA's Editorial Ethics Review Panel, will highlight the imperfect nature of the publishing world by covering some of the more obvious violations to complex situations faced by authors, reviewers and editors. He also explains how OSA responds to allegations of ethical violations.

11:00 a.m.–12:00 p.m.
The Power of Procrastination
Jorge Cham, Piled High & Deeper, USA

Jorge Cham, creator of the comic strip "Piled High & Deeper," recounts his experiences bringing humor into the lives of stressed-out academics, examines the source of their anxieties and explores the guilt, the myth and the power of procrastination.

OSA Fellow Member Lunch (Sponsored by the OSA Foundation)

Tuesday, October 21, 12:00 p.m.–1:30 p.m.
Regency Ballroom, Hyatt Regency Rochester

In September all OSA Fellow, Fellow Emeritus and Honorary Members were sent an invitation to this event. Please email rsvp@osa.org by October 3 to reserve your place.

Meet the APS Journal Editors and Celebrate 50 Years of PRL

Tuesday, October 21, 3:30 p.m.–5:30 p.m.
Riverside Court, Rochester Riverside Convention Center

Physical Review Letters (PRL) turned 50 in 2008, and is still going strong. Please join the editors of the APS journals in celebrating 50 years of publication of interesting and important physics. Refreshments will be served. Please note that this follows the technical session on the history of PRL (LTuH: PRL 50th Anniversary Celebration, Tuesday, October 21, 2008, 2:00 p.m.–3:30 p.m., *Highland K, Rochester Convention Center*).

Division of Laser Science Annual Business Meeting

Tuesday, October 21, 6:00 p .m.–7:00 p.m.
Highland B, Rochester Riverside Convention Center

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

OSA's Annual Business Meeting

Tuesday, October 21, 6:00 p.m.–7:00 p.m.
Highland E, Rochester Riverside Convention Center

Learn more about OSA and join the OSA Board of Directors for the Society's annual business meeting. The 2007 Activity Reports will be presented and the results of the Board of Directors election will be announced. To view the slate of candidates, go to http://www.osa.org/aboutosa/leadership/electionprocess/default.aspx.

Agenda

I. Welcome	2008 OSA President, Rod Alferness
II. 2007 Activity Reports from Society Representatives	
Treasurer	Stephen Fantone
Co-Chairs, Science & Engineering Council	David Fittinghoff and Edward

	Watson
Chair, Member & Education Services Council	Irene Georgakoudi
Chair, Corporate Associates Committee	Paul Crosby
Chair, International Council	Jonathan Marangos
Chair, Board of Editors	Tony Heinz
Chair, Publications Council	James Fienup
Chair, OSA Foundation	Gary Bjorklund

III. 2008 Election Results	2008 OSA President, Rod Alferness
2009 Vice President and Directors at Large	

OSA Member Reception

Tuesday, October 21, 7:00 p.m.–8:30 p.m.
Lilac Ballroom North and South, Rochester Riverside Convention Center

Free to all OSA Members: The OSA member reception is a great opportunity to see old friends and establish new contacts. Appetizers and beverages will be served. Please note: Membership will be verified at the entrance.

Laser Science Banquet

Tuesday, October 21, 7:00 p.m.–10:00 p.m.
Triphammer Grill, 60 Browns Race, Rochester, New York, 14614, Phone: 585.262.2700

Join your colleagues for the annual LS Banquet. Tickets are required for this event and can be purchased during registration for US $50. There is a limited quantity of tickets and tickets must be purchased by 12:00 p .m. noon on Monday, October 20.

Minorities and Women in OSA (MWOSA) Luncheon

Wednesday, October 22, 12:00 p.m.–1:30 p.m.
Regency Ballroom, Hyatt Regency Rochester

OSA boasts a distinguished list of past presidents; each has brought individual talents and passions to the job and left a lasting and positive impact on the Society. Please join us for the unique opportunity to hear three highly noted scientists in the field of optics share their perspectives on serving as the president of OSA and their views on future trends in optics and photonics.

There is limited space for this event. Please RSVP to mwosa@osa.org by October 10, 2008.

Moderator:
Meredith M. Lee, Stanford Univ.—OSA Student Member
Panelists:
Elsa M. Garmire, Dartmouth College, USA —1993 OSA President
Susan N. Houde-Walter, LaserMax, Inc., USA—2005 OSA President
Anthony M. Johnson, Univ. of Maryland, USA—2002 OSA President

FiO Postdeadline Papers

Wednesday, October 23, 7:00 p.m.–8:30 p.m.
Locations to be announced

The FiO 2008 Technical Program Committee accepted 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. For more information, including the schedule and locations, please check back.

2008 OSA Science Educators' Day

Thursday, October 23, 4:30 p.m.–8:00 p.m.
Lilac Ballroom North and South, Rochester Riverside Convention Center

Special FREE event (includes dinner and parking) for Middle and High School Educators

Featuring the theme:
OPTICS FOR THE ENVIRONMENT

The event includes:

- Approximately 20 stations with educators demonstrating and discussing ***hands-on materials for teaching optics*** to secondary school students
- ***Gift bags*** containing demonstration aids and lesson plans for the ***first 100 registrants***
- Additional optics materials available as ***door prizes***
- A ***buffet dinner*** allowing you to mingle with fellow teachers and conference attendees

This year, in addition to general optics education, we are emphasizing the theme ***"Optics for the Environment."*** Demonstrations and information will be provided about solar cells, efficient lighting (compact fluorescents, LEDs), light pollution, UV protection, and increased awareness of lighting as a significant form of energy consumption. Local vendors of energy-conscious optical products will be present. We hope that "Optics for the Environment" can provide a useful entry point for optics in your school's existing science curriculum.
Questions? Email EDAY@osa.org, call Andrew Berger at 585-273-4724 or visit http://www.optics.rochester.edu/workgroups/berger/ for other information.

Space will be limited! Register by ***Friday, October 3, 2008!***

To register, please submit the **registration form** via any of the following, or **register online**:

- Email: EDAY@osa.org
- Fax: 585-244-4936, attention to Andrew Berger
- Mail: Educators' Day
  c/o Andrew Berger
  University of Rochester
  Rochester, NY 14627-0186

Fall Vision Meeting

Friday, October 24–Sunday, October 26
Ctr. for Visual Science, Univ. of Rochester

The Optical Society Fall Vision Meeting is a small, high-quality scientific meeting focused on all aspects of vision research. Talks are organized so that there is plenty of time for discussion. Additional meeting details can be found at http://www.cvs.rochester.edu/fvm_2008/index.html.

Student Information

FiO Student Events

Students, recent graduates and early-career professionals who want to improve their presentation skills and leadership abilities should not miss these special events.

Student Chapter New Officers Orientation
Sunday, October 19, 7:00 a.m.–8:00 a.m.
Highland D, E, F, G, Rochester Riverside Convention Center

Student Chapter officers should plan to attend this special orientation session that will provide an overview of OSA Student Chapter benefits and guidance on applying for funding, requesting Traveling Lecturers and submitting annual reports. This meeting will precede the Annual Student Chapter Leadership Meeting and those chapter leaders wishing to attend should RSVP to KiKi L'Italien at klital@osa.org by September 12.

Annual Student Chapter Leadership Meeting – Invitation Only
Sunday, October 19, 8:00 a.m.–3:30 p.m.
Highland D, E, F, G, Rochester Riverside Convention Center

Moderator: KiKi L'Italien, OSA Chapter & Student Services Manager

Student Chapter leaders from around the globe are invited to attend this annual meeting focused on best practices for Student Chapter management. This year's agenda will include special visits from optics luminaries, a special session on mentoring, case studies on education outreach, the presentation of the 2008 Excellence Awards and much more! Additionally, we will highlight a new OSA program designed for OSA members who have recently completed their academic studies, the OSA Young Professionals Program. To attend this event, Chapter leaders must be invited or request approval to attend by contacting KiKi L'Italien at klital@osa.org by September 12.

Student Member Reception
Monday, October 20, 6:30 p.m.–8:30 p.m.
Abilene, 153 Liberty Pole Way, Downtown Rochester, 14604, Phone: 585.232.3230

Free to all OSA Student Members! After a long day filled with exhibits and education, it may be tempting to retire to your room for the evening and gear up for another long day. Resist that urge! This reception is a fun event that encourages students to meet, enjoy refreshments and have a good time! *Please note: Membership will be verified at the entrance.*

Building Your Future in Optics
(sponsored by the OSA Foundation)

Tuesday, October 21, 9:30 p .m .–12:00 p .m.
Grand Ballroom C, Hyatt Rochester Regency

Students will receive valuable tips and advice from back-to-back presentations geared towards students and young professionals interested in publications and life perspectives.

9:30 a.m.–10:15 a.m.
All You Ever Wanted to Know about Publications but Were Afraid to Ask
Bahaa Saleh, Boston Univ., USA

Dr. Saleh has been an active contributor to OSA journals for over 20 years and has held positions including Editor-in-Chief of the Journal of the Optical Society of America (JOSA A), Chair of the OSA Board of Editors, and now Editor of Advances in Optics and Photonics (AOP). His insight on scientific publishing, including how to write a useful review, will be invaluable to any student seeking publication in optics/physics journals.

10:15 a.m.–11:00 a.m.
Ethics in Publishing
Anthony Campillo, *The Optical Society, USA*

Dr. Campillo, Chair of OSA's Editorial Ethics Review Panel, will highlight the imperfect nature of the publishing world by covering some of the more obvious violations to complex situations faced by authors, reviewers and editors. He als-o explains how OSA responds to allegations of ethical violations.

11:00 a.m.–12:00 p.m.
The Power of Procrastination
Jorge Cham, *Piled High & Deeper, USA*

Jorge Cham, creator of the comic strip "Piled High & Deeper," recounts his experiences bringing humor into the lives of stressed out academics, examines the source of their anxieties and explores the guilt, the myth and the power of procrastination.

FiO Outstanding Student Paper Awards

At this year's annual meeting in October, OSA's student members were given an opportunity to have their presentations considered for a Presentation Award. More than 200 students participated and 41 finalists were selected. Two awards from each of the seven subcommittees were awarded. Congratulations to the winners: **Christopher Barsi** (Princeton Univ.); **Matthew R. Bolcar** (Univ. of Rochester); **Pamela Bowlan** (Georgia Tech); **Daniel H. Broaddus** (Cornell Univ.); **Ksenia Dolgaleva** (Univ. of Rochester); **Sangwoo Ha** (Australian Natl. Univ.); **Shu Jia** (Princeton Univ.); **John Nguyen** (Cornell Univ.); **Sri Rama Prasanna Pavani** (Univ. of Colorado at Boulder); **Carmel Rotschild** (Solid State Inst., Technion Israel); **Can Sun** (Princeton Univ.); **Laura Waller** (MIT); **Xin Wei** (Indiana Univ.); and **Zhangyi Zhong** (Indiana Univ.).

OSA Outstanding Student Paper Award Finalists at FiO.

Student Travel Grants

Incubic/Milton Chang Travel Grant

Application Deadline: August 4, 2008

Funded by an endowment from Milton and Rosalind Chang, this program provides 10 grants of $1000 each to enable students who present papers to travel the Frontiers in Optics/OSA Annual Meeting. Grants are awarded to the presenter and usually the first author of the paper.
All of the following information MUST be included in the grant application:

- A letter of support from the student
- A letter of support from the student's advisor
- An estimated budget for the trip
- A copy of the paper abstract

Students should also include home mailing address and email address. U.S. students should include their social security number, which is required to process the check. 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.

Grant applications for Frontiers in Optics must be submitted on or before August 4, 2008.

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
Optical Society of America
2010 Massachusetts Avenue, NW
Washington, DC 20036

OSA Foundation Student Travel Grants

The OSA Foundation is pleased to offer travel grants to students working or studying in a qualifying developing nation who plan to attend Frontiers in Optics (FiO) 2008. Travel grants will average $1,000 US per award.

Application Deadline: August 8, 2008

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.

Applications must include:

1. One document that includes:
    a. Your full contact information
    b. OSA Member number (if applicable)
    c. Name of meeting you will be attending
    d. An approximation of anticipated expenses for attending the meeting
    e. 3 – 4 paragraphs stating how attending this meeting will benefit your studies and career
2. Proof of enrollment, such as a scanned copy of your student identification card or a letter with a seal or endorsement from your university – You must be working or studying in a qualifying developing nation
3. A letter from your advisor demonstrating need and stating the benefit to you for attending the meeting
4. A short resume or CV
5. A copy of the paper or description of the poster you will be presenting at the conference (if applicable).

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. 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.

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.

The application packet should be submitted via email to foundationgrants@osa.org
The meeting chairs will review all qualified applications and applicants will be notified of the results via email.

Application Deadline: August 8, 2008

Agenda of Sessions — Sunday, October 19

7:00 a.m.–3:00 p.m.	**OSA Student Chapter Leadership Meeting,** *Highland D, E, F and G, Rochester Riverside Convention Center*
7:00 a.m.–6:00 p.m.	**Registration,** *Galleria, Rochester Riverside Convention Center*
9:00 a.m.–12:30 p.m.	**SC196: Light Emitting Diodes and Solid-State Lighting, E. Fred Schubert; SC321: Principles of Far-Field Fluorescence Nanoscopy, Andreas Schoenle; SC322: Silicon Nanophotonics, Jelena Vuckovic; SC323: Latest Trends in Optical Manufacturing, Paul Dumas,** *Locations will be provided at registration*
12:30 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*
1:30 p.m.–5:00 p.m.	**SC235: Nanophotonics: Materials, Fabrication and Characterization, Joseph Haus; SC306: Exploring Optical Aberrations, Virendra Mahajan; SC320: Polarization Engineering of Optical Fields, Thomas Brown; SC324: Plasmonics, Stefan Maier,** *Locations will be provided at registration*
4:00 p.m.–6:00 p.m.	**What's Hot in Optics Today?** *Lilac Ballroom North and South, Rochester Riverside Convention Center*
6:00 p.m.–7:30 p.m.	**JSuA: Joint FiO/LS Poster Session I/Welcome Reception,** *Galleria Lobby/Riverside Court, Rochester Riverside Convention Center*
7:00 p.m.–8:30 p.m.	**OSA Division and Technical Group Meetings,** *Exact times and locations are listed on the Update Sheet*

Key to Shading

Frontiers in Optics | Laser Science | Joint FiO/LS | META | OF&T

Agenda of Sessions — Monday, October 20

	Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
7:00 a.m.–6:00 p.m.	**Registration,** *Galleria, Rochester Riverside Convention Center*					
8:00 a.m.–10:00 a.m.						
8:00 a.m.–12:00 p.m.	**2008 Joint FiO/LS Awards Ceremony and Plenary Session,** *Lilac Ballroom North and South, Rochester Riverside Convention Center*					
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Lilac Ballroom Foyer, Rochester Riverside Convention Center*					
10:30 a.m.–12:30 p.m.						
12:00 p.m.–2:00 p.m.	**SMA: Laser Science Symposium on Undergraduate Research Posters,** *Riverside Court, Rochester Riverside Convention Center*					
12:30 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*					
1:30 p.m.–3:30 p.m.	**SMB: Schawlow-Townes Symposium on 50 Years of the Laser: The Birth of the Laser**	**FMA: Nonclassical Light** (ends at 3:15 p.m.)	**SMC: Laser Science Symposium on Undergraduate Research I** (2:00 p.m.–4:00 p.m.)	**FMB: Intense Field Science** (ends at 2:45 p.m.)	**FMC: Illumination I: Modeling, Ray Tracing and Rendering**	**FMD: General Optical Sciences I**
3:30 p.m.–4:00 p.m.	**Coffee Break,** *Lilac Ballroom Foyer, Rochester Riverside Convention Center*					
4:00 p.m.–6:00 p.m.	**SMD: Schawlow-Townes Symposium on 50 Years of the Laser: Looking to Tomorrow**	**FMH: Photon Sources** (ends at 5:45 p.m.)	**SME: Laser Science Symposium on Undergraduate Research II** (4:30 p.m.–6:30 p.m.)	**FMI: Femtosecond Surface Science** (ends at 6:15 p.m.)	**FMJ: Illumination II: Vision and Measurement**	**FMK: General Optical Sciences II**
6:30 p.m.–8:30 p.m.	**OSA Student Member Welcome Reception,** *Abilene, 153 Liberty Pole Way, Downtown Rochester, Phone: 585.232.3230*					

Key to Shading

Frontiers in Optics · Laser Science · Joint FiO/LS · META · OF&T

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
Registration, *Galleria, Rochester Riverside Convention Center*					
					MMA: Nano-Focusing, -Lensing and -Trapping
2008 Joint FiO/LS Awards Ceremony and Plenary Session, *Lilac Ballroom North and South, Rochester Riverside Convention Center*					
Coffee Break, *Lilac Ballroom Foyer, Rochester Riverside Convention Center*					
					MMB: Transformation Optics and Metamaterials
SMA: Laser Science Symposium on Undergraduate Research Posters, *Riverside Court, Rochester Riverside Convention Center*					
Lunch Break *(on your own)*					
FME: Novel Trapping and Micromanipulation Techniques I	**FMF: Wavefront Sensing and Control I**	**FMG: Silicon Photonics I**	**LMA: Cavity Optomechanics I**	**LMB: THz Spectroscopy of Charges in Semiconductors**	**MMC: Spectroscopy of Individual Plasmonic Nanostructures**
Coffee Break, *Lilac Ballroom Foyer, Rochester Riverside Convention Center*					
FML: Novel Trapping and Micromanipulation Techniques II	**FMM: Wavefront Sensing and Control II**	**FMN: Integrated Optics**	**LMC: Cavity Optomechanics II**	**LMD: THz Imaging and Novel Technology**	**MMD: THz Structures**
OSA Student Member Welcome Reception, *Abilene, 153 Liberty Pole Way, Downtown Rochester, Phone: 585.232.3230*					

Agenda of Sessions — Tuesday, October 21

	Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
7:00 a.m.–6:00 p.m.	**Registration,** *Galleria, Rochester Riverside Convention Center*					
8:00 a.m.–10:00 a.m.	**STuA: NASA at 50: The Hubble and Imaging**	**FTuA: Photonic Integrated Devices in Optical Networking**	**FTuB: Photonic Bandgap Engineering I**	**FTuC: Quantum Information Processing**	**FTuD: Imaging of Mice and Men I**	**FTuE: Optical Manipulation of Biosystems I**
9:30 a.m.–12:00 p.m.	**Student Event: Building Your Future in Optics,** *Grand Ballroom C, Hyatt Regency Rochester*					
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Empire Hall, Rochester Riverside Convention Center*					
10:00 a.m.–4:00 p.m.	**Exhibit Open,** *Empire Hall, Rochester Riverside Convention Center*					
10:30 a.m.–12:00 p.m.	**STuB: NASA at 50: Future Telescopes**	**FTuH: Novel Modulation Formats** (ends at 11:45)	**FTuI: Fundamental Nonlinear Optics**	**FTuJ: Beam Combining I**	**FTuK: Light Propagation Models for Therapy and Diagnosis**	**FTuL: Optical Manipulation of Biosystems II**
12:00 p.m.–1:30 p.m.	**Exhibit Only Time,** *Empire Hall, Rochester Riverside Convention Center*					
12:00 p.m.–1:30 p.m.	**OSA Fellow Member Lunch,** *Regency Ballroom, Hyatt Regency Rochester*					
12:30 p.m.–1:30 p.m.	**Lunch** *(on your own)*					
1:30 p.m.–3:30 p.m.		**STuC: NASA at 50: NASA and Space Science**	**FTuP: Photonic Bandgap Engineering II** (ends at 3:15 p.m.)	**FTuQ: Quantum Measurement and Entanglement**	**FTuR: Imaging of Mice and Men II**	**FTuS: Microscopy Superresolution and Source Engineering I**
3:30 p.m.–4:00 p.m.	**Coffee Break,** *Empire Hall, Rochester Riverside Convention Center*					
3:30 p.m.–5:30 p.m.	**Meet the APS Journal Editors and Celebrate 50 Years of PRL,** *Riverside Court, Rochester Riverside Convention Center*					
4:00 p.m.–5:30 p.m.		**STuD: NASA at 50: NASA and Earth Science**	**FTuV: Ultrafast Nonlinear Optics** (ends at 5:15 p.m.)	**FTuW: Beam Combining II**	**FTuX: Biosensing** (ends at 5:00 p.m.)	**FTuY: Microscopy Superresolution and Source Engineering II**
6:00 p.m.–7:00 p.m.	**OSA Business Meeting,** *Highland E, Rochester Riverside Convention Center*					
6:00 p.m.–7:00 p.m.	**DLS Business Meeting,** *Highland B, Rochester Riverside Convention Center*					
6:00 p.m.–7:30 p.m.	**META/OF&T Welcome Reception,** *Grand Ballroom D, Hyatt Regency Rochester*					
7:00 p.m.–8:30 p.m.	**OSA Member Reception,** *Lilac Ballroom North and South, Rochester Riverside Convention Center*					
7:00 p.m.–10:00 p.m.	**LS Banquet,** *Triphammer Grill, 60 Browns Race, Rochester, Phone: 585.252.2700*					

Key to Shading

Frontiers in Optics | Laser Science | Joint FiO/LS | META | OF&T

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
Registration, *Galleria, Rochester Riverside Convention Center*						
FTuF: Systems for Optical Manipulation I	**FTuG: Fiber Lasers and Amplifiers**	**LTuA: Innovative Lasers and Spectroscopy**	**LTuB: Lasers in Fundamental Physics I**	**LTuC: Spectroscopy of Semiconducting Quantum-Confined Structures** (ends at 9:45 a.m.)	**MTuA: Metamaterials I**	
Student Event: Building Your Future in Optics, *Grand Ballroom C, Hyatt Regency Rochester*						
Coffee Break, *Empire Hall, Rochester Riverside Convention Center*						
Exhibit Open, *Empire Hall, Rochester Riverside Convention Center*						
FTuM: Systems for Optical Manipulation II	**FTuN: Quantum Dot Semiconductor Optical Amplifiers**	**FTuO: HHG and Attosecond Pulses I**	**LTuD: Lasers in Fundamental Physics II**	**LTuE: Spectroscopy in Single Semiconducting Nanoparticles** (ends at 11:45 a.m.)	**MTuB: Control of Plasmonic Fields**	
Exhibit Only Time, *Empire Hall, Rochester Riverside Convention Center*						
OSA Fellow Member Lunch, *Regency Ballroom, Hyatt Regency Rochester*						
Lunch *(on your own)*						
FTuT: Frequency Conversion and Optical Gain (starts at 1:45 p.m. ends at 3:00 p.m.)	**FTuU: Silicon Photonics II**	**LTuF: Optical Combs, Frequency References and Spectroscopy**	**LTuG: Microchips for Laser-Cooled Atoms**	**LTuH: PRL 50th Anniversary Celebration** (starts at 2:00 p.m.)	**MTuC: Towards 3-D Photonic Metamaterials**	**OTuA: Keynote Session on Mid-Spatial Frequencies and PSD***
Coffee Break, *Empire Hall, Rochester Riverside Convention Center*						
Meet the APS Journal Editors and Celebrate 50 Years of PRL, *Riverside Court, Rochester Riverside Convention Center*						
FTuZ: Plasmas and Optical Combs	**FTuAA: Microcavities and Lasers**	**FTuBB: HHG and Attosecond Pulses II**		**LTuI: Excited State Dynamics in Semiconducting Nanoparticles**	**MTuD: Plasmonic Waveguides** (ends at 6:00 p.m.)	**OTuB: Molded Optics** (ends at 6:00 p.m.)
OSA Business Meeting, *Highland E, Rochester Riverside Convention Center*						
DLS Business Meeting, *Highland B, Rochester Riverside Convention Center*						
META/OF&T Welcome Reception, *Grand Ballroom D, Hyatt Regency Rochester*						
OSA Member Reception, *Lilac Ballroom North and South, Rochester Riverside Convention Center*						
LS Banquet, *Triphammer Grill, 60 Browns Race, Rochester, Phone: 585.252.2700*						

Dedicated to the memory of Jean M. Bennett (1930–2008)

Agenda of Sessions — Wednesday, October 22

	Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
7:00 a.m.–5:30 p.m.	**Registration,** *Galleria, Rochester Riverside Convention Center*					
8:00 a.m.–10:00 a.m.		**FWA: Quantum Telecom I**	**SWA: Polarized Light: 200 Years since Malus' Discovery I**	**FWB: Optical Switching and Routing**	**FWC: Nonlinear Dynamics and Chaos**	**FWD: Microscopy for Diagnostics**
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Empire Hall, Rochester Riverside Convention Center*					
10:00 a.m.–2:00 p.m.	**Exhibit Open,** *Empire Hall, Rochester Riverside Convention Center*					
10:30 a.m.–12:00 p.m.		**FWG: Beam Combining III**	**SWB: Polarized Light: 200 Years since Malus' Discovery II**	**FWH: Coherent Communications**	**FWI: Systems for Optical Manipulation III**	**FWJ: Targeted Therapy and Molecular Imaging**
12:00 p.m.–1:30 p.m.	**JWA: Joint FiO/LS Poster Session II,** *Empire Hall, Rochester Riverside Convention Center*					
12:00 p.m.–1:30 p.m.	**MWOSA (Minorities and Women in OSA) Luncheon,** *Regency Ballroom, Hyatt Regency Rochester*					
12:30 p.m.–1:30 p.m.	**Lunch** *(on your own)*					
1:30 p.m.–3:30 p.m.	**SWC: A Tribute to Howard Schlossberg I**	**FWM: Quantum Telecom II**	**JWB: Optics for Energy I: Solar Cell Materials and Development**	**FWN: Optics and Instrumentation for Next-Generation Sources I** (ends at 3:15 p.m.)	**FWO: Optical Hydrodynamics and Solitons**	**FWP: Dynamic Fluorescence Imaging**
3:30 p.m.–4:00 p.m.	**Coffee Break,** *Lilac Ballroom Foyer, Rochester Riverside Convention Center*					
4:00 p.m.–5:30 p.m.	**SWD: A Tribute to Howard Schlossberg II**	**FWT: Diffractive Micro and Nano Structures for Sensing and Information Processing I**	**JWC: Optics for Energy II: Systems for Energy Efficiency**	**FWU: Optics and Instrumentation for Next-Generation Sources II**	**FWV: Coherence I** (ends at 5:45 p.m.)	**FWW: Microscopy Instrument and Software Developments**
5:30 p.m.–7:00 p.m.	**Dinner** *(on your own)*					
6:00 p.m.–7:30 p.m.	**JWD: Joint META/OF&T Poster Session,** *Hyatt Grand Ballroom D, Hyatt Regency Rochester*					
7:00 p.m–8:30 p.m.	**FiO Postdeadline Paper Sessions,** *Locations are listed in Postdeadline Papers Book in registration bag*					

Key to Shading

Frontiers in Optics · Laser Science · Joint FiO/LS · META · OF&T

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
Registration, *Galleria, Rochester Riverside Convention Center*						
FWE: Optically Probed Dynamics in Condensed Matter Systems	**FWF: Photonic Crystal Fibers**	**LWA: Lasers in Space**	**LWB: Quantum Optics for Information Processing**	**LWC: Transient Spectroscopy in Conjugated Polymers I** (ends at 9:45 a.m.)	**MWA: Plasmonics—Devices and Applications I**	**OWA: Metrology Fundamentals**
Coffee Break, *Empire Hall, Rochester Riverside Convention Center*						
Exhibit Open, *Empire Hall, Rochester Riverside Convention Center*						
FWK: Petawatt Lasers and Laser Facilities	**FWL: Photonic Band Gap Devices**	**LWD: Slow Light in Atomic Systems** (ends at 11:45 a.m.)	**LWE: Cold Molecules I**	**LWF: Transient Spectroscopy in Conjugated Polymers II**	**MWB: Apertures and Slits in Metal Films**	**OWB: Testing, CGHs and Aspheres** (ends at 12:30 p.m.)
JWA: Joint FiO/LS Poster Session II, *Empire Hall, Rochester Riverside Convention Center*						
MWOSA (Minorities and Women in OSA) Luncheon, *Regency Ballroom, Hyatt Regency Rochester*						
Lunch *(on your own)*						
FWQ: Petawatt and Chirped Pulse Laser Technology	**FWR: Novel Fiber Devices I**	**FWS: Lasing in and Scattering from Random Media**	**LWG: Cold Atom Sensors**	**LWH: Carbon Nanostructure Imaging and Spectroscopy** (ends at 3:00 p.m.)	**MWC: Metamaterials II**	**OWC: Micro/Integrated Optics**
Coffee Break, *Lilac Ballroom Foyer, Rochester Riverside Convention Center*						
FWX: Ultrahigh Fields and Laser Technology (ends at 5:15 p.m.)		**LWI: Novel Elements of Laser Science** (ends at 4:45 p.m.)	**LWJ: Cold Molecules II**	**LWK: Spectroscopy of Carbon Nanotubes**	**MWD: Nanoplasmonics I** (ends at 6:00 p.m.)	**OWD: Large Optics** (starts at 4:30 p.m., ends at 5:45 p.m.)
Dinner *(on your own)*						
JWD: Joint META/OF&T Poster Session, *Hyatt Grand Ballroom D, Hyatt Regency Rochester*						
FiO Postdeadline Paper Sessions, *Locations are listed in Postdeadline Papers Book in registration bag*						

Agenda of Sessions — Thursday, October 23

	Highland A	Highland B	Highland C	Highland D	Highland E
7:30 a.m.–4:00 p.m.	**Registration,** *Galleria, Rochester Riverside Convention Center*				
8:00 a.m.–10:00 a.m.	**JThA: Optics for Energy III: Solar Energy Design and Development** (ends at 9:30 a.m.)	**FThA: Optical Models of the Eye I**	**FThB: Pulse Measurement**	**SThA: Best of Topicals I**	**FThC: Nonlinear Optics in Novel Media**
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Lilac Ballroom Foyer, Rochester Riverside Convention Center*				
10:30 a.m.–12:00 p.m.	**JThB: Optics for Energy IV: Water in Energy Production** (ends at 11:45 a.m.)	**FThG: Optical Models of the Eye II**	**FThH: Harmonic Generation and Phase Matching** (ends at 11:45 a.m.)	**SThC: Best of Topicals II**	**FThI: Slow Light and Signal Processing**
12:00 p.m.–1:30 p.m.	**FThM: Vision and Color Poster Session,** *Riverside Court, Rochester Riverside Convention Center*				
12:00 p.m.–1:30 p.m.	**Lunch** *(on your own)*				
1:30 p.m.–3:30 p.m.		**FThN: Virtual Displays and Natural Tasks**	**FThO: Imaging and Sensing**	**FThP: Coherence II and General Quantum Electronics**	**FThQ: Imaging and Detection**
3:30 p.m.–4:00 p.m.	**Coffee Break,** *Lilac Ballroom Foyer, Rochester Riverside Convention Center*				
4:00 p.m.–6:00 p.m.		**SThE: The Stiles-Crawford Effects of the First and Second Kinds, 75 Years of Scientific Achievements**	**FThT: Coherence in Optical Fields**		**FThU: Novel Optical Design and Measurement**
4:30 p.m.–8:00 p.m.	**Science Educator's Day,** *Lilac Ballroom North and South, Rochester Riverside Convention Center*				

Key to Shading

Frontiers in Optics · Laser Science · Joint FiO/LS · META · OF&T

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
Registration, *Galleria, Rochester Riverside Convention Center*						
FThD: Light Waves in Lattices	**FThE: Novel Fiber Devices II**	**FThF: Silicon and III-V Based Optoelectronics for Optical Interconnects I**	**SThB: Quantum Optics and Quantum Engineering for Undergraduates Symposium I**	**LThA: Spectroscopy of Biomolecular Processes**	**MThA: Nanoplasmonics II** (starts at 8:15 a.m.)	**OThA: Optical Materials** (ends at 9:45 a.m.)
Coffee Break, *Lilac Ballroom Foyer, Rochester Riverside Convention Center*						
FThJ: Light Localization	**FThK: Silicon Photonics III** (ends at 11:45 a.m.)	**FThL: Silicon and III-V Based Optoelectronics for Optical Interconnects II**	**SThD: Quantum Optics and Quantum Engineering for Undergraduates Symposium II**	**LThB: THz Spectroscopy in Biomaterials** (ends at 11:45 a.m.)	**MThB: Nanoplasmonics III** (ends at 12:30 p.m.)	**OThB: Subaperture Polishing** (ends at 12:30 p.m.)
FThM: Vision and Color Poster Session, *Riverside Court, Rochester Riverside Convention Center*						
Lunch *(on your own)*						
FThR: Diffractive Micro and Nano Structures for Sensing and Information Processing II		**FThS: Silicon and III-V Based Optoelectronics for Optical Interconnects III**	**LThC: Quantum Information with Atoms**	**LThD: Cellular Imaging Techniques**	**MThC: Surface Plasmons**	**OThC: Materials/ Processing/Coatings**
Coffee Break, *Lilac Ballroom Foyer, Rochester Riverside Convention Center*						
FThV: Diffractive Micro and Nano Structures for Sensing and Information Processing III		**FThW: Silicon and III-V Based Optoelectronics for Optical Interconnects IV**	**LThE: Quantum Information Processing**		**MThD: Plasmonics—Devices and Applications II**	**OThD: Beams/Jets/ Belts/Wheels**
Science Educator's Day, *Lilac Ballroom North and South, Rochester Riverside Convention Center*						

Agenda of Sessions — Friday, October 24

	Hyatt Regency Rochester
7:30 a.m.–12:00 p.m.	**Registration,** *Regency Foyer*
8:00 a.m.–10:00 a.m.	**OFA: Polishing and Figuring,** *Grand Ballroom E/F*
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Grand Ballroom D*
10:30 a.m.–12:30 p.m.	**OFB: Optical Systems,** *Grand Ballroom E/F*

Key to Shading

Frontiers in Optics | Laser Science | Joint FiO/LS | META | OF&T

Technical Program Overview and Explanation of Session Codes

FiO, LS, OF&T and META have more than 1,000 papers scheduled for presentation, including several special symposia. There will be two joint plenary speakers and two award lectures.

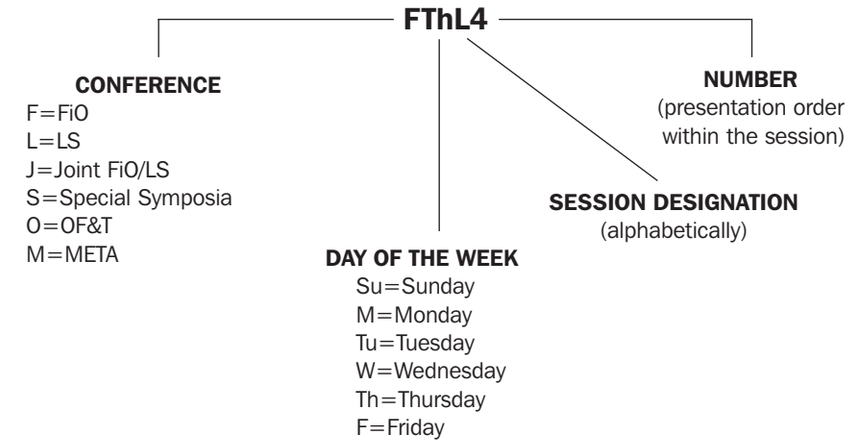
FiO has 177 invited presentations, 11 tutorials and 469 contributed papers, of which 108 will be presented in the poster sessions. FiO postdeadline papers will be presented in oral sessions on Wednesday, October 22nd from 7:00 p.m.–8:30 p.m.; locations will be included in the Postdeadline Papers Book in your registration bag. FiO/LS has eight Short Courses scheduled. All eight are half-day courses.

LS has 67 invited presentations and 83 contributed papers, of which 17 will be presented in the poster sessions.

OF&T has 27 invited presentations and 54 contributed papers, of which 14 will be presented in the Joint META/OF&T poster session.

META has 16 invited presentations and 122 contributed papers, of which 30 will be presented in the Joint META/OF&T poster session.

Explanation of Session Codes



The first part of the code designates the conference (F=FiO, L=LS, J=Joint, S=Special Symposium, O=OF&T, M=META).

The next part designates the day of the week (Su=Sunday, M=Monday, Tu=Tuesday, W=Wednesday, Th=Thursday, F=Friday).

The next part indicates the session within the particular day the talk is being given. Each day begins with the letter A and continues alphabetically.

The number on the end of the code signals the position of the talk within the session (first, second, third, etc.).

For example, a presentation numbered FThL4 indicates that this FiO paper is being presented on Thursday during the 12th session (L) and that it is the fourth paper presented in session FThL.

7:00 a.m.–3:00 p.m. **OSA Student Chapter Leadership Meeting,** *Highland D, E, F and G, Rochester Riverside Convention Center*

9:00 a.m.– 12:30 p.m. **Short Courses,** *Locations will be provided at registration*
SC196: Light Emitting Diodes and Solid-State Lighting, E. Fred Schubert
SC321: Principles of Far-Field Fluorescence Nanoscopy, Andreas Schoenle
SC322: Silicon Nanophotonics, Jelena Vuckovic
SC323: Latest Trends in Optical Manufacturing, Paul Dumas

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

1:30 p.m.– 5:00 p.m. **Short Courses,** *Locations will be provided at registration*
SC235: Nanophotonics: Materials, Fabrication and Characterization, Joseph Haus
SC306: Exploring Optical Aberrations, Virendra Mahajan
SC320: Polarization Engineering of Optical Fields, Thomas Brown
SC324: Plasmonics, Stefan Maier

4:00 p.m.–6:00 p.m. **What's Hot in Optics Today?** *Lilac Ballroom North and South, Rochester Riverside Convention Center*

6:00 p.m.–7:30 p.m. **FiO/LS Welcome Reception,** *Riverside Court, Rochester Riverside Convention Center*

Galleria Lobby

Joint

6:00 p.m.–7:30 p.m.
JSuA • Joint FiO/LS Poster Session I

Quantum Electronics Posters

JSuA1
Universal Quantum Gates for Order N=1 Orbital Angular Momentum States, *Bryce R. Gadway, John W. Noe, Martin G. Cohen; Stony Brook Univ., USA.* Universal single-qubit quantum logic gates acting on order N=1 orbital angular momentum states, based on SU(2) Euler rotations and spatial and polarization gate analogues, are investigated. The universal polarization gate analogue was constructed and analyzed.

JSuA2
Paper Withdrawn

JSuA3
Odd- and Even-Order Dispersion Cancellation in Quantum Interferometry, *Olga Minaeva[1,2], Cristian Bonato[1,3], Bahaa E. A. Saleh[1], Alexander V. Sergienko[1,4]; [1]Dept. of Electrical and Computer Engineering, Boston Univ., USA, [2]Dept. of Physics, Moscow State Pedagogical Univ., Russian Federation, [3]CNR-INFM LUXOR, Dept. of Information Engineering, Univ. of Padova, Italy, [4]Dept. of Physics, Boston Univ., USA.* Here we introduce a new quantum-optical tool for dispersion management. This technique allows for simultaneous observation of quantum cancellation of odd-order and even-order dispersion using frequency-anticorrelated entangled photons.

JSuA4
Excessive Noise Purification Using Temporal Homodyne Detection toward a Fiber-Based Continuous-Variable Entangled Light Source, *Kenichi Hirosawa, Hidetake Ushio, Yuji Fujiwara, Fumihiko Kannari; Keio Univ., Japan.* To generate entanglement in quadrature phase amplitude using fiber-based optics, we perform a post-selection purification scheme to eliminate excess noise generated in an EDFA fiber laser and during fiber propagation.

Optics in Information Science Posters

JSuA5
Contrast in Multi-Beam-Interference Lithography for the Fabrication of Photonic Crystal Structures, *Justin L. Stay, Andrew T. Heidt, Thomas K. Gaylord; Georgia Tech, USA.* Multi-beam-interference lithography can be contrast-optimized to provide an efficient means of fabricating photonic crystal structures. Comparison to light- and dark-field mask technology in conventional lithography is presented and experimentally verified.

JSuA6
Diffraction Gratings for "Smart Plasmon Sensor" Application, *Joseph Taylor, Jack Hessburg, Olena Palyvoda, Ildar Salakhutdinov, Gregory Auner; Wayne State Univ., USA.* The concept of the "smart" sensor has been proposed. We investigated protein attachment to the diffraction grating surface area. The same diffraction grating was used for surface plasmon sensors both SPP and LRSSP structures.

JSuA7
Preferential-Order Waveguide Grating Couplers: Rigorous Analysis Using Finite-Difference Time-Domain Methods, *Aristeides D. Papadopoulos, Elias N. Glytsis; School of Electrical and Computer Engineering, Natl. Technical Univ. of Athens, Greece.* Preferential-order waveguide grating output couplers are rigorously analyzed using the finite-difference time-domain method in the total field/scattered field formulation for TE and TM polarizations. Their out-coupling efficiencies are calculated and compared.

JSuA8
Deep Sub-Wavelength Photolithography Using Metal-Dielectric Multilayer, *Yi Xiong, Zhaowei Liu, Xiang Zhang; Univ. of California at Berkeley, USA.* Using a metal-dielectric multilayer and diffraction-limited masks, we numerically demonstrate a fast and cheap photolithography scheme that can fabricate deep sub-wavelength nanometer scale one- and two-dimensional periodic gratings at wavelength 405nm.

JSuA9
Polarization-Holographic Element for Complete Analysis of Light, *Barbara N. Kilosanidze, George A. Kakauridze; Inst. of Cybernetics, Georgia.* Polarization-Holographic Element on the basis of diffraction gratings with different profile of anisotropy for complete analysis of light, namely definition of all parameters of polarization ellipse is described.

Optics in Biology and Medicine Posters

JSuA10
Holographic Video Microscopy for Biology, *Fook Chiong Cheong, David G. Grier; New York Univ., USA.* We present the use of holographic video microscopy for extracting quantitative data from digitized video holograms of colloidal suspensions in biological sample. Holographic video microscopy offers both multiple particles three-dimensions tracking and particle characterization concurrently.

JSuA • Joint FiO/LS Poster Session I—Continued

JSuA11
Radiative Transport in the Delta-P_1 Approximation for Optical Tomography with Small Source-Detector Separations, *Baohong Yuan; Catholic Univ. of America, USA.* The applicability of delta-P_1 approximation to 3-dimensional optical tomography with small source-detector separations is discussed by comparing experimentally measured and theoretically calculated sensitivity matrices of photon propagation in turbid media.

JSuA12
Ablation of Dental Hard Tissue with an Ultrashort Pulsetrain-Burst (>100MHz) Laser, *Christian Dille[1], Patrick Kaifosh[1], Paul Forrester[1], Robin Marjoribanks[1], Lothar Lilge[2]; [1]Dept. of Physics, Univ. of Toronto, Canada, [2]Dept. of Medical Biophysics, Univ. of Toronto, Canada.* Effects of irradiating dental hard tissue with an ultrashort pulsetrain-burst (>100MHz) laser were studied. The ablation rate was measured and the effects of dividing the pulsetrains were examined. Material modification was measured using micro-Raman spectroscopy.

JSuA13
Cell Tracking by Using Nonlinear Cross-Correlation, *Eduardo Pérez-Careta[1], Miguel Torres-Cisneros[1], Oscar G. Ibarra-Manzano[1], Eduardo Aguilera Gómez[1], Javier Sanchez-Mondragón[2]; [1]Univ. of Guanajuato, Mexico, [2]INAOE, Mexico.* In this work we present a computational cell tracking task using preprocessing techniques jointly with nonlinear filtering joint and cross-correlation technique. Nonlinear filtering technique increases tracking robustness with respect to sudden shape and size cell changes.

JSuA14
Assessment of Second Harmonic Properties of Tumor Collagen, *Xiaoxing Han[1], Ryan M. Burke[2], Martha L. Zettel[3], Ping Tang[4], Edward B. Brown[5]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Biomedical Engineering, Univ. of Rochester, USA, [3]Dept. of Neurobiology and Anatomy, Univ. of Rochester, USA, [4]Dept. of Pathology, Univ. of Rochester, USA, [5]Dept. of Biomedical Engineering, Univ. of Rochester, USA.* We utilize the polarization and directionality of second harmonic generation to study molecular structure of fibrillar collagen in mouse mammary tumor models and in healthy mammary fat pad.

Optical Design and Instrumentation Posters

JSuA15
Mueller Matrix Measurement and Stress Engineering, *Amber M. Beckley, Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA.* Symmetric stress-birefringence is a potential tool for pupil apodization. In exploration of its properties, Mueller matrix calculations, measurements were made, along with an analytic model of stress distribution and birefringence in windows under symmetric stress.

JSuA16
Spectroscopic Mueller Matrix Polarimeter by Two Liquid Crystal Polarization Modulator, *Makoto Chujo, Yukitoshi Otani, Norihiro Umeda; Tokyo Univ. of Agriculture andTechnology, Japan.* All polarization characteristics can be described by Mueller matrix. We succeed to measure spectroscopic Mueller matrix without any mechanical unit after retardations of two liquid crystal modulators are calibrated by spectroscopic Stokes polarimeter.

JSuA17
Lossy Dielectric Polarizers for Polarization Based Subresolution Assist, *Michael J. Theisen, Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA.* Lossy dielectric polarizers have been designed for use with 193nm light. These polarizers have the possibility for polarization based subresolution assist. Through numerical simulation, transmission and reflection coefficients have been found.

Laser Science Posters

JSuA18
Collision Studies between Ultracold NaCs Molecules and Composite Atoms, *Amy E. Wakim, Patrick J. Zabawa, Chris Haimberger, Jan Kleinert, Nicholas P. Bigelow; Univ. of Rochester, USA.* Deeply bound ultracold polar NaCs molecules are electrostatically trapped and spatially overlapped with each magneto-optical trap to induce atom-molecule interactions. The resulting atom-molecule collision studies are presented.

JSuA19
Cross Correlations to Characterize Atomic Motion in an Optical Lattice, *Todd van Woerkom, Perry Rice; Miami Univ., USA.* We examine correlations between right and left circularly polarized light for atoms in an optical lattice using a simple model. We calculate diffusion coefficients, temperatures, and discuss signatures of atomic motion in the correlations.

JSuA20
Optical Fiber Filter Based on Two Sagnac Interferometers with Different Loops, *Alberto Varguez-Flores, Georgina Beltrán-Pérez, Severino Muñoz-Aguirre, Juan Castillo-Mixcóatl; Benemerita Univ. Autonoma de Puebla, Mexico.* An all-fiber filter composed of two Sagnac interferometers with different loops in serial configuration is proposed. As a result, a reduction on the full-width at half maximum (FWHM) of the transmission peaks was obtained.

JSuA21
Comparison of Slow Plasmons on Flat Surfaces and Gratings, *Giovanni Piredda, Lukas Novotny, Robert W. Boyd; Inst. of Optics, Univ. of Rochester, USA.* We show that slow surface plasmons can utilize optical gain more efficiently when propagating on a grating than on a flat surface.

JSuA22
Controlled Filament Non-Local Discharge (CFND) for Laser Pumping, *George Miley; Univ. of Illinois, USA.* A pulsed CFND is described for low E/N discharge pumping of lasers. Micro-protrusions on the cathode produce highly non-equilibrium beam-like electron filaments in the discharge, providing a discharge E/N ~10^{-16} Vcm^2 for lasers like ElectricOIL.

Photonics Posters

JSuA23
On Modeling of Spontaneous Emissions in Semiconductor Optical Amplifiers, *Dong-Xue M. Wang, John A. Buck, Kevin Brennan, Ian T. Ferguson; Georgia Tech, USA.* A new model of spontaneous emissions in semiconductor optical amplifiers is developed. A numerical simulation is also implemented using the finite difference method.

JSuA24
Static and Dynamic Characteristics Simulation of Self-Assembled InGaAs/GaAs Quantum Dot Lasers, *Davoud Ghodsi[1], Vahid Ahmadi[2]; [1]Univ. of Gilan, Islamic Republic of Iran, [2]Univ. of Tarbiat Modares, Islamic Republic of Iran.* We simulate the static and dynamic-characteristics of self-assembled InGaAs/GaAs QD lasers numerically. We show the threshold current increases as the homogeneous and inhomogeneous broadening increase. The turn-on delay increases with the increase of inhomogeneous broadening.

JSuA25
Ultrafast All-Optical Demultiplexing by Using Multi-Section Semiconductor Optical Amplifiers in a M-Z Interferometer, *Claudio Crognale, Antonella Di Giansante; Technolabs S.p.A., Italy.* The performances of a 100Gb/s all-optical interferometric demultiplexer based on a multi-section SOA are numerically investigated. The 25Gb/s extracted signal exhibits a significant amplification, a very high extinction ratio, and no relevant pattern-dependence.

JSuA26
Self-Modulation in Heavily Doped Erbium Fiber Lasers, *Jesus J. Garcia[1], Erwin A. Martí Panameño[1], Aleksander N. Pisarchik[2]; [1]Benemerita Univ. Autonoma de Puebla, Mexico, [2]Ctr. de Investigaciones en Optica A.C., Mexico.* A new mathematical model for the study of nonlinear chaotic dynamics in a heavily doped erbium fiber laser is proposed. The model takes into account excited state and saturable absorption at the lasing wavelength.

Optical Sciences Posters

JSuA27
SiO_2/HfO_2 Multilayers: Impact of Process Parameters and Stack Geometry on the Optical and Structural Properties, *Peter Langston[1], Dinesh Patel[1], Ashot Markosyan[2], Erik Krous[1], Benjamin Langdon[1], R. Route[2], M. Fejer[2], Carmen Menoni[1,2]; [1]Colorado State Univ., USA, [2]Stanford Univ., USA.* Loss, stress and surface roughness in ion-beam deposition of HfO_2/SiO_2 interference coatings are assessed for different growth conditions to understand how to improve the performance of these coatings for high power laser applications.

JSuA28
Noise Suppression ASE of Erbium Doper Fiber Laser by Means of a Filter Optical Fiber Fattening, *Julián M. Estudillo-Ayala[1], Ruth I. Mata-Chavez[2], Roberto Rojas-Laguna[1], Everardo Vargas-Rodríguez[1], Alejandro Martinez-Ríos[2], Edgar Alvarado-Méndez[1], Mónica Trejo-Duran[1], Romeo Selvas-Aguilar[3]; [1]Univ. of Guanajuato, Mexico, [2]Ctr. de Investigaciones en Óptica, Mexico, [3]UANL, Mexico.* In this work we present the results obtained to couple a filter optical fiber to erbium doped fiber laser, with this setup we eliminate noise ASE.

JSuA29
Energy Transfer Processes in Tm^{3+}:YAG, *David M. Perry[1], Douglass S. Hamilton[1], Stacey K. Vargas[2]; [1]Univ. of Connecticut, USA, [2]Virginia Military Inst., USA.* Lifetime measurements of Tm^{3+} in Tm^{3+}:YAG samples were investigated. Dipole-dipole coupling governs the Tm-Tm cross-relaxation and Tm-Tm energy migration. The temperature dependence of the decay measurements was also investigated.

JSuA30
Phase Dynamics of Electromagnetically Induced Transparency, *Hebin Li[1], Vladimir A. Sautenkov[1], Yuri V. Rostovtsev[1], George R. Welch[1], John P. Davis[2], Frank A. Narducci[2], Marlan O. Scully[1]; [1]Texas A&M Univ., USA, [2]Naval Air Systems Command, USA.* We have studied phase dynamics in EIT. We observed how the transmission decreases and recovers when the phase of the optical field changes abruptly. The result can be used for the fast control of EIT.

7:00 p.m.– 8:30 p.m. OSA Division and Technical Group Meetings, *Exact times and locations are listed on the Update Sheet*

Lilac Ballroom North and South

Joint

8:00 a.m.–12:00 p.m.
2008 Joint FiO/LS Awards Ceremony and Plenary Session

Welcome

OSA Award and Honor Presentations

Ives Medal Address: Light, Photons and Nonclassicality, *Peter Knight, Imperial College London, UK*

APS/Laser Science Award and Honor Presentations

Schawlow Prize Lecture: Single-Atom Optical Clocks, *James C. Bergquist, NIST, USA*

Coffee Break

From the Big Bang to the Nobel Prize and on to James Webb Space Telescope, *John C. Mather, NASA Goddard Space Flight Ctr., USA*

Photonic Entanglement and Quantum Information, *Anton Zeilinger, Univ. of Vienna, Austria, and Inst. of Quantum Optics and Quantum Information of the Austrian Acad. of Sciences, Austria*

Closing Remarks

Hyatt Grand Ballroom A/B

META

8:00 a.m.–10:00 a.m.
MMA • Nano-Focusing, -Lensing and -Trapping
Mark I. Stockman; Georgia State Univ., USA, Presider

MMA1 • 8:00 a.m. Invited
Optical Bulk Metamaterials, *Xiang Zhang; Univ. of California at Berkeley, USA.* I will discuss recent experiments demonstrating intriguing phenomena in metamaterials: sub-diffraction limit imaging and focusing, low loss negative refraction and imaging in bulk optical metamaterials, and 3-D negative-index metamaterials exhibiting negative phase propagation.

MMA2 • 8:30 a.m.
Experimental Demonstration of Optical Nanofocusing by a Plasmonic Dimple Lens, *Hyojune Lee[1], Shantha Vedantam[1], Japeck Tang[1], Josh Conway[1], Matteo Staffaroni[1], Eli Yablonovitch[2]; [1]Univ. of California at Los Angeles, USA, [2]Univ. of California at Berkeley, USA.* This paper reports the first experimental characterization of Plasmonic Dimple Lens structure that can focus optically-coupled surface plasmons to a nanoscopic volume beyond the diffraction limit, using the near-field scanning optical microscopy (NSOM) technique.

MMA3 • 8:45 a.m.
Metallic Nanolens for Color Imaging, *Prabhat Verma[1], Atsushi Ono[2], Satoshi Kawata[1,2]; [1]Osaka Univ., Japan, [2]RIKEN, Japan.* We present a plasmonic nanolens made of silver nanorod arrays arranged in tapered stacked arrangement. Unlike other plasmonic lenses, our design can produce magnified color images of nanostructures that can be transferred to long distances.

MMA4 • 9:00 a.m. Invited
Surface Plasmon Optics for Enhanced Light-Matter Interaction, *Romain Quidant[1,2]; [1]ICFO, Inst. de Ciencies Fotoniques, Spain, [2]ICREA, Inst. Catalana de Recerca i Estudis Avancat, Spain.* We review some recent advances in the sub-wavelength control of light fields in plasmonic systems and discuss its application to enhanced light-matter interaction focusing on the optical manipulation of nano-objects.

MMA5 • 9:30 a.m.
Analysis of Optical Forces in Plasmonic Traps, *Lina Huang, Sebastian Maerkl, Olivier Martin; Swiss Federal Inst. of Technology Lausanne, Switzerland.* We study the optical forces in plasmonic systems and show how they depend on the metals used in the experiment. The incorporation of plasmonic traps in a microfluidic environment provides new functionalities for lab-on-the-chip applications.

MMA6 • 9:45 a.m.
Plasmon Assisted Nanotrapping, *Edward P. Furlani, Alexander Baev, Paras N. Prasad; Inst. for Lasers, Photonics and Biophotonics, SUNY at Buffalo, USA.* We study plasmon assisted nanotrapping using tapered metallic nanopillars. We use 3-D full-wave time-harmonic field analysis to predict field distribution and the dipolar force on sub-wavelength dielectric particles in proximity to these structures.

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

Hyatt Grand Ballroom A/B

META

10:30 a.m.–12:30 p.m.
MMB • Transformation Optics and Metamaterials
Martin Wegener; Karlsruhe Univ., Germany, Presider

MMB1 • 10:30 a.m.
Quasiconformal Mapping in Transformation Optics, *Jensen Li[1], Xiang Zhang[1], John Pendry[2]; [1]Univ. of California Berkeley, USA, [2]Imperial College London, UK.* We apply quasiconformal mapping in transformation optics. The anisotropy within the cloak remains a constant that can be made very small. A cloak is designed to turn an object into a conducting plane.

MMB2 • 10:45 a.m.
Ray Optics at Sub-Wavelength Scale, *Seunghoon Han, Yi Xiong, Dentcho Genov, Zhaowei Liu, Guy Bartal, Xiang Zhang; Univ. of California at Berkeley, USA.* Molding the flow of light via ray optical way is proposed at sub-wavelength scale. Anisotropic indefinite media having near-flat isofrequency contours are conformal transformed. Multi-layers of matched opposite permittivity/permeability metamaterials enable the control of light.

MMB3 • 11:00 a.m. Invited
Transformation Optics with Metamaterials: A New Paradigm for Science of Light, *Vladimir M. Shalaev, A. V. Kildishev, W. Cai, U. K. Chettiar, E. E. Narimanov; Purdue Univ., USA.* Optical metamaterials designed for extreme control over the flow of light at both the nano- and macroscopic scales are discussed. These extreme metamaterials incorporate the innovative theories of transformation optics (TO).

MMB4 • 11:30 a.m.
Cloaking of Cold Atoms, *Shuang Zhang, Dentcho A. Genov, Cheng Sun, Xiang Zhang; Univ. of California at Berkeley, USA.* Invariant transformation for quantum mechanical systems is proposed. We show that it may be possible to construct such a cloaking system for cold atoms using optical lattices.

MMB5 • 11:45 a.m.
Heating Rate and Impossibility of Negative Refraction, *Vadim A. Markel; Dept. of Radiology, Univ. of Pennsylvania, USA.* I compute from first principles the local heating rate for electromagnetic waves propagating in magnetically and electrically polarizable media. The result indicates that the second law of thermodynamics prohibits negative refraction.

MMB6 • 12:00 p.m.
A Subwavelength Near-Infrared Negative Index Material, *Xuhuai Zhang[1], Marcelo Davanço[1], Yaroslav Urzhumov[2], Gennady Shvets[2], Stephen R. Forrest[1]; [1]Univ. of Michigan, USA, [2]Univ. of Texas at Austin, USA.* A near-infrared negative index material is demonstrated. The index calculated from a monolayer is verified by band calculations to be a bulk property. Full-wave simulations of a prism made of the structure show negative refraction.

MMB7 • 12:15 p.m.
Two-Dimensional Cut-Wire-Pair Magnetic Metamaterials, *David A. Powell, Ilya V. Shadrivov, Yuri S. Kivshar; Australian Natl. Univ., Australia.* We fabricate a two-dimensional microwave metamaterial composed of pairs of cut wires and study its properties. We extract effective parameters of the structure and find a good agreement with direct numerical simulations.

12:00 p.m.–2:00 p.m. SMA: Laser Science Symposium on Undergraduate Research Posters, *Riverside Court, Rochester Riverside Convention Center*
See Undergraduate Research Symposium program in registration bag.

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

NOTES

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
FiO					

1:30 p.m.–3:30 p.m.
SMB • Schawlow-Townes Symposium on 50 Years of the Laser: The Birth of the Laser

Robert W. Boyd; Univ. of Rochester, USA, Presider
Martin Richardson; CREOL, College of Optics and Photonics, Univ. of Central Florida, Presider

SMB1 • 1:30 p.m. Invited
Initiation and Development of the Laser, *Charles H. Townes; Univ. of California at Berkeley, USA.* A broad discussion of initiation and development of amplification by stimulated emission of radiation (lasers, masers). The field provides an example of how unexpected and tremendously important technology and science emerge from basic research exploration.

1:30 p.m.–3:15 p.m.
FMA • Nonclassical Light

Jiangrong "Frank" Cao; Canon USA Inc., Presider

FMA1 • 1:30 p.m. Tutorial
Nonclassical Light for Quantum Information Science, *H. Jeff Kimble; Caltech, USA.* Over the past several decades, the Quantum Optics community has generated a zoology of manifestly quantum or nonclassical states of the electromagnetic field. Beyond a historical significance in physics, nonclassical light is playing a leading role in Quantum Information Science, including for quantum computation, communication, and metrology. My tutorial will provide an overview of nonclassical light, from generation to identification to application.

H. Jeff Kimble is the William L. Valentine Professor and Professor of Physics at the California Institute of Technology. He completed his doctoral degree in 1977 at the University of Rochester under the supervision of Professor Leonard Mandel. After spending two years as a staff scientist at the General Motors Research Laboratories, he joined the faculty at the University of Texas at Austin in 1979, where he eventually held the Sid Richardson Regents' Chair of Physics before moving to Caltech in 1989. The

2:00 p.m.–4:00 p.m.
SMC • Laser Science Symposium on Undergraduate Research I

Jenny Magnes; Vassar College, USA, Presider
See Undergraduate Research Symposium program in registration bag.

1:30 p.m.–2:45 p.m.
FMB • Intense Field Science

Jeffrey Squier; Colorado School of Mines, USA, Presider

FMB1
Paper Withdrawn

FMB2 • 1:30 p.m.
The Formation of Metallic Nanoclusters at the Surface of Natural Silicates Induced by CO_2 Laser Radiation, *Anel F. Mukhamedgalieva, Anatolii M. Bondar; Moscow State Mining Univ., Russian Federation.* The continuous and pulsed CO_2 laser irradiation (10^5-10^7 W/cm^2) of silicates (nepheline - $Na[AlSiO_4]$, rodonite - $CaMn_4[Si_5O_{15}]$, zircon - $ZrSiO_4$ etc.) leads to the creation of metallic and silicon nanoclusters at the surface.

FMB3 • 1:45 p.m.
Ultra-Intense 35fs Laser-Matter Interaction Physics in Nanostructured Ni-Nanowire Targets, *Robin S. Marjoribanks[1], Ludovic Lecherbourg[1], Patrick Audebert[2], Jean-Paul Geindre[2], Brett Teeple[1], Marina Servol[1,3], Anne Héron[4], Jean-Claude Adam[4], Gabor Kulcsár[1], John Sipe[1], Paul Forrester[1], Jean-Claude Kieffer[3], Luke McKinney[1], Simon Le Moal[1,5], Hart Levy[1]; [1]Univ. of Toronto, Canada, [2]Lab pour l'Utilisation des Lasers Intenses (LULI), France, [3]Inst. Natl. de la Recherche Scientifique, Énergie, Matériaux et Télécommunications (INRS), Canada, [4]Ctr. de Physique Théorique (CPhT), France, [5]Ecole des Mines de Paris, France.* Nickel nanowires present >90% absorption in an absorption depth ~1 μm, making efficient x-ray converters at high energy-densities. We present new theoretical and experimental results for intensities from small-signal up to relativistic ultrafast pulses.

1:30 p.m.–3:30 p.m.
FMC • Illumination I: Modeling, Ray Tracing and Rendering

Hong Hua; Univ. of Arizona, USA, Presider

FMC1 • 1:30 p.m.
Locating Illumination Sources from Lighting on Planar Surfaces in Paintings: An Application to Georges de la Tour and Caravaggio, *David G. Stork; Ricoh Innovations, USA.* We used maximum-likelihood methods to estimate the location and number of illuminants in tableaus in realist paintings from the pattern of illuminance on planar walls and floors to test for artists' use of optical projections.

FMC2 • 1:45 p.m. Invited
Modulating and Demodulating Projected Light, *Oliver Bimber; Bauhaus-Univ. Weimar, Germany.* Projector-camera systems allow measuring and compensating the modulation of projected light on surfaces that are not optimized for projections. This enables new applications in different domains, such as entertainment, visualization, film production and many more.

1:30 p.m.–3:30 p.m.
FMD • General Optical Sciences I

Gregory Quarles; VLOC, USA, Presider

FMD1 • 1:30 p.m.
Simple Models for Laser-Induced Damage of KH_2PO_4 Crystals by Nanosecond Pulses, *Guillaume Duchateau, Anthony Dyan; CEA, Ctr. d'Etudes du Ripault, France.* We present two approaches based on the heating of nanometric model defects. They allow one to find experimental results such as a particular scaling law. Information about the physical nature of these defects is provided.

FMD2 • 1:45 p.m.
The Effects of Radiation Waves on Dark Stripe Dynamics, *Christopher Barsi, Jason W. Fleischer; Princeton Univ., USA.* We study the evolution of a narrow dark stripe in a nonlinear defocusing medium. It is shown that radiation waves are shed during the evolution and should influence the interaction force between pairs of stripes.

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META

1:30 p.m.–3:30 p.m.
FME • Novel Trapping and Micromanipulation Techniques I
David McGloin; Univ. of Dundee, UK, Presider

FME1 • 1:30 p.m. Invited
Revisiting Optical Manipulation with Surface Plasmons, *Romain Quidant[1,2]; [1]Inst. de Ciencies Fotoniques, Spain, [2]Inst. Catalana de Recerca i Estucis Avancat, Spain.* We review recent advances achieved in the use of surface plasmons for integrated optical manipulation. We show how this method enables efficient and parallel trapping, with low laser intensity, of objects down to the nanoscale.

1:30 p.m.–3:30 p.m.
FMF • Wavefront Sensing and Control I
Bruce Dean; NASA Goddard Space Flight Ctr., USA, Presider

FMF1 • 1:30 p.m. Invited
Perspectives on Image-Based Wavefront Sensing, *Robert A. Gonsalves; Tufts Univ., USA.* We review the development of image-based wavefront sensing, some tools (phase retrieval, phase diversity), some successes (Hubble fix, curvature sensing, solar research), and some future applications (control of the JWST, human vision, video cameras).

1:30 p.m.–3:30 p.m.
FMG • Silicon Photonics I
George K. Celler; SOITEC USA, USA, Presider

FMG1 • 1:30 p.m. Invited
Towards Fabless Silicon Photonics, *Pieter Dumon; Ghent Univ., Belgium.* A well-defined technology platform is necessary for a broader take-up of silicon photonics. We are working towards such platform, with a generic integration technology, a well-defined design interface, and integration with the full food chain.

1:30 p.m.–3:30 p.m.
LMA • Cavity Optomechanics I
Jack Sankey; Yale Univ., USA, Presider

LMA1 • 1:30 p.m. Invited
Cavity Optomechanics on a Silicon Chip, *Kerry Vahala; Caltech, USA.* Amplification and cooling of micromechanical motion using light will be described. Micromechanical oscillators to microwave rates, as well as progress directed towards cooling to the quantum ground state will be reviewed.

1:30 p.m.–3:30 p.m.
LMB • THz Spectroscopy of Charges in Semiconductors
Megan R. Leahy-Hoppa; Johns Hopkins Univ. Applied Physics Lab, USA, Presider

LMB1 • 1:30 p.m. Invited
Photocarrier Dynamics of Semiconducting Single-Walled Carbon Nanotubes Probed by Terahertz Time-Domain Spectroscopy, *Hugen Yan, Yang Wu, Tony Heinz; Columbia Univ., USA.* Terahertz pump-probe spectroscopy has been applied to measure photocurrent in semiconducting single-walled carbon nanotubes. The THz response of photoexcited nanotubes will be presented and discussed in terms of the underlying carrier dynamics of this model nanosystem.

1:30 p.m.–3:30 p.m.
MMC • Spectroscopy of Individual Plasmonic Nanostructures
Mathieu Kociak; Lab de Physique des Solides, Univ. Paris-Sud, France, Presider

MMC1 • 1:30 p.m. Invited
Mapping Surface Plasmons on a Single Metallic Nanoparticle, *M. Kociak[1], J. Nelayah[1], O. Stephan[1], S. Mazzucco[1], F. J. Garcia de Abajo[2], R. Bernard[1], Christian Colliex[1]; [1]Lab de Physique des Solides, Univ. Paris-Sud, France, [2]Inst. de Optica, Consejo Superior de Investigaciones Cientificas, Spain.* Spatially resolved electron energy loss spectroscopy experiments have given the electromagnetic eigenmodes of individual metallic nanoparticles. The electromagnetic local density of states has been measured with 10 nm spatial accuracy over the whole near-infrared/ultraviolet regime.

NOTES

SMB • Schawlow-Townes Symposium on 50 Years of the Laser: The Birth of the Laser—Continued

SMB2 • 2:00 p.m. Invited
The World in a New Light, *Steven Chu[1,2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of California at Berkeley, USA.* This fantastic light, which unified electronics with the quantum world, transformed our ability to measure and control matter and energy with unprecedented precision. After 50 years of a storied history, the best is yet to come.

FMA • Nonclassical Light—Continued

general areas of his research are quantum information science and the quantum dynamics of open systems, including quantum measurement, cavity quantum electrodynamics, and the realization of quantum networks. Professor Kimble is a Fellow of the American Association for the Advancement of Science, the American Physical Society, and the Optical Society of America, and is a Member of the National Academy of Sciences.

FMA2 • 2:15 p.m.
Resonant Enhancement of Quantum SFG, *Irfan Ali-Khan, S. Sensarn, G. Y. Yin, S. E. Harris; Stanford Univ., USA.* By resonating the sum frequency, the quantum term for sum frequency generation with incoming biphotons is enhanced by a factor of 12.

SMC • Laser Science Symposium on Undergraduate Research I—Continued

FMB • Intense Field Science—Continued

FMB4 • 2:00 p.m. Invited
Trapping and Destruction of Long Range High Intensity Optical Filaments by Molecular Quantum Wakes in Air, *S. Varma, Y. H. Chen, Howard Milchberg; Univ. of Maryland, USA.* We report the first observation of the strong trapping and extinguishing effects of quantum molecular rotational wavepackets in atmospheric air on long range filamentary propagation of intense femtosecond laser pulses.

FMC • Illumination I: Modeling, Ray Tracing and Rendering—Continued

FMC3 • 2:15 p.m.
Analysis of Second Order Light Fields in Closed 3-D Spaces, *Alexander A. Mury, Sylvia C. Pont, Jan J. Koenderink; Physics of Man, Dept. of Physics and Astronomy, Utrecht Univ., Netherlands.* We present a method for measurement and reconstruction of second order approximations of light fields in closed spaces. We visualized their structure using light tubes and rendered objects at several points along a tube.

FMD • General Optical Sciences I—Continued

FMD3 • 2:00 p.m.
Nonlinear Optics with Radio Frequency Field, *Hebin Li[1], Vladimir A. Sautenkov[1], Michael M. Kash[1,2], Yuri V. Rostovtsev[1], Marlan O. Scully[1]; [1]Texas A&M Univ., USA, [2]Dept. of Physics, Lake Forest College, USA.* Performing experiments with Rb-atoms and RF fields, we have demonstrated several nonlinear effects, such as multiphoton transitions and excitation of coherence using far-detuned field with different time-shape pulses. Our results agree with our theoretical predictions.

FMD4 • 2:15 p.m.
Precise Modal Decomposition in Multimode Optical Fibers by Maximizing the Sum of Modal Power Weights, *Zhuo Jiang[1,2], John R. Marciante[1,3]; [1]Lab for Laser Energetics, Univ. of Rochester, USA, [2]Dept. of Physics and Astronomy, Univ. of Rochester, USA, [3]Inst. of Optics, Univ. of Rochester, USA.* We determine accurate modal power weights of the optical field in multimode fibers without precise knowledge of fiber or imaging system parameters by maximizing the sum of modal power weights. Experimental results will be reported.

NOTES

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META

FME • Novel Trapping and Micromanipulation Techniques I—Continued

FME2 • 2:00 p.m.
Complex Nonlinear Opto-Fluidity, *Carmel Rotschild[1], Meirav Saraf[1], Assaf Barak[1], Ramy El-Ganainy[2], Efrat Lifshitz[1], Demetrios Christodoulides[2], Mordechai Segev[1]; [1]Solid State Inst., Technion - Israel Inst. of Technology, Israel, [2]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We demonstrate symbiotic dynamics of light and nano-particles suspended in liquid. Light-force varies the local particle density, modifies the fluid properties (surface-tension, viscosity), inducing motion/rotation in the fluid, causing synergetic nonlinear-dynamics of light and fluid.

FME3 • 2:15 p.m.
Plasmonic Trapping for Nanoscale Analysis in Lab-on-the-Chip Applications, *Lina Huang[1], Weihua Zhang[1], Sebastian Maerkl[2], Olivier J. F. Martin[1]; [1]Nanophotonics and Metrology Lab, Swiss Federal Inst. of Technology Lausanne, Switzerland, [2]Lab of Biological Network Characterization, Swiss Federal Inst. of Technology Lausanne, Switzerland.* We study the optical forces in plasmonic systems and show how they depend on the metals used in the experiment. The incorporation of plasmonic traps in a microfluidic environment provides new functionalities for lab-on-the-chip applications.

FMF • Wavefront Sensing and Control I—Continued

FMF2 • 2:00 p.m.
Hybrid Wavefront Sensor for Strong Turbulence, *Troy R. Ellis, Jason D. Schmidt; Air Force Inst. of Technology, USA.* This research presents results of wave optics simulations that compare the performance of Shack-Hartmann, interferometric, and hybrid wavefront sensors in weak and strong turbulence.

FMF3 • 2:15 p.m. Invited
Advanced Imaging for Space Science, *Richard Lyon; NASA Goddard Space Flight Ctr., USA.* Future NASA interferometric missions will realize high-resolution with less mass and volume compared to filled-apertures. Reduced sensitivity requires longer integration times to SNR but is likely the only cost-effective path towards future space imaging.

FMG • Silicon Photonics I—Continued

FMG2 • 2:00 p.m.
Complete Optical Isolation Created by Indirect Interband Photonic Transitions, *Zongfu Yu, Shanhui Fan; Stanford Univ., USA.* Optical isolator is proposed for optoelectronic chip integration. Instead of magneto-optical effects, the isolation mechanism is based on indirect photonic transition. Using only silicon material, this micro-scale isolator is CMOS compatible.

FMG3 • 2:15 p.m.
Performance of 1.53 μm Emission in Er^{3+}-Si NPs: Nanostructured Al_2O_3 Films for Integrated Amplifiers in Silicon Platforms, *Sara Núñez-Sánchez, Rosalía Serna; Inst. de Óptica, Spain.* a-Al_2O_3 films codoped with Si-nanoparticles and Er^{3+} are produced with nanometer control of the separation between dopants and Si-nanoparticle size. The enhancement up to two orders of magnitude of the 1.54 μm emission is discussed.

LMA • Cavity Optomechanics I—Continued

LMA2 • 2:00 p.m. Invited
Radiation-Pressure Effects upon a Micro-Mirror in a High-Finesse Optical Cavity, *Antoine Heidmann, Chiara Molinelli, Olivier Arcizet, Tristan Briant, Pierre-Francois Cohadon; Lab Kastler-Brossel, France.* We demonstrate direct effects of radiation pressure in the optical monitoring of a micromirror at the quantum level. Applications to quantum optics and to the observation of the micromirror quantum ground state are discussed.

LMB • THz Spectroscopy of Charges in Semiconductors—Continued

LMB2 • 2:00 p.m. Invited
Ultrafast Dynamics of Carrier Localization Probed via Time-Resolved Terahertz Spectroscopy, *Susan L. Dexheimer; Washington State Univ., USA.* We present femtosecond time-resolved studies of the dynamics of carrier localization processes in quasi-one-dimensional materials and in amorphous semiconductors using time-resolved terahertz spectroscopy.

MMC • Spectroscopy of Individual Plasmonic Nanostructures—Continued

MMC2 • 2:00 p.m.
Electron Energy Loss Spectroscopy of Plasmons in Individual Silver Nanowires and Gold Nanorods, *Moussa Ngom[1], Jan Ringnalda[2], John F. Mansfield[1], Ashish Agrawal[1], Nicholas Kotov[1], Nestor J. Zaluzec[3], Theodore B. Norris[1]; [1]Univ. of Michigan at Ann Arbor, USA, [2]FEI Co., USA, [3]Argonne Natl. Lab, USA.* We resolve the modes from individual silver and gold nanostructures by means of electron energy loss spectroscopy. We compare experimental results to analytical descriptions of the loss probability for electrons incident on a prolate spheroid.

MMC3 • 2:15 p.m.
Spectroscopy of Individual Split-Ring Resonators, *Martin Husnik[1], Matthias W. Klein[1], Martin Wegener[1], Nils Feth[2], Stefan Linden[2], Michael König[1], Jens Niegemann[1], Kurt Busch[1]; [1]Univ. Karlsruhe, Germany, [2]Forschungszentrum Karlsruhe, Germany.* We measure the absolute extinction cross-section spectrum of the magnetic resonance of individual split-ring resonators by a modulation technique. The experimental data are in excellent agreement with numerical calculations.

NOTES

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
FiO					
SMB • Schawlow-Townes Symposium on 50 Years of the Laser: The Birth of the Laser—Continued	**FMA • Nonclassical Light—Continued**	**SMC • Laser Science Symposium on Undergraduate Research I—Continued**	**FMB • Intense Field Science—Continued**	**FMC • Illumination I: Modeling, Ray Tracing and Rendering—Continued**	**FMD • General Optical Sciences I—Continued**
SMB3 • 2:30 p.m. Invited **My Time with Charlie,** *James P. Gordon; Consultant, Bell Labs, Alcatel-Lucent, USA*. Quantum electronics came into being with the success of the first (ammonia beam) maser. I will recall my time at Columbia University where the maser was created, and the ideas that made it possible.	**FMA3 • 2:30 p.m.** **Strongly Correlated Photon Transport in One-Dimensional Systems,** *Jung-Tsung Shen, Shanhui Fan; Stanford Univ., USA*. We show that two-photon transport is strongly correlated in one-dimensional waveguide coupled to a two-level system. Moreover, we show that the two-level system can induce effective attractive or repulsive interactions in space for photons. **FMA4 • 2:45 p.m.** **Classical and Quantum Correlations in Waveguide Lattices,** *Yaron Bromberg[1], Yoav Lahini[1], Roberto Morandotti[2], Yaron Silberberg[1]; [1]Weizmann Inst. of Science, Israel, [2]Inst. Natl. de la Recherche Scientifique, Canada*. The propagation of correlated photon pairs in a lattice of coupled waveguides is studied. We calculate the evolution of quantum correlations along the lattice, and experimentally demonstrate a classical analogue using two incoherent sources.		**FMB5 • 2:30 p.m.** **Theory and Modeling of the Absorption of Laser Light in Nanostructured Metallic Nanowire ("Velvet") Surfaces,** *Ludovic Lecherbourg[1], Brett Teeple[1], Patrick Audebert[2], Jean-Paul Geindre[2], Jean-Claude Adam[3], Anne Héron[3], John Sipe[1], Gabor Kulcsàr[1], Simon Le Moal[4], Robin S. Marjoribanks[1]; [1]Univ. of Toronto, Canada, [2]Lab pour l'Utilisation des Lasers Intenses (LULI), CEA, CNRS, Ecole Polytechnique, France, [3]Ctr. de Physique Théorique (CPhT), CEA, CNRS, Ecole Polytechnique, France, [4]Ecole des Mines de Paris, France*. Nanostructured metal targets exhibit low-intensity linear optical absorption > 95%. Is such absorption also possible for ultra-intense femtosecond laser pulses? Analytic theory (low intensities) and particle-in-cell simulations (high intensities) show similarities and remarkable differences.	**FMC4 • 2:30 p.m.** **Estimation of Illuminance Flow over Anisotropic Surfaces for Arbitrary Viewpoints,** *Stefan M. Karlsson, Sylvia C. Pont, Jan J. Koenderink; Physics of Man, Dept. of Physics and Astronomy, Utrecht Univ., Netherlands*. The theory of illuminance flow estimation by structure tensors is generalized for oblique viewing of anisotropic texture. Previous theory is revised using general matrix formulations and predictions are compared with results on rendered images. **FMC5 • 2:45 p.m.** **Differential Ray Tracing for an Improved Simulation of Incoherent Illumination Systems,** *Oliver Stolz, Norbert Lindlein; Inst. of Optics, Information and Photonics, Max Planck Res. Group, Univ. of Erlangen-Nuremberg, Germany*. Analyzing intensity distributions is of great importance for today's illumination systems design. Contrary to Monte-Carlo techniques, differential ray tracing possesses great potential to improve simulation efficiency by reducing computational time while concurrently showing accurate results.	**FMD5 • 2:30 p.m.** **Goos-Hänchen Effect for High-Loss Materials,** *Jörg B. Götte, Andrea Aiello, J. P. Woerdman; Leiden Univ., Netherlands*. We extend the analysis of the Goos-Hänchen shift on bare surfaces to high losses. In contrast to the low-loss case, for high losses the Goos-Hänchen shifts for metals and dielectrics are similar. **FMD6 • 2:45 p.m.** **Goos-Hänchen Shift on Flat and Not-So-Flat Metal Surfaces,** *M. Merano, A. Aiello, G. W. 't Hooft, M. P. van Exter, E. R. Eliel, J. P. Woerdman; Huygens Lab, Leiden Univ., Netherlands*. We report the first observation of the Goos-Hänchen shift in metallic reflection. The shift is found to be insensitive to surface flatness but it depends on the microscopic roughness of the metal surface.

NOTES

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META

FME • Novel Trapping and Micromanipulation Techniques I—Continued

FME4 • 2:30 p.m. Invited

Optically Driven Mechanical Systems at Nano- to Micro-Scale, *Theodor Asavei, Simon Parkin, Timo Nieminen, Norman Heckenberg, Halina Rubinsztein-Dunlop; Univ. of Queensland, Australia.* Building and applying optically-driven mechanical systems at ever-smaller scale runs into many problems. Use of the linear momentum, orbital and spin angular momentum solves many of these difficulties and provides means to drive such systems.

FMF • Wavefront Sensing and Control I—Continued

FMF4 • 2:45 p.m. Invited

Wavefront Sensing and Control for JWST, *Scott Acton; Ball Aerospace, USA.* The Wavefront Sensing and Controls commission process for the James Webb Space Telescope will be described, and data from supporting experiments will be presented.

FMG • Silicon Photonics I—Continued

FMG4 • 2:30 p.m.

Ultra-High Quality Factor Microdisk Resonators for Chip-Scale Visible Integrated Photonics, *Ehsan Shah Hosseini, Siva Yegnanarayanan, Mohammad Soltani, Ali Adibi; Georgia Tech, USA.* Ultra-high-quality ($Q>4x10^6$) microdisk resonators are demonstrated in a Si_3N_4 platform at 655nm with curved in-plane coupling waveguides on a Si substrate. Critical coupling to different radial modes is demonstrated using pedestal layer to control coupling.

FMG5 • 2:45 p.m.

Silicon-Coupled, High-Q Chalcogenide Microspheres, *Daniel H. Broaddus, Mark A. Foster, Imad H. Agha, Alexander L. Gaeta, Jacob T. Robinson, Michal Lipson; Cornell Univ., USA.* We fabricate high-Q As_2Se_3 glass microspheres using resistive heating and demonstrate quality factors as large as 2.9×10^6 at 1550 nm. We achieve efficient coupling via a novel scheme utilizing index-engineered unclad silicon waveguides.

LMA • Cavity Optomechanics I—Continued

LMA3 • 2:30 p.m. Invited

Detecting Quantum Behavior in Cavity-Based Electromechanical and Optomechanical Systems, *Aashish Clerk; McGill Univ., Canada.* I will present two theoretical works related to the goal of detecting the quantum behaviour of a mechanical resonator. The first involves position detection below the standard quantum limit; the second involves detecting energy quantization.

LMB • THz Spectroscopy of Charges in Semiconductors—Continued

LMB3 • 2:30 p.m. Invited

The Effect of Spin-Polarized Electrons on THz Emission from Photoexcited GaAs(111), *Charles Schmuttenmaer, James M. Schleicher, Shayne M. Harrel; Yale Univ., USA.* We report the dependence of optical rectification and shift currents in unbiased GaAs(111) on the excitation beam polarization using THz emission spectroscopy. Emission when exciting slightly above bandgap is strongly influenced by spin-polarized electrons.

MMC • Spectroscopy of Individual Plasmonic Nanostructures—Continued

MMC4 • 2:30 p.m.

Nanoscale Characterization of Single Metal Nanoparticles by their Scattering Patterns, *Tina Züchner[1], Antonio Virgilio Failla[1,2], Frank Wackenhut[1], Alfred J. Meixner[1]; [1]Inst. of Physical and Theoretical Chemistry, Eberhard-Karls Univ. Tübingen, Germany, [2]Cancer Res. UK, Univ. of Cambridge, UK.* We used confocal interference scattering microscopy combined with higher order laser modes to determine the position, the shape, the orientation and the effect of the environment on individual metal nanoparticles by studying their scattering patterns.

MMC5 • 2:45 p.m.

Quantitative Analysis of Certain Nano-Plasmonic Systems, *Kurt Busch, Jan Gieseler, Michael König, Jens Niegemann, Kai Stannigel, Lasha Tkeshelashvili; Inst. für Theoretische Festkörperphysik, Univ. Karlsruhe, Germany.* We apply a Discontinuous-Galerkin finite-element Time-Domain (DGTD) solver to certain nano-photonic structures and we show quantitative results of field enhancements and modified radiation dynamics in these systems.

NOTES

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
		FiO			

FMA • Nonclassical Light—Continued

FMA5 • 3:00 p.m.
Security of a Discretely Signaled Continuous Variable QKD Protocol against Collective Attacks, *Zheshen Zhang[1,2], Paul L. Voss[1,2]; [1]Georgia Tech, Ctr. Natl. de la Recherche Scientifique, France, [2]School of Electrical and Computer Engineering, Georgia Tech, USA.* We prove security against collective attacks of a four-state discretely signaled continuous variable quantum key distribution protocol with and without post-selection. This protocol is compatible with optical networks and high speed coding techniques.

SMC • Laser Science Symposium on Undergraduate Research I—Continued

FMC • Illumination I: Modeling, Ray Tracing and Rendering—Continued

FMC6 • 3:00 p.m. Invited
Accurate Lit-Appearance Modeling of Illumination Systems, *R. John Koshel[1,2]; [1]Photon Engineering LLC, USA, [2]College of Optical Sciences, Univ. of Arizona, USA.* Lit-appearance modeling of illumination systems is the determination of what that system looks like before costly fabrication. Methods using ray-tracing software will be presented through examples: spot projection, pupil sampling, and luminance modeling.

FMD • General Optical Sciences I—Continued

FMD7 • 3:00 p.m.
Partially Coherent Cyclostationary Pulses in Young's Interference Experiment, *Robert W. Schoonover[1], Brynmor J. Davis[1], Randy A. Bartels[2], P. Scott Carney[1]; [1]Univ. of Illinois at Urbana-Champaign, USA, [2]Colorado State Univ., USA.* Young's interference experiment is used to analyze the statistical properties of a certain class of spatially partially coherent, cyclostationary, optical fields.

FMD8 • 3:15 p.m.
Closed Form Formula for Mie Scattering of Generalized Gaussian Beams, *Nicole J. Moore, Miguel A. Alonso; Inst. of Optics, Univ. of Rochester, USA.* A closed form formula is found for the Mie scattering coefficients of an incident generalized Gaussian beam with any numerical aperture. This formula takes the simple form of multipoles evaluated at a complex point.

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

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META

FME • Novel Trapping and Micromanipulation Techniques I—Continued

FME5 • 3:00 p.m.
DNA Concentration by Surface Plasmon Induced Microfluidic Convective Flow, *Xiaoyu Miao, Benjamin K. Wilson, Suzie H. Pun, Lih Y. Lin; Univ. of Washington, USA*. We demonstrate that microfluidic convective flow created by the enhanced light absorption through localized surface plasmons can be utilized to realize the efficient concentration of DNA.

FME6 • 3:15 p.m.
3-D Optical Trap Design for Multi-Purpose Microscopes with Space Constraints, *Ruby Raheem, Alistair Elfick; Univ. of Edinburgh, UK*. Maximizing axial trap displacement with lenses for a given space using ray optics is demonstrated on a Raman microscope with nearest lens placement at 350mm from the objective.

FMF • Wavefront Sensing and Control I—Continued

FMF5 • 3:15 p.m.
Compensation for Dynamic Optomechanical Vibrations in a Phase-Diverse Phase Retrieval Algorithm, *Thomas Zielinski, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA*. Vibration-induced modes in optical system surfaces and supporting optomechanics result in inconsistent PSF data and reduce the fidelity of phase retrieval results. A method for algorithmically accounting for known system vibration modes is presented.

FMG • Silicon Photonics I—Continued

FMG6 • 3:00 p.m. Invited
Silicon-Organic Hybrid (SOH) Devices for Optical Signal Processing, *Christian Koos[1,2], Jan-Michael Brosi[1], Philipp Vorreau[1], Thomas Vallaitis[1], Pieter Dumon[3], Roel Baets[3], Bweh Esembeson[4], Ivan Biaggio[4], Tsuyoshi Michinobu[5], François Diederich[5], Wolfgang Freude[1], Juerg Leuthold[1]; [1]Inst. of High-Frequency and Quantum Electronics, Univ. of Karlsruhe, Germany, [2]Carl Zeiss AG, Corporate Res. and Technology, Oberkochen Res. Ctr., Germany, [3]Photonics Res. Group, Ghent Univ., IMEC, Belgium, [4]Dept. of Physics, Lehigh Univ., USA, [5]Lab für Organische Chemie, ETH Zürich, Switzerland*. Silicon-organic hybrid (SOH) integration allows overcoming insufficient nonlinear optical properties of silicon-on-insulator waveguides. We discuss 100Gbit/s electro-optic modulation and demonstrate 120Gbit/s all-optical signal processing with SOH devices.

LMA • Cavity Optomechanics I—Continued

LMA4 • 3:00 p.m.
Optical Properties of a Dispersively-Coupled High Finesse Cavity and Micromechanical Membrane, *Cheng Yang[1], Benjamin M. Zwickl[1], Andrew E. Jayich[1], Jack C. Sankey[1], Jeff D. Thompson[1], Jack G. E. Harris[1,2]; [1]Dept. of Physics, Yale Univ., USA, [2]Dept. of Applied Physics, Yale Univ., USA*. The linear optical properties of a dispersively coupled high finesse cavity and a micromechanical membrane with high mechanical quality factor Q are studied. We demonstrated a system with 150,000 cavity finesse and 10^6 mechanical Q.

LMA5 • 3:15 p.m.
Entangling the Ro-Vibrational Modes of a Macroscopic Mirror Using Radiation Pressure, *Mishkatul Bhattacharya[1,2], Pierre-Louis Giscard[1,2], Pierre Meystre[1,2]; [1]Dept. of Physics, Univ. of Arizona, USA, [2]College of Optical Sciences, Univ. of Arizona, USA*. We explore the ability of radiation pressure to entangle macroscopic objects, using a Laguerre-Gaussian mode in a cavity containing a mirror that can vibrate as well as rotate.

LMB • THz Spectroscopy of Charges in Semiconductors—Continued

LMB4 • 3:00 p.m.
Role of Orbital Angular Momentum in Femtomagnetism, *Guoping Zhang[1], Thomas F. George[2]; [1]Dept. of Physics, Indiana State Univ., USA, [2]Office of the Chancellor, Depts. of Chemistry and Biochemistry, and Physics and Astronomy, Univ. of Missouri at St. Louis, USA*. In contrast to popular understanding, the total angular momentum conservation does not impose a limit on the spin momentum change in femtomagnetism. Theory predicts a similar sharp reduction of spin and orbit momenta upon excitation.

LMB5 • 3:15 p.m.
THz-Induced Ultrafast Dynamics and Extreme Nonlinear Optical Effects in Semiconductor Quantum Wells, *Yun-Shik Lee[1], Jeremy R. Danielson[1], John P. Prineas[2], Johannes T. Steiner[3], Mackillo Kira[3], Stephan W. Koch[3]; [1]Oregon State Univ., USA, [2]Univ. of Iowa, USA, [3]Philipps-Univ., Germany*. We demonstrate THz-induced extreme-nonlinear transients in a GaAa/AlGaAs quantum-well system. The terahertz-pump and optical-probe experiments show pronounced spectral modulations of the excitonic resonances. Microscopic many-body calculations identify clear ponderomotive contributions and THz harmonic generations.

MMC • Spectroscopy of Individual Plasmonic Nanostructures—Continued

MMC6 • 3:00 p.m.
Paper Withdrawn

MMC7 • 3:15 p.m.
Observation of Defect Formation in Metamaterials, *Humeyra Caglayan[1], Irfan Bulu[2], Marko Loncar[2], Ekmel Ozbay[1]; [1]Bilkent Univ. Nanotechnology Res. Ctr., Bilkent Univ., Turkey, [2]School or Engineering and Applied Sciences, Harvard Univ., USA*. A defect in metamaterials by replacing the center unit cell with a positive index medium is introduced. Defect modes in the transmission spectrum of a split ring resonator and composite metamaterials defect structures are observed.

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

FiO

Lilac Ballroom North

4:00 p.m.–6:00 p.m.
SMD • Schawlow-Townes Symposium on 50 Years of the Laser: Looking to Tomorrow
Robert W. Boyd; Univ. of Rochester, USA, Presider
Martin Richardson; CREOL, College of Optics and Photonics, Univ. of Central Florida, Presider

SMD1 • 4:00 p.m. Invited
From Millisecond to Attosecond Laser Pulses, *Nicolaas Bloembergen; Univ. of Arizona, USA*. Abstract not available.

Highland A

4:00 p.m.–5:45 p.m.
FMH • Photon Sources
Jason Fleischer; Princeton Univ., USA, Presider

FMH1 • 4:00 p.m.
Four-Wave Mixing in a Birefringent Semiconductor Waveguide for Correlated Photon Generation, *Daniel J. Rogers[1], Julius Goldhar[1], Christopher J. K. Richardson[1], Charles W. Clark[2]; [1]Univ. of Maryland, USA, [2]NIST, USA*. We demonstrate birefringent phase-matched four-wave mixing in a III-V semiconductor waveguide as a potential source of correlated and ultimately entangled photon pairs for high-speed quantum key distribution.

FMH2 • 4:15 p.m.
Towards Hyperentanglement via Semiconductor Two-Photon Emission, *Alex Hayat, Pavel Ginzburg, Pavel Gurevich, David Neiman, Serge Rosenblum, Meir Orenstein; Technion - Israel Inst. of Technology, Israel*. We investigate a new phenomenon of semiconductor two-photon emission presenting the first experiments. This allows implementation of compact highly-efficient room-temperature sources of entangled (for microcavity interband transitions) and hyperentangled (for intersubband transitions) photons.

Highland B

4:30 p.m.–6:30 p.m.
SME • Laser Science Symposium on Undergraduate Research II
David Sukow; Washington and Lee Univ., USA, Presider

See Undergraduate Research Symposium program in registration bag.

Highland C

4:00 p.m.–6:15 p.m.
FMI • Femtosecond Surface Science
Oren Cohen; JILA, Univ. of Colorado, USA, Presider

FMI1 • 4:00 p.m. Invited
Ultrafast Spin-Dependent Carrier Dynamics in Ferromagnetic Thin Films, *Martin Weinelt[1,2]; [1]Max-Born-Inst., Germany, [2]Freie Univ. Berlin, Germany*. Spin-dependent carrier dynamics in ferromagnetic thin films is studied by time-, energy-, angle-, and spin-resolved photoelectron spectroscopy. We will discuss spin-flip scattering and its relation to femtomagnetism.

Highland D

4:00 p.m.–6:00 p.m.
FMJ • Illumination II: Vision and Measurement
Anurag Gupta; Optical Res. Associates, USA, Presider

FMJ1 • 4:00 p.m. Invited
An Overview of the Non-Visual Effects of Retinal Light Exposure, *Mark S. Rea, Mariana G. Figueiro; Rensselaer Polytechnic Inst., USA*. Comparisons will be made between light as a stimulus to the visual system and light as a stimulus to non-visual, biological effects that affect human behavior and well-being.

Highland E

4:00 p.m.–6:00 p.m.
FMK • General Optical Sciences II
Jason Schmidt; Air Force Inst. of Technology, USA, Presider

FMK1 • 4:00 p.m.
Conservation of Angular Momentum in Mie Scattering, *David P. Haefner, Sergey Sukhov, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA*. We show that the spin angular momentum carried by the incident wave is distributed between spin and orbital momentum of the wave scattered from a spherically symmetric scattering potential resulting in a spiral power flow.

FMK2 • 4:15 p.m.
Study of the Persistent Laser-Induced Change in the Index of Refraction in Pr^{3+}-Doped Silicate Glass Using Pump-Probe X-Scan Technique, *Abdullatif Y. Hamad, Seong Heon Kim; Southern Illinois Univ. Edwardsville, USA*. The profile, size, and magnitude of the change in the refraction index in Pr^{3+}-doped silicate glass were determined using the x-scan technique. The index profile was dependent on the exposure time of the pump beam.

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META

4:00 p.m.–6:00 p.m.
FML • Novel Trapping and Micromanipulation Techniques II
Halina Rubinsztein-Dunlop; Univ. of Queensland, Australia, Presider

FML1 • 4:00 p.m.
Rapid Nanodroplet-Based Real-Time PCR System with Laser Heating, *Hanyoup Kim, Sanhita Dixit, Alhaji Cherif, Gregory W. Faris; SRI Intl., USA.* We report the first use of laser heating for rapid PCR to our knowledge. Real-time PCR DNA analysis is performed using nanoliter droplets dispersed in oil as independent assay chambers.

FML2 • 4:15 p.m.
Optical Trapping and Manipulation of Carbon Nanotubes Decorated with Silver Nanoparticles, *Chao Shi, Yi Zhang, Claire Gu, Leo Seballos, Jin Z. Zhang; Univ. of California at Santa Cruz, USA.* Manipulating carbon nanotube (CNT) bundles through optical trapping of attached silver nanoparticles (SNPs) and light-induced agglomeration of SNPs/CNTs were demonstrated which could be exploited for fabricating patterned CNT films for nanoscale devices and other applications.

4:00 p.m.–6:00 p.m.
FMM • Wavefront Sensing and Control II
Bruce Dean; NASA Goddard Space Flight Ctr., USA, Presider

FMM1 • 4:00 p.m.
A Comparison of Regularized Metrics for Phase Diversity, *Matthew R. Bolcar, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* We compare the performance of four metrics for use in a phase diversity algorithm. Three of the metrics utilize a regularization based on the signal-to-noise ratio.

FMM2 • 4:15 p.m. Invited
Phase-Diverse Wavefront Sensing and Control, *Richard Paxman; General Dynamics, USA.* Improved computational capabilities render phase-diverse wavefront sensing to be a viable choice for selected adaptive-optics applications. Phase diversity acquires informative data with simple optical hardware, works with low-contrast extended scenes, and accommodates wavefront discontinuities.

4:00 p.m.–6:00 p.m.
FMN • Integrated Optics
Daniel H. Broaddus; Cornell Univ., USA, Presider

FMN1 • 4:00 p.m.
Characterization of Optical PCB Interconnects by Means of Low-Coherence Interferometry, *Silvia Fabiani[1], Marco Farina[1], Andrea Di Donato[1], Agnese Lucesoli[1], Luigino Criante[2], Francesco Vita[2], Riccardo Castagna[2], Giacomo Angeloni[3], Giordano Di Gregorio[3], Tullio Rozzi[1,3]; [1]Dept. of Electromagnetism and Bioengineering, Polytechnic Univ. of Marche, Italy, [2]Dept of Physics and Engineering of Materials and Territory, Polytechnic Univ. of Marche, Italy, [3]Somacis PCB S.P.A., Italy.* Thanks to the low-coherence interferometry it is possible to characterize the transmission of highly dense multimode polymeric waveguides for the O-PCB. In particular the attenuation and the multimodal dispersion are directly deduced by interferometry patterns.

FMN2 • 4:15 p.m.
An Integrated Elliptical Reflector for High Efficiency 90° Turn of Waveguide with Arbitrary Width, *Xiangyu Li, Yingyan Huang, Seng-Tiong Ho; Dept. of Electrical Engineering and Computer Science, Northwestern Univ., USA.* A novel on-chip 90° turn based on elliptical reflector is proposed. Our simulation demonstrates that it can achieve high transmission efficiency for larger range of waveguide widths than conventional mirror turn or circular waveguide bend.

4:00 p.m.–6:00 p.m.
LMC • Cavity Optomechanics II
Kerry Vahala; Caltech, USA, Presider

LMC1 • 4:00 p.m. Invited
Measuring and Cooling the Motion of a Nanomechanical Oscillator with a Microwave Cavity Interferometer, *Konrad W. Lehnert, John D. Teufel; JILA, Univ. of Colorado, USA.* By embedding a nanomechanical beam in a superconducting microwave cavity, we measure the beam's motion near the standard quantum limit, we cool the beam with radiation pressure and, we realize an ultrasensitive force detector.

4:00 p.m.–6:00 p.m.
LMD • THz Imaging and Novel Technology
Susan L. Dexheimer; Washington State Univ., USA, Presider

LMD1 • 4:00 p.m. Invited
Terahertz Technology for Defense Related Applications, *Megan R. Leahy-Hoppa, Michael J. Fitch, Robert Osiander; Johns Hopkins Univ. Applied Physics Lab, USA.* Terahertz technology for security and defense related applications has recently experienced an increase in interest with an emphasis on imaging of concealed explosives. Our research has focused on spectroscopy of explosives and novel THz taggants.

4:00 p.m.–6:00 p.m.
MMD • THz Structures
Xiang Zhang; Univ. of California at Berkeley, USA, Presider

MMD1 • 4:00 p.m. Invited
Time-Domain Terahertz Plasmonics: Unmasking the Hidden Dynamics in Metals, *Abdul Elezzabi; Univ. of Alberta at Edmonton, Canada.* We explore the time-domain terahertz plasmonic properties of metallic composites to investigate two interesting phenomena: artificial isotropic plasmonic magnetoresistance and plasmonic bimetallic contact reactance. Such characteristics are further revealed via examining the ultrafast dynamics.

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
FiO					

SMD • Schawlow-Townes Symposium on 50 Years of the Laser II: Looking to Tomorrow—Continued

SMD2 • 4:30 p.m. Invited

From Gas Lasers and Tunable Raman Lasers to Quantum Cascade Lasers, *Kumar Patel; Pranalytica Inc, USA*. I will describe my involvement in lasers from 1961 to present, encompassing high power carbon dioxide lasers, tunable spin-flip Raman lasers, and now high power CW room temperature quantum cascade lasers and their applications.

FMH • Photon Sources—Continued

FMH3 • 4:30 p.m. Invited

From a Single-Photon Source to a Single-Ion Laser, *Francois Dubin, Carlos Russo, Helena G. Barros, Andreas Stute, Piet Schmidt, Rainer Blatt; Univ. of Innsbruck, Austria*. A single Ca^+ ion is trapped in a high finesse cavity. Under continuous excitation, our single-ion device shows signatures of a quantum laser. Under pulsed excitation, it acts as an efficient source of single photons.

SME • Laser Science Symposium on Undergraduate Research II—Continued

FMI • Femtosecond Surface Science—Continued

FMI2 • 4:30 p.m. Invited

Real Time Electronic Structure Investigated by Femtosecond Time- and Angle-Resolved Photoemission Spectroscopy, *Uwe Bovensiepen; Freie Univ. Berlin, Fachbereich Physik, Germany*. The real time evolution of electronic structure is analyzed for the Mott insulator TaS_2 and the charge density wave compound $TbTe_3$. The results facilitate unprecedented insight into the impact of collective modes and electronic correlation.

FMJ • Illumination II: Vision and Measurement—Continued

FMJ2 • 4:30 p.m.

A Perfect Illumination Spectral Ratio Effect on Microsaccades and Drift, *Richard Friedhoff[1], James Schirillo[1,2]; [1]Tandent Vision Science, Inc., USA, [2]Wake Forest Univ., USA*. Can eye movements differentiate illumination versus material borders? Stimuli containing a material edge bisected an illumination edge that contained a correct or incorrect spectral ratio. Microsaccades and drift were longer only across plausible illumination borders.

FMJ3 • 4:45 p.m. Invited

Vision at Mesopic Light Levels, *Alan L. Lewis; Electric Power Res. Inst. (EPRI) Lighting Res. Office, USA*. Lighting designers use photopic photometry even when applications call for lower adaptation levels. There is a need for a mesopic unit that will adequately predict visual performance for outdoor use under today's spectrally diverse lamps.

FMK • General Optical Sciences II—Continued

FMK3 • 4:30 p.m.

Topological Reactions of Correlation Vortices, *Yalong Gu, Greg Gbur; Univ. of North Carolina at Charlotte, USA*. The topological reactions of correlation vortices are investigated. They suggest the possible use of correlation vortices as a probe of the statistical properties of a field or a medium.

FMK4 • 4:45 p.m.

General Theory for Self-Healing Beams Applied to a Caustic Field, *Sabino Chávez-Cerda[1], Marcelino Anguiano-Morales[2], Marcelo D. Iturbe-Castillo[1]; [1]INAOE, Mexico, [2]Ctr. de Investigaciones en Optica, Mexico*. We present a general theory of self-healing beams and demonstrate that caustic optical fields generated by an axicon illuminated with a cylindrical wavefront are self-healing when they are partially obstructed by an opaque object.

NOTES

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META

FML • Novel Trapping and Micromanipulation Techniques II—Continued

FML3 • 4:30 p.m. Invited

Studying Aerosols Using Optical Traps, *David McGloin; Univ. of Dundee, UK.* In order to use optical tweezers for studies of airborne particles we must understand the underlying physics. We explore the interaction of aerosols with an optical potential, examining the Brownian and optical forces.

FMM • Wavefront Sensing and Control II—Continued

FMM3 • 4:45 p.m. Invited

Recent Topics in Wavefront Sensing and Control, *James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Image-based wavefront sensing has been advanced by several new twists on phase retrieval algorithms.

FMN • Integrated Optics—Continued

FMN3 • 4:30 p.m.

Efficient Four-Wave Mixing in Dispersion Engineered As_2S_3 Highly Nonlinear Waveguides, *Michael R. E. Lamont[1], Barry Luther-Davies[2], Duk Yong Choi[2], Steve Madden[2], Benjamin J. Eggleton[1]; [1]CUDOS, Univ. of Sydney, Australia, [2]CUDOS, Australian Natl. Univ., Australia.* We report efficient four-wave mixing based wavelength conversion in dispersion engineered As_2S_3 highly nonlinear planar waveguides. Experiments are in good agreement with theory, and show a peak four-wave mixing gain of +39 dB.

FMN4 • 4:45 p.m.

Photoconductive Polymer Based Planar Structure as Adaptive Photodetector of Mechanical Vibrations, *Ileana Guizar Iturbide[1], Ponciano Rodriguez Montero[1], Svetlana Mansurova[1], Sebastian Köber[2], Klaus Meerholz[2]; [1]INAOE, Mexico, [2]Inst. für Physikalische Chemie, Univ. zu Köln, Germany.* Experimental results on detection of vibrations from objects with rough surface using an adaptive detector based on non-steady-state photo-EMF effect in a photoconductive polymer based planar structure are reported.

LMC • Cavity Optomechanics II—Continued

LMC2 • 4:30 p.m. Invited

Quantum-Optical Control of Micromechanics, *Markus Aspelmeyer; Austrian Acad. of Sciences, Austria.* Massive mechanical resonators are approaching the quantum regime. This opens up a spectrum of new applications and a previously inaccessible parameter range for macroscopic quantum experiments on systems consisting of up to 10^{20} atoms.

LMD • THz Imaging and Novel Technology—Continued

LMD2 • 4:30 p.m. Invited

Method and Applications of Intense Terahertz Wave Radiation from Laser-Induced Air Plasma, *Jianming Dai, Xi Cheng Zhang; Rensselaer Polytechnic Inst., USA.* Intense THz waves can be generated, amplified, and detected with laser induced air plasma as the medium through a mechanism similar to four-wave-mixing optical nonlinear process. The potential application is THz standoff sensing and identification.

MMD • THz Structures—Continued

MMD2 • 4:30 p.m.

Subwavelength Confinement and Guiding of Terahertz Waves by Gap Magnetic Plasmon Waveguides, *Atsushi Ishikawa[1,2], Shuang Zhang[1], Dentcho A. Genov[1], Guy Bartal[1], Xiang Zhang[1,3]; [1]Univ. of California at Berkeley, USA, [2]Japan Society for the Promotion of Science, Japan, [3]Materials Sciences Div., Lawrence Berkeley Natl. Lab, USA.* We propose a subwavelength terahertz waveguide using magnetic plasmon polariton modes guided by a narrow gap in a negative permeability metamaterial. Deep subwavelength wave-guiding ($<\lambda/10$) with modest propagation loss ($2.5\text{dB}/\lambda$) is achieved at terahertz frequencies.

MMD3 • 4:45 p.m.

Near-Field Imaging of Subwavelength Circular Hole Arrays at Terahertz Frequencies, *Joseph R. Knab[1], Aurèle J. L. Adam[1], Michael Nagel[2], Min Ah Seo[3], Dai Sik Kim[3], Paul C. M. Planken[1]; [1]Delft Univ. of Technology, Faculty of Applied Sciences, Dept. of Imaging Science and Technology, Netherlands, [2]RWTH Aachen Univ., Inst. für Halbleitertechnik, Germany, [3]Seoul Natl. Univ., School of Physics and Astronomy, Republic of Korea.* Sub-wavelength, metallic circular aperture arrays were studied in the near-field at terahertz frequencies, using terahertz time-domain spectroscopy (THz-TDS). Two different periodicities were investigated and array subsections were imaged in both the time- and frequency-domain.

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
FiO					
SMD • Schawlow-Townes Symposium on 50 Years of the Laser II: Looking to Tomorrow—Continued	**FMH • Photon Sources—Continued**	**SME • Laser Science Symposium on Undergraduate Research II—Continued**	**FMI • Femtosecond Surface Science—Continued**	**FMJ • Illumination II: Vision and Measurement—Continued**	**FMK • General Optical Sciences II—Continued**
SMD3 • 5:00 p.m. Invited **The Rejuvenation of Optical Spectroscopy,** *Boris Stoicheff; Univ. of Toronto, Canada*. In Canada, as in many countries, the advent of the laser has brought unprecedented growth in optical spectroscopy, resulting not only in precise determinations of atomic and molecular energy levels, but in detailed investigations of mechanisms having femtosecond and attosesond durations.	**FMH4 • 5:00 p.m.** **A Time Bandwidth Limited Fiber Pair Photon Source,** *John G. Rarity[1,2], Jeremie Fulconis[1], Alex Clark[1], Jeremy L. O'Brien[1], Matthaeus Halder[1], William J. Wadsworth[2], Chunle Xiong[2]; [1]Univ. of Bristol, UK, [2]Univ. of Bath, UK*. Using birefringent phase matching in microstructured fibers we have developed a pair photon source with bandwidth limited solely by pulse length.		**FMI3 • 5:00 p.m.** Invited **Generation and Time-Resolved Detection of Coherently Controlled Electric Currents at Surfaces,** *J. Gudde[1], M. Rohleder[1], T. Meier[2], S. W. Koch[1], Ulrich Höfer[1]; [1]Philipps-Univ. Marburg, Germany, [2]Univ. Paderborn, Germany*. We demonstrate an experimental technique for the generation and detection of electron currents at surfaces on a femtosecond time scale with a contact-free experimental setup based on a combination of coherent control and photoemission spectroscopy.		**FMK5 • 5:00 p.m.** **Generation of Maximal Coherence in a Two-Level System via Breaking Adiabaticity,** *Yuri Rostovtsev[1], Hichem Eleuch[1,2], Anatoly Svidzinsky[1], Marlan O. Scully[1,3]; [1]Inst. for Quantum Studies, Texas A&M Univ., USA, [2]Inst. Natl. des Sciences Appliques et de Technologie, Tunisia, [3]Princeton Inst. for the Science and Technology of Materials and Dept. of Mechanical and Aerospace Engineering, Princeton Univ., USA*. We study population transfer and the generation of quantum coherence in a two-level system interacting with a strong off-resonance ultra-short laser pulse. We derive analytical solutions for an ultra-short pulse of arbitrary shape.
	FMH5 • 5:15 p.m. **Increasing the Bandwidth of Quantum Light: A New Way towards the Generation of Narrow Temporal Biphoton,** *Xiaojuan Shi, Martin Hendrych, Alejandra Valencia, Juan Perez Torres; ICFO, Institut de Ciències Fotòniques, Spain*. We experimentally demonstrate a new method to enlarge the quantum light bandwidth. Paired photons with bandwidths more than 1000 THz could be obtained, which opens up a new way to generate narrow temporal biphoton states.			**FMJ4 • 5:15 p.m.** **Effectiveness of Various Light Sources on the Stimulation of Phosphorescent Safety Markings,** *David R. Wyble[1], C. Cameron Miller[2], Maria E. Nadal[2]; [1]Munsell Color Science Lab, Rochester Inst. of Technology, USA, [2]NIST, USA*. Commercially available phosphorescent materials are experimentally evaluated under conventional and solid-state lighting sources. The spectral and photopic properties of the sources are considered against the current ASTM test method for photoluminescent safety markings.	**FMK6 • 5:15 p.m.** **Propagation of Electromagnetic Waves in Non-Uniform Volume Bragg Gratings,** *Sergiy V. Mokhov, Leonid B. Glebov, Vadim I. Smirnov, Boris Ya Zeldovich; CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA*. Spectral properties of reflective Volume Bragg Gratings (VBG) are studied with rigorous coupled wave approach. Similarities and differences between volume and fiber gratings are discussed. Simulation technique for VBG is proposed and compared with experiment.
SMD4 • 5:30 p.m. Invited **Looking back to the Laser of Schawlow and Townes, and Looking forward to the Generation of Gravitational Radiation,** *Raymond Chiao; Univ. of California at Merced, USA*. In 1958 Schawlow and Townes proposed the use of stimulated emission for generating macroscopically coherent light. I propose that the use of charged, macroscopically coherent quantum matter can lead to efficient generation of gravitational waves.	**FMH6 • 5:30 p.m.** **Measurement of Biphoton Wavefunctions Using Fast Amplitude Modulators,** *Chinmay Belthangady, Shengwang Du, Pavel Kolchin, Guang-Yu Yin, Stephen E. Harris; Stanford Univ., USA*. We demonstrate a proof-of-principle experimental realization of a novel technique that uses fast amplitude modulators to measure biphoton waveforms whose temporal lengths are shorter than the resolution time of present single photon counting modules.		**FMI4 • 5:30 p.m.** Invited **Ultrafast Dynamics of Electron Transfer at Polar Adsorbate/Metal Interfaces Studied with Time-Resolved Photoelectron Spectroscopy,** *Martin Wolf; Freie Univ. Berlin, Germany*. Interfacial electron transfer and solvation processes in thin layers of water and ammonia on metal surfaces are studied by femtosecond photoelectron spectroscopy to analyze the tunnelling barrier and solvation site of photoinjected excess electrons.	**FMJ5 • 5:30 p.m.** **Shape Recognition through Opto-Mechanical Scanning,** *Jenny Magnes[1], Trevor David[1], Rahul Khakurel[1], Margo Kinneberg[1], Derek Olson[1], Noureddine Melikechi[2]; [1]Vassar College, USA, [2]Delaware State Univ., USA*. We explore capabilities and limits of opto-mechanical knife-edge scanning methods for the purpose of shape recognition techniques that are scale invariant. Different algorithms for corner scanning, opto-mechanical integration and symmetry based shape recognition are discussed.	**FMK7 • 5:30 p.m.** **Paper Withdrawn**

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META
FML • Novel Trapping and Micromanipulation Techniques II—Continued	**FMM • Wavefront Sensing and Control II—Continued**	**FMN • Integrated Optics—Continued**	**LMC • Cavity Optomechanics II—Continued**	**LMD • THz Imaging and Novel Technology—Continued**	**MMD • THz Structures—Continued**
FML4 • 5:00 p.m. **Parallel Optical Manipulation in Evanescent Optical Landscapes,** *Carlos López-Mariscal, Kris Helmerson; NIST, USA*. Using multiple-beam interference and total internal reflection, we couple an evanescent optical field to a large number of particles in a periodical landscape. The particles are confined and manipulated modifying the parameters of the landscape.		**FMN5 • 5:00 p.m.** **One-Step Imprinting of Optical Waveguides by Melt Processing of Plasticized Polymers,** *Ismail E. Araci, Jayan Thomas, Valery Temyanko, Robert Norwood, N. Peyghambarian; College of Optical Sciences, Univ. of Arizona, USA*. Single mode fiber compatible optical waveguides were imprinted in single step by melt processing technique. The processing times were short, material wastage was negligible and processing temperature was lower than conventional imprinting process.	**LMC3 • 5:00 p.m.** Invited **A Radio Wave Analog of Laser Cooling for Macroscopic Systems,** *Kenton Brown, J. Britton, R. J. Epstein, J. Chiaverini, D. Leibfried, D. J. Wineland; NIST, USA*. We cool a 7 kHz cantilever from room temperature to 45 K by capacitively coupling it to a driven rf resonant circuit. Cooling results from the capacitive force, phase shifted relative to the cantilever motion.	**LMD3 • 5:00 p.m.** **Rapid Time Scanning Using a Spatial Light Modulator for Terahertz Imaging,** *D. Ahmasi Harris, Edwin J. Heilweil; Optical Technology Div., NIST, USA*. We describe and characterize a novel high-speed, all optical variable delay line design that uses a spatial light modulator to time delay gate pulses used for electro-optic sampling in pulsed terahertz hyperspectral imaging.	**MMD4 • 5:00 p.m.** **Generation of Broadband Terahertz Surface Plasmons on Cylindrical Metal Wires via Optical Rectification,** *Wenqi Zhu[1], Amit Agrawal[1], Ajay Nahata[1], Hua Cao[2]; [1]Univ. of Utah, USA, [2]Univ. of South Florida, USA*. We demonstrate the generation of broadband radially polarized terahertz surface plasmons on a cylindrical metal wire via optical rectification in a poled polymer layer, creating new opportunities for terahertz near-field microscopy.
FML5 • 5:15 p.m. **Near-Field Modeling of Particle-Particle Interactions,** *David P. Haefner, Sergey Sukhov, Aristide Dogariu; College of Optics and Photonics, CREOL, Univ. of Central Florida, USA*. We demonstrate an extension of the coupled dipole approximation to model particle-particle or probe-object interactions in optical near fields. These interactions determine the properties of both optical forces and scattered intensities.	**FMM4 • 5:15 p.m.** **Wavefront Aberration Correction for Dual-Deformable-Mirror Adaptive Optics Systems,** *Weiyao Zou, Xiaofeng Qi, Stephen A. Burns; Indiana Univ., USA*. A control algorithm for a Woofer-Tweeter dual deformable-mirror (DM) adaptive optics system is developed for correcting the low-order aberration with the Woofer DM and high-order aberration with the Tweeter DM.	**FMN6 • 5:15 p.m.** **Design and Fabrication of Integrated Lens Based on Curved Reflector with Physical Optics Correction,** *Zhenyu Hou, Qian Zhao, Yingyan Huang, Seng-Tiong Ho; Northwestern Univ., USA*. Integration of lens on-chip is challenging but can be realized with curved reflector. FDTD simulation shows that the curved reflector throughput can be improved via physical optics correction. Actual devices are fabricated on SOI wafer.		**LMD4 • 5:15 p.m.** **Intense Terahertz Emission from Biased Femtosecond Laser Filament in Air,** *Aurélien Houard[1], Yi Liu[1], Bernard Prade[1], Vladimir Tikhonchuk[2], André Mysyrowicz[1]; [1]Lab d'Optique Appliquée, ENSTA, Ecole Polytechnique, CNRS, France, [2]Ctr. Lasers Intenses et Applications, Univ. Bordeaux 1, CNRS, CEA, France*. The THz radiation emitted by a filament in air can be enhanced by up to 6 orders of magnitude in the presence of a DC field. A complete determination of the THz pulse is performed.	**MMD5 • 5:15 p.m.** Invited **Active Terahertz Metamaterial Devices,** *Hou-Tong Chen[1], John F. O'Hara[1], Abul K. Azad[1], David Shrekenhamer[2], Willie Padilla[2], Joshua M. O. Zide[3], Arthur Gossard[3], Richard D. Averitt[4], Antoinette J. Taylor[1]; [1]Los Alamos Natl. Lab, USA, [2]Dept. of Physics, Boston College,, USA, [3]Univ. of California at Santa Barbara, USA, [4]Dept. of Physics, Boston Univ., USA*. We describe THz metamaterials exhibiting either amplitude control, via carrier injection or depletion in the active semiconductor substrate or frequency control, via photoexcitation of carriers into active semiconducting materials incorporated into the sub-wavelength metamaterial structure.
FML6 • 5:30 p.m. Invited **Optical Manipulation and Characterization of Aerosol Particles,** *Jonathan Reid; Univ. of Bristol, UK*. Aerosols play a significant role in many areas of pure and applied science. We will examine the latest developments in using light to manipulate and characterise aerosol particles, concentrating on optical tweezers and Raman spectroscopy.	**FMM5 • 5:30 p.m.** **Wavefront Sensing for Measuring the Stability of High-Power Laser Beams,** *Juan M. Bueno[1], Brian Vohnsen[1], Luis Roso[2], Pablo Artal[1]; [1]Univ. de Murcia, Spain, [2]Univ. de Salamanca, Spain*. Temporal changes in wavefront aberration of a high-power laser beam have been investigated using a home-built 25-Hz Hartmann-Shack sensor involving conventional optics. Results show that aberrations measured at two different temporal rates are fairly constant.	**FMN7 • 5:30 p.m.** **Optical Digital Audio Interconnect Based on Organic Light Emitting Diodes and Organic Photodiodes,** *Sebastian Valouch[1], Martin Punke[1], Siegfried W. Kettlitz[1], Uli Lemmer[1], Martina Gerken[2]; [1]Light Technology Inst. (LTI), Univ. Karlsruhe (TH), Germany, [2]Inst. for Electrical Engineering and Information Technology, Christian-Albrechts-Univ. zu Kiel, Germany*. An optical interconnect using solely organic optoelectronic components is presented. Careful optimization of the organic light emitting diodes and photodiodes allows us to successfully transmit a digitized audio signal based on the S/PDIF-format (2.8224 Mbit/s).	**LMC4 • 5:30 p.m.** **Level Crossing in Toroidal On-Chip Microcavities,** *Harald G. Schwefel[1], Lan Yang[2], Mark Oxborrow[3], A. Douglas Stone[4], Kerry J. Vahala[5], Tal Carmon[6]; [1]Inst. for Optics, Univ. Erlangen, Germany, [2]Washington Univ., USA, [3]Natl. Physical Lab, UK, [4]Yale Univ., USA, [5]Caltech, USA, [6]Univ. of Michigan, USA*. Level crossing between optical whispering-gallery modes is studied in toroidal microcavities. We photograph azimuthal and radial envelope patterns of crossed optical modes. We also investigate anti-crossing between modes and polarizations evolution.	**LMD5 • 5:30 p.m.** **First Demonstration of an All-Semiconductor Room-Temperature Terahertz Time-Domain Spectrometer,** *Zakaria Mihoubi[1], Keith Wilcox[1], Stephen Elsmere[1], Adrian Quarterman[1], Rakchanok Rungsawang[2], Ian Farrer[2], Harvey Beere[2], David Ritchie[2], Anne Tropper[1], Vasileios Apostolopoulos[1]; [1]Univ. of Southampton, UK, [2]Univ. of Cambridge, UK*. We report the first demonstration of an all-semiconductor, room temperature terahertz time-domain spectrometer using a femtosecond mode-locked Vertical-External-Cavity Surface-Emitting Laser at 1040 nm and photoconductive antennae.	

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
		SME • Laser Science Symposium on Undergraduate Research II—Continued	**FMI • Femtosecond Surface Science—Continued**	**FMJ • Illumination II: Vision and Measurement—Continued**	**FMK • General Optical Sciences II—Continued**

FMI5 • 6:00 p.m.
Enhanced Nonlinear Photoelectron Emission by Surface Plasmons from Nanostructure-Covered Periodic Grooves, *Taek Yong Hwang, Anatoliy Y. Vorobyev, Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA.* We find that surface plasmon excitation on nanostructure-covered periodic grooves can significantly enhance photoelectron emission, leading to a 4-photon process that is absent without surface plasmons within the intensity range in our experiment.

FMJ6 • 5:45 p.m.
Application of Imaging Sphere for BSDF Measurements of Arbitrary Materials, *Hubert Kostal, Doug Kreysar, Ronald Rykowski; Radiant Imaging, USA.* BSDF measurements are broadly applicable to material characterization, quality assessment, and computer modeling. The Imaging Sphere is novel optical measurement technology that allows BSDFs to be obtained quickly and accurately for a wide variety of materials.

FMK8 • 5:45 p.m.
Diffraction Effects in Wigner Functions for Paraxial and Nonparaxial Fields, *Seongkeun Cho, Jonathan C. Petruccelli, Miguel A. Alonso; Univ. of Rochester, USA.* The diffraction effects caused by apertures are described in terms of Wigner functions for paraxial and nonparaxial fields. This description is numerically advantageous in the case of partially coherent fields.

6:30 p.m.–8:30 p.m. OSA Student Member Welcome Reception, *Abilene, 153 Liberty Pole Way, Downtown Rochester, Phone: 585.232.3230*

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META
FML • Novel Trapping and Micromanipulation Techniques II—Continued	**FMM • Wavefront Sensing and Control II—Continued**	**FMN • Integrated Optics—Continued**	**LMC • Cavity Optomechanics II—Continued**	**LMD • THz Imaging and Novel Technology—Continued**	**MMD • THz Structures—Continued**
	FMM6 • 5:45 p.m. **Singular Wavefront Distortions for Propagated Optical Beam,** *Valerii P. Aksenov, Olga V. Tikhomirova; Inst. of Atmospheric Optics, Russian Federation*. Wave front of singular optical beam is analyzed with allowance for the phase calculated as a potential of the beam diffractive field. Extreme wave front distortions are demonstrated as accompaniments of vortices' generation and annihilation.	**FMN8 • 5:45 p.m.** **Tapered Couplers for Group-Velocity Insensitive Coupling to Photonic Crystal Waveguide Modes,** *Murtaza Askari, Babak Momeni, Ali Adibi; Georgia Tech, USA*. We present a systematic method for designing couplers for high efficiency coupling of electromagnetic energy from a ridge waveguide into a Photonic Crystal Waveguide (PCW) irrespective of the group velocity of the PCW modes.	**LMC5 • 5:45 p.m.** **Strong "Position-Squared" Readout of a Micromechanical Oscillator Using Higher-Order Transverse Modes of an Optical Cavity,** *Jack C. Sankey, Benjamin M. Zwickl, Andrew E. Jayich, Cheng Yang, Jack G. E. Harris; Yale Univ., USA*. We describe an optical cavity which realizes a sensitive "position-squared" readout for micromechanical oscillators. This readout uses the cavity's higher-order transverse modes. We will present detailed measurements and theoretical analysis of this device.	**LMD6 • 5:45 p.m.** **Photon-to-Carrier Efficiencies of Nanostructured Zinc-Phthalocyanine/Fullerene Thin Films Assessed by Time-Resolved Terahertz Spectroscopy,** *Okan Esenturk[1], Joseph S. Melinger[2], Paul Lane[2], Edwin J. Heilweil[3]; [1]Univ. of Maryland, USA, [2]NRL, USA, [3]NIST, USA*. Blend and multilayer zinc-phthalocyanine/fullerene thin films were investigated as model active layers for solar cells by time-resolved terahertz spectroscopy. A strong dependence on the blend ratio and multilayer nano-structure of the films was found.	**MMD6 • 5:45 p.m.** **Mid-Infrared Beam Propagation and Modulation in Extraordinary Transmission Gratings,** *Eric A. Shaner[1], Brandon Passmore[1], Albert Grine[1], Daniel Wasserman[2]; [1]Sandia Natl. Labs, USA, [2]Univ. of Massachusetts at Lowell, USA*. We have characterized laser beam propagation, with up to 10W power, through an extraordinary transmission grating fabricated on GaAs. The grating was designed to have a 10 μm fundamental resonance at the metal/dielectric interface.

6:30 p.m.–8:30 p.m. OSA Student Member Welcome Reception, *Abilene, 153 Liberty Pole Way, Downtown Rochester, Phone: 585.232.3230*

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
FiO					

8:00 a.m.–10:00 a.m. STuA • NASA at 50: The Hubble and Imaging

Mark Clampin; NASA Goddard Space Flight Ctr., USA, Presider

8:00 a.m.
Social Time

STuA1 • 8:30 a.m. Invited
Recovery of the Hubble: Discovery, Cause, Characterization and Mitigation of the Aberration, *James B. Breckinridge[1,2]; [1]JPL, USA, [2]Caltech, USA.* This paper reviews the flow of the work, describes how the investigation proceeded, the processes used and describes the opto-mechanical repair, test and verification effort.

8:00 a.m.–10:00 a.m. FTuA • Photonic Integrated Devices in Optical Networking

Pietro Bernasconi; Bell Labs, Alcatel-Lucent, USA, Presider

FTuA1 • 8:00 a.m. Tutorial
InP-Based Photonic Integrated Circuits, *Thomas L. Koch; Lehigh Univ., USA.* After decades of research and development, InP-based Photonic Integrated Circuits (PICs) are finally entering the commercial marketplace as enabling technology for high-capacity optical communications. I will review the underlying technology, current applications, and future trends.

Thomas Koch holds a joint position as Professor in Lehigh University's ECE and Physics departments, and holds the Daniel E. '39 and Patricia M. Smith Endowed Chair of Director, Center for Optical Technologies. Dr. Koch previously held Vice President positions in research and development at SDL, Lucent, and Agere Systems.

Dr. Koch received his A.B. in Physics from Princeton, and his Ph.D. in Applied Physics from Caltech in 1982. Joining Bell Labs Research in that year, his contributions in optoelectronic technologies enabled key advances in high-capacity optical fiber communications. He has chaired numerous major international conferences and has authored or co-authored more than 300 conference and journal publications, books and book chapters. He has received the Eric E. Sumner Award from IEEE, the Distinguished Lecturer Award and the William Streifer Award for Scientific

8:00 a.m.–10:00 a.m. FTuB • Photonic Bandgap Engineering I

Stefan Enoch; Inst. Fresnel, France, Presider

FTuB1 • 8:00 a.m. Invited
Cavity QED, Single-Photon Nonlinear Optics and Quantum Information Processing with Quantum Dots in Photonic Crystals, *Jelena Vuckovic, Andrei Faraon, Ilya Fushman, Dirk Englund; Edward L. Ginzton Lab, Stanford Univ., USA.* We have performed coherent probing of a strongly coupled quantum dot-photonic crystal cavity system, and employed this platform to demonstrate effects including controlled phase shift at the single photon level and photon blockade.

FTuB2 • 8:30 a.m.
Non-Classical Light Generation by a Photonic-Crystal One-Atom Laser, *Lucia Florescu; Dept. of Bioengineering, Univ. of Pennsylvania, USA.* We investigate the effects of sub-Poissonian photon statistics and photon antibunching in a coherently pumped photonic-crystal one-atom laser. Pronounced non-classical effects and strong emission enhancement relative to that of a conventional one-atom laser are predicted.

8:00 a.m.–10:00 a.m. FTuC • Quantum Information Processing

John G. Rarity; Univ. of Bristol, UK, Presider

FTuC1 • 8:00 a.m. Invited
Tools and Technology for Optical Quantum Information Processing, *Paul G. Kwiat, Scott Jobling, Kevin T. McCusker, Radhika Rangarajan; Univ. of Illinois at Urbana-Champaign, USA.* Practical optical quantum information processing requires a suite of advanced quantum photonic technologies, including high-efficiency sources and detectors, and low-loss storage and interconnects. We report on our progress toward these goals.

FTuC2 • 8:30 a.m.
Towards Interfacing Single Ions and Single Photons, *Felix Rohde, Carsten Schuck, Marc Almendros, Roger Gehr, Markus Hennrich, Francois Dubin, Albrecht Haase, Nicolas Piro, Morgan Mitchell, Juergen Eschner; ICFO, Inst. of Photonic Sciences, Spain.* Indistinguishability of resonance fluorescence from two distant Ca^+ ions is demonstrated. We also report on experiments where entangled photon pairs are generated whose frequency and bandwidth are matched to an absorption line of Ca^+ ions.

8:00 a.m.–10:00 a.m. FTuD • Imaging of Mice and Men I

Elizabeth M. Hillman; Columbia Univ., USA, Presider

FTuD1 • 8:00 a.m. Tutorial
Diffuse Optical Tomography, *Brian Pogue; Dartmouth College, USA.* Diffuse optical tomography of tissue can be used to characterize molecular features of tissue during detection, diagnosis, or management of cancer therapy. This tutorial will review the process and current applications in the field.

Brian W. Pogue is Professor of Engineering Sciences at the Thayer School of Engineering at Dartmouth College, as well as Director of the M.S. and Ph.D. Programs in engineering. He holds a Research Scientist appointment through the Wellman Center for Photomedicine at Massachusetts General Hospital, and has published over 130 peer-reviewed papers in the areas of biomedical optics, diffuse spectral tomography, breast cancer and photodynamic therapy of cancer. This research is funded through two program grants and several individual grants from the National Cancer Institute. He is Deputy Editor for the journal *Optics Letters* for OSA. He is also on the editorial boards of *Medical Physics,* the *Journal of Biomedical Optics,* and the *Journal of Photochemistry and Photobiology B,* and is a Program Chair for the upcoming European Conferences on Biomedical Optics, being held in June 2009 in Munich.

8:00 a.m.–10:00 a.m. FTuE • Optical Manipulation of Biosystems I

Karl Deisseroth; Stanford Univ., USA, Presider

FTuE1 • 8:00 a.m. Invited
Application of Femtosecond Laser Surgery for the Treatment of Glaucoma, *Tibor Juhasz[1,2], Dongyul Chai[1], Gautam Chaudhary[1,3], Hui Sun[1], Bin Rao[3,4], Zhongping Chen[2,3,4], Ron Kurtz[1], James Jester[1]; [1]Dept. of Ophthalmology, Univ. of California at Irvine, USA, [2]Dept. of Biomedical Engineering, Univ. of California at Irvine, USA, [3]Dept. of Electrical Engineering and Computer Science, Univ. of California at Irvine, USA, [4]Beckman Laser Inst., Univ. of California at Irvine, USA.* Femtosecond laser pulses can be used to create partial thickness scleral channels that drain aqueous humor into the sub-conjunctival space, showing potential for the treatment of glaucoma. Treatment techniques and *in vivo* results are discussed.

FTuE2 • 8:30 a.m. Invited
Nanoeffects in Cells and Tissues by Femtosecond and Nanosecond Laser Pulses, *Alfred Vogel[1], Norbert Linz[1], Sebastian Freidank[1], Joachim Noack[1], Gunther Paltauf[2]; [1]Inst. of Biomedical Optics, Univ. of Lübeck, Germany, [2]Physics Inst., Karl-Franzens-Univ. Graz, Austria.* Both femtosecond and nanosecond pulses can create low-density plasmas in transparent dielectrics suitable for nano-cell surgery and modification of glasses. The varation of mechanisms with pulse repetition rate and duration will be discussed.

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO		LS			META

8:00 a.m.–10:00 a.m. FTuF • Systems for Optical Manipulation I

Miles Padgett; Univ. of Glasgow, UK, Presider

FTuF1 • 8:00 a.m. Invited

Photonic Manipulations for Fighting Cancer, *S. Esener, I. Ortak, S. Zlatanovic, Y. T. Liu, D. Carson; Moses Cancer Ctr., Univ. of California at San Diego, USA.* Exploring light matter interactions provides means for analysis of biological samples and manipulation of cells. This paper focuses on the use of optical forces and light scattering for characterization of cellular and biomolecular properties related to cancer.

FTuF2 • 8:30 a.m. Invited

Optical MEMS Technology for Scalable Quantum Information Processor, *Jungsang Kim[1], Caleb W. Knoernschild[1], Changsoon Kim[1], Justin Migacz[1], Kyle S. McKay[1], Felix Lu[1,2]; [1]Duke Univ., USA, [2]Applied Quantum Technologies, Inc., USA.* We describe microsystems approach to realizing a scalable quantum information processor in trapped ions and atoms. A flexible, MEMS-based beam steering system is demonstrated that enables random access of qubits in a 2-D array.

8:00 a.m.–10:00 a.m. FTuG • Fiber Lasers and Amplifiers

Reza Salem; Cornell Univ., USA, Presider

FTuG1 • 8:00 a.m.

Spun Fiber Raman Amplifiers, *Sergey V. Sergeyev[1], Sergei Popov[2], Ari T. Friberg[2,3,4]; [1]Optics Res. Group, Waterford Inst. of Technology, Ireland, [2]Royal Inst. of Technology, Sweden, [3]Helsinki Univ. of Technology, Finland, [4]Univ. of Joensuu, Finland.* Simultaneous mitigation of polarization mode dispersion and polarization dependent gain in the long periodically spun fiber Raman amplifier has been demonstrated for the first time based on a fiber spin profile tailoring technique.

FTuG2 • 8:15 a.m.

Single-Frequency Hybrid Brillouin/Ytterbium Fiber Lasers, *Weihua Guan[1,2], John R. Marciante[1,2]; [1]Lab for Laser Energetics, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* A novel single-frequency, hybrid Brillouin/ytterbium fiber laser has been demonstrated in a ring cavity. The output power reaches 40 mW with an optical signal-to-noise ratio greater than 50 dB.

FTuG3 • 8:30 a.m.

Transient Suppression of Gain Controlled EDFAs for Optical Reconfigurable Optical Networks Applications, *Juliano R. F. Oliveira[1,2], Julio C. R. F Oliveira[1], Elnatan C. Ferreira[2]; [1]CPqD Foundation, Brazil, [2]School of Electrical and Computer Engineering, Univ. of Campinas, Brazil.* We demonstrate a generalized transient suppression scheme applied to gain controlled EDFAs allowing reduced overshoot/undershoot power transients (<1dB) to any input power even in a severe channel add/drop scenario.

8:00 a.m.–10:00 a.m. LTuA • Innovative Lasers and Spectroscopy

Rostislav Roussev; Corning Inc., USA, Presider

LTuA1 • 8:00 a.m. Invited

Alkali Vapor Lasers, *Randall Knize, Boris Zhdanov; Laser and Optics Res. Ctr., US Air Force Acad., USA.* In this paper we present a review of our main results and recent achievements in high power alkali laser development, and discuss some possible applications of these lasers.

LTuA2 • 8:30 a.m. Invited

Atomic Spectroscopy and Quantum Interference in On-Chip Hollow-Core Waveguides, *Holger Schmidt; Univ. of California at Santa Cruz, USA.* Miniaturized atomic vapor cells can be built on a semiconductor chip using hollow-core waveguide technology. We review the status of these integrated spectroscopy chips, including the observation of signatures of quantum interference on a chip.

8:00 a.m.–10:00 a.m. LTuB • Lasers in Fundamental Physics I

Dmitry Budker; Univ. of California at Berkeley, USA, Presider

LTuB1 • 8:00 a.m. Invited

A Modern Michelson-Morley Experiment Using Optical Resonators, *S. Herrmann, A. Senger, K. Möhle, N. Nagel, E. V. Kovalchuk, Achim Peters; Humboldt Univ., Germany.* Comparing the resonance frequencies of optical resonators continuously rotating on a precision turntable, our modern Michelson-Morley experiment tests Lorentz-Invariance at the $\Delta c/c = 10^{-18}$ level. A hundredfold improvement should be possible in the near future.

LTuB2 • 8:30 a.m. Invited

Measuring the Fine Structure Constant Using Multiphoton Atom Interferometry, *Holger Müller, Sheng-wey Chiow, Sven Herrmann, Steven Chu; Stanford Univ., USA.* 24-photon Bragg diffraction of matter waves by light pulses increases the splitting between the arms of Ramsey-Borde or Mach-Zehnder atom interferometers, leading to up to 144-fold sensitivity. Simultaneous conjugate interferometers reject noise.

8:00 a.m.–9:45 a.m. LTuC • Spectroscopy of Semiconducting Quantum-Confined Structures

Todd Krauss; Univ. of Rochester, USA, Presider

LTuC1 • 8:00 a.m. Invited

Multi-Exciton Generation by a Single Photon in Nanocrystals, *Alexander Efros; NRL, USA.* We present a theoretical model, which explains a very efficient multi-exciton generation by a single photon with energy greater than the two effective energy gap—the new physical phenomena observed recently in nanocrystals.

LTuC2 • 8:30 a.m. Invited

Electron Injection from Colloidal Lead-Salt Quantum Dots into Oxide Nanoparticles, *Frank Wise; Cornell Univ., USA.* PbS and PbSe nanocrystals are coupled to widegap oxide nanoparticles by molecular linkers. When appropriate-sized nanocrystals are photoexcited, electrons transfer efficiently to the oxide particles. Initial results from quantum-dot-sensitized solar cells will be presented.

8:00 a.m.–10:00 a.m. MTuA • Metamaterials I

Mathieu Kociak; Lab de Physique des Solides, Univ. Paris-Sud, France, Presider

MTuA1 • 8:00 a.m.

Demonstration of Chiral Negative-Index Metamaterials, *Yong-Shik Park[1], Shuang Zhang[1], Jensen Li[1], Xinchao Lu[2], Weili Zhang[2], Xiang Zhang[1]; [1]Univ. of California at Berkeley, USA, [2]Oklahoma State Univ., USA.* We present the first experimental demonstration of a chiral metamaterial exhibiting negative refractive index at the terahertz frequencies. The refractive indices were retrieved directly from the measured complex coefficients of transmission and reflectance.

MTuA2 • 8:15 a.m.

Optical Activity without Chirality: A New Way to Negative Index Metamaterials, *Eric Plum, Vassili A. Fedotov, Nikolay I. Zheludev; Optoelectronics Res. Ctr., Univ. of Southampton, UK.* We demonstrate a new class of metamaterials that show negative index behavior linked to exceptionally strong resonant optical activity but which are neither 2-D-chiral nor 3-D-chiral.

MTuA3 • 8:30 a.m.

Degenerate Infrared Magnetic Resonances from Geometrically Frustrated Metamaterials , *Chih-Wei Chang[1], Ming Liu[1], Sunghyun Nam[1], Guy Bartal[1], Xiang Zhang[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* Coupled split-ring resonators with structures similar to the frustrated spin systems are designed and fabricated. The geometrically frustrated metamaterial has two-fold degenerate magnetic resonances at infrared frequency.

STuA • NASA at 50: The Hubble and Imaging—Continued

FTuA • Photonic Integrated Devices in Optical Networking—Continued

Achievement from IEEE/LEOS, and is a Fellow of Bell Labs, OSA, and IEEE, and a member of the National Academy of Engineering.

FTuA2 • 8:45 a.m.
Efficient Dynamic Bandwidth Re-Allocation in Photonic Networks Using SOI-Based Microring Resonators, *Avinash K. Kodi[1], Ahmed Louri[2]; [1]Ohio Univ., USA, [2]Univ. of Arizona, USA.* We propose a non-blocking, low-power, micro-ring resonator-based row-column switching matrix that can achieve dynamic bandwidth re-allocation by re-allocating bandwidth from under-utilized links to over-utilized links with less than 0.4% increase in power dissipation.

FTuB • Photonic Bandgap Engineering I—Continued

FTuB3 • 8:45 a.m.
Enhanced Spontaneous Emission Observed for the Band Edge of One-Dimensional Photonic Crystals, *Keiji Kuroda, Tsutomu Sawada, Takashi Kuroda, Kenji Watanabe, Kazuaki Sakoda; Natl. Inst. for Materials Science, Japan.* We report band edge enhancement in one-dimensional photonic crystals. Enhancement of emissions from Ta_2O_5 and SiO_2, which build a periodic structure inside the photonic crystal, is observed at the band edge.

FTuC • Quantum Information Processing—Continued

FTuC3 • 8:45 a.m.
Mapping Photonic Entanglement into and out of a Quantum Memory, *Kyung Soo Choi[1], Hui Deng[1], Julien Laurat[1,2], Scott B. Papp[1], H. Jeff Kimble[1]; [1]Caltech, USA, [2]Lab Kastler Brossel, Univ. Paris 6, Ecole Normale Superieure et CNRS, France.* We demonstrate reversible mapping of photonic entanglement into and out of two atomic memories. We achieve input-output transfer efficiency of entanglement approaching 20%. Our protocol helps to enable "push-button" capabilities for entanglement in quantum networks.

FTuD • Imaging of Mice and Men I—Continued

FTuD2 • 8:45 a.m. Invited
Diffuse Optical Monitoring of Cerebral Oxygen Metabolism at the Bedside in Cerebrovascular Disorders, *Turgut Durduran, Meeri N. Kim, Erin M. Buckey, Chao Zhou, Guoqiang Yu, Regine Choe, Joel H. Greenberg, John A. Detre, Arjun G. Yodh; Univ. of Pennsylvania, USA.* The development and validation of hybrid near-infrared spectroscopy and diffuse correlation/wave spectroscopy for non-invasive measurement of cerebral blood oxygenation, blood flow and metabolism at bedside in cerebrovascular disorders is described in adult and pediatric populations.

FTuE • Optical Manipulation of Biosystems I—Continued

Tuesday, October 21

STuA2 • 9:00 a.m. Invited
Wavefront Sensing for Hubble Recovery, *James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Image-based phase retrieval techniques for determining the prescription of the Hubble Space Telescope are reviewed.

FTuA3 • 9:00 a.m. Invited
A Technological Platform for 10Gb/s-100 Gb/s Photonic Sources, *Christophe Kazmierski; Alcatel-Thales III-V Lab, France.* Single active layer, selective area growth, AlGaInAs quantum wells and semi-insulating buried-heterostructure technologies are assembled in a platform open to evolve in integration complexity. Examples of access and core network sources emphasize the platform versatility.

FTuB4 • 9:00 a.m.
Thermal Radiation in Microstructured Photonic Reservoirs, *Marian Florescu[1], Kurt Busch[2], Jonathan P. Dowling[3]; [1]Dept. of Physics, Princeton Univ., USA, [2]Inst. für Theoretische Festkörperphysik, Univ. Karlsruhe, Germany, [3]Dept. of Physics and Astronomy, Louisiana State Univ., USA.* We investigate the thermal radiation in photonic micro-structures and show that the relevant quantity to describe the radiation characteristics is the area of the iso-frequency surfaces and not the photonic density of states.

FTuC4 • 9:00 a.m.
Dynamical Quantum Memories, *Qiongyi He[1], Jean Cviklinski[2], Peter Drummond[1], Elisabeth Giacobino[2], Margaret D. Reid[1]; [1]Univ. of Queensland, Australia, [2]Univ. Pierre et Marie Curie, France.* To overcome storage-time difficulties in experiments, we propose a dynamical approach. We show that there is a critical coupling between atoms and cavity that allows both high fidelity and long storage times.

FTuE3 • 9:00 a.m.
Femtosecond Laser-Driven Photodisruption to Induce Single Venule Occlusions in Rodent Brain, *John Nguyen[1], Nozomi Nishimura[1], Costantino Iadecola[2], Chris B. Schaffer[1]; [1]Cornell Univ., USA, [2]Weill Cornell Medical College, USA.* High-energy femtosecond laser pulses are used to occlude single cortical venules in live, anesthetized rats. Two-photon excited fluorescence imaging of blood flow shows significant reduction in blood flow four branches upstream of the clot.

FTuB5 • 9:15 a.m.
Efficient Light Coupling into Slow Photonic Crystal Modes Mediated by Evanescent Modes, *Carel M. de Sterke[1], Tom P. White[2], Lindsay C. Botten[3], Kokou B. Dossou[3], Ross C. McPhedran[1]; [1]Univ. of Sydney, Australia, [2]Univ. of St. Andrews, UK, [3]Univ. of Technology Sydney, Australia.* We show that light can be very efficiently coupled into slow photonic crystal modes mediated by evanescent modes and without a transition region. Though evanescent modes don't carry energy, they affect the interface boundary conditions.

FTuC5 • 9:15 a.m.
Controlled Rotation (C-ROT) Gate in a Single Self-Assembled Quantum Dot, *Stephen J. Boyle[1], Andrew J. Ramsay[1], A. Mark Fox[1], Maurice S. Skolnick[1], Hiu Yun Liu[2], Mark Hopkinson[2]; [1]Dept. of Physics and Astronomy, Univ. of Sheffield, UK, [2]EPSRC Natl. Ctr. for III-V Technologies, Univ. of Sheffield, UK.* We demonstrate conditional Rabi rotations on the exciton-biexciton transition in a single self-assembled InGaAs/GaAs quantum dot using picosecond optical excitation and photocurrent readout. This is an implementation of the two-qubit C-ROT quantum logic gate.

FTuD3 • 9:15 a.m.
Optical Intraoperative Measurement of Function in the Human Brain, *Paul R. Hoy[1], Harvey N. Rutt[1], William P. Gray[2], Diederik O. Bulters[3]; [1]Optoelectronic Res. Ctr., Univ. of Southampton, UK, [2]School of Medicine, Univ. of Southampton, UK, [3]Southampton General Hospital, UK.* This paper details the development and results of a camera system that is sensitive to blood oxygen level for intraoperative delineation of function in the human brain. Results indicate good correlation with current mapping techniques.

FTuE4 • 9:15 a.m.
Femtosecond Laser-Induced Microvascular Clots Trigger Alzheimer's Disease Pathology, *Nozomi Nishimura[1], Joan Zhou[1], Costantino Iadecola[2], Chris B. Schaffer[1]; [1]Cornell Univ., USA, [2]Weill Cornell Medical College, USA.* We use femtosecond-laser ablation to lesion cortical microvessels in transgenic mouse models of Alzheimer's Disease. Aβ plaques and blood flow were imaged *in vivo* with 2-photon microscopy. Aβ accumulated after lesions which stalled blood flow.

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO		LS			META
FTuF • Systems for Optical Manipulation I—Continued	**FTuG • Fiber Lasers and Amplifiers—Continued**	**LTuA • Innovative Lasers and Spectroscopy—Continued**	**LTuB • Lasers in Fundamental Physics I—Continued**	**LTuC • Spectroscopy of Semiconducting Quantum-Confined Structures—Continued**	**MTuA • Metamaterials I—Continued**
	FTuG4 • 8:45 a.m. **Elimination of Self-Pulsations in Dual-Clad Ytterbium-Doped Fiber Lasers,** *Weihua Guan[1,2], John R. Marciante[1,2]; [1]Lab for Laser Energetics, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* High-power fiber lasers exhibit self-pulsations in some regimes of operation. The complete elimination of all self-pulsations is demonstrated by the addition of a long section of passive fiber in the laser cavity.				**MTuA4 • 8:45 a.m.** **Toy Model for Metamaterials Incorporating Gain,** *Martin Wegener[1], Juan Luis García Pomar[1], Nina Meinzer[2], Matthias Ruther[2], Stefan Linden[2]; [1]Inst. für Angewandte Physik and DFG-Ctr. for Functional Nanostructures (CFN), Germany, [2]Inst. für Nanotechnologie, Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, Germany.* We introduce and solve a simple model that can describe plasmonic resonances coupled to two-level-system gain via evanescent (local) fields. Analytic solutions reveal avoided crossings, Fano resonances, and steady-state gain pinning of the "lasing spaser."
FTuF3 • 9:00 a.m. **Cryogenic Optomechanics with Microtoroids,** *Olivier Arcizet, Rémi Rivière, Albert Schliesser, Georg Anetsberger, Tobias J. Kippenberg; Max Planck Inst. for Quantum Optics, Germany.* We expose low temperature optomechanical properties of toroidal silica microcavities and report on low phonon occupation number achieved when combining standard cryogenic operation and optical cooling.	**FTuG5 • 9:00 a.m.** **High-Power Yb-Doped Solid-Core Photonic Bandgap Fiber Amplifier at 1150-1200nm,** *Hiroki Maruyama[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Christina B. Olausson[2], Jens K. Lyngsø[2], Brian Mangan[2], Jes Broeng[2]; [1]Inst. for Laser Science, Univ. of Electro-Communications, Japan, [2]Crystal Fibre A/S, Denmark.* Solid-core photonic-bandgap fiber amplification at the long-wavelength edge of ytterbium band is reported. A 32W output at 1156nm with a 66% slope efficiency and 9.1W output at 1178nm were succesfully obtained.	**LTuA3 • 9:00 a.m.** **An Efficient $KTiOAsO_4$ Raman Laser,** *Qingpu Wang, Xingyu Zhang, Zhaojun Liu, Zejin Liu, Jun Chang, Hao Wang, Shuzhen Fan, Shutao Li, Guofan Jin, Xutang Tao, Shaojun Zhang, Huaijin Zhang; Shandong Univ., China.* An efficient nanosecond $KTiOAsO_4$ (KTA) Raman laser is realized within a diode-end-pumped acousto-optically (AO) Q-switched Nd:YAG laser. A first-Stokes (1091.4 nm) power of 1.38 W is obtained, corresponding to a diode-to-Stokes conversion efficiency of 17%.	**LTuB3 • 9:00 a.m.** **A Zero-Area Sagnac Ring Laser Gravitational Wave Detector with Fast-Light Enhanced Strain Sensitivity,** *Selim M. Shahriar, Mary Salit; Northwestern Univ., USA.* We show that a zero-area Sagnac ring laser based gravitational wave (GW) detector, when augmented by a medium with anomalous dispersion corresponding to superluminal group velocity, becomes hyper-sensitive to GW-induced strain	**LTuC3 • 9:00 a.m.** **Universal Optical Gain in Strongly Confined Semiconductor Quantum Dots,** *Patanjali Kambhampati, Ryan R. Cooney, Samuel L. Sewall, D. M. Sagar; McGill Univ., Canada.* Using state-selective excitation to tailor multi-exciton interactions, we have demonstrated that optical gain in strongly confined semiconductor quantum dots is a completely universal, size independent, and intrinsic property of these materials.	**MTuA5 • 9:00 a.m.** **Magnetic Resonance in Near Infrared Region of Gold Nanoparticle Cluster Metamaterial,** *Jin Hyoung Lee, Qi Wu, Wounjhang Park; Univ. of Colorado at Boulder, USA.* We present a new nano-cluster-based metamaterial fabricated by template-directed self-assembly. Gold nanoparticles were self-assembled on template to form clusters. Experimental results were in good agreement with theoretical prediction of magnetic resonance in near infrared region.
FTuF4 • 9:15 a.m. **Vectorial Theory of Holographic Optical Trapping,** *Bo Sun, Yohai Roichman, David G. Grier; New York Univ., USA.* We combine Debye-Wolf diffraction integral formalism with Lorenz-Mie scattering theory to compute the electromagnetic fields projected by holographic optical trapping systems, and also the forces and torques they exert on illuminated objects.	**FTuG6 • 9:15 a.m.** **Stable Dual Wavelength Mode-Locked Erbium-Doped Fiber Ring Laser,** *Zhe Chen, Shaozhen Ma, Niloy K. Dutta; Univ. of Connecticut, USA.* We demonstrate a stable dual-wavelength actively mode-locked erbium-doped fiber laser operating at 20 GHz. The pulses have been stabilized using a phase locked loop. Dual wavelength pulse trains with pulse widths ~ 3ps are obtained.	**LTuA4 • 9:15 a.m.** **Spectroscopic Study of Optical Centers Formed in Bi, Pb, Sb, Sn, Te and In-Doped Germanate Glasses,** *Mikhail Y. Sharonov, Alexei B. Bykov, Vladimir Petricevic, Robert R. Alfano; Inst. for Ultrafast Spectroscopy and Lasers, Dept. of Physics, City College and Graduate School of the City Univ. of New York, USA.* We have shown that broadband near infrared fluorescence recently discovered in Bi-doped glasses is not specific to solely Bi-ions. Glasses doped with different 6p (Bi, Pb) and 5p (Sn, Sb) ions exhibit very similar behavior.	**LTuB4 • 9:15 a.m.** **Ion Interferometers and Massive Photons,** *Dallin S. Durfee, Brian Neyenhuis, Dan Christensen, Christopher Erickson; Brigham Young Univ., USA.* We will report on an ion interferometer which is under construction. One application of this device is the test of Coulomb's law and the search for a possible photon rest mass.	**LTuC4 • 9:15 a.m.** **State-Resolved Studies of Exciton-Phonon Couplings in Quantum Dots,** *Patanjali Kambhampati, D. M. Sagar, Ryan R. Cooney, Samuel L. Sewall; McGill Univ., Canada.* Coherent optical and acoustic phonons are simultaneously observed in CdSe quantum dots with excitonic state-specificity for the first time. These experiments yield the size and eigenstate dependent coupling strengths for both modes.	**MTuA6 • 9:15 a.m.** Invited **Nonlinear Optics of Metamaterials,** *David A. Powell, Ilya V. Shadrivov, Yuri S. Kivshar; Australian Natl. Univ., Australia.* We review our recent theoretical and experimental results in different types of microwave metamaterials and backward-wave structures, including nonlinear transmission lines, two-dimensional cut-wire structures, and nonlinear split-ring resonator metamaterials.

STuA • NASA at 50: The Hubble and Imaging—Continued

STuA3 • 9:30 a.m. Invited

The Achievements of the Hubble Space Telescope, *David S. Leckrone; NASA Goddard Space Flight Ctr., USA.* The Hubble Space Telescope has revolutionized astronomy, pioneered the advancement of human and robotic spaceflight and become a public icon. This review will broadly survey over 18 years of achievements by this remarkable facility.

FTuA • Photonic Integrated Devices in Optical Networking—Continued

FTuA4 • 9:30 a.m. Invited

Photonic Integrated Circuit Enabled Bandwidth Virtualization, *Mehrdad Ziari, Chuck Joyner, Serge Melle, Chris Liou, Radha Nagarajan, Ted Sprage, Ting-Kuang Chang, Drew Perkins, Fred Kish, David F. Welch; Infinera, USA.* Large scale photonic integrated circuits enable a digital optical networking architecture with an unconstrained programmable reconfigurability and virtualization of bandwidth for end-to-end service provisioning at super- and sub-wavelength data rates over a common WDM network.

FTuB • Photonic Bandgap Engineering I—Continued

FTuB6 • 9:30 a.m. Invited

Slow Wave Resonance in Photonic Crystals, *Alexander Figotin, Ilya Vitebskiy; Univ. of California at Irvine, USA.* Light incident on periodic structure can be converted into frozen mode with drastically enhanced amplitude and vanishing group velocity. In bounded photonic crystals, the frozen mode can give rise to a giant slow wave resonance.

FTuC • Quantum Information Processing—Continued

FTuC6 • 9:30 a.m.

Not all $(SWAP)^{1/m}$ Gates are Perfect Entanglers, *Subramanian Balakrishnan, Ramasubramanian Sankaranarayanan; Natl. Inst. of Technology, India.* In $(SWAP)^{1/m}$ gates, we proved that the only gates correspond to m=2, 3 require lesser number of gates to achieve the entangling power of CNOT and $(SWAP)^{1/2}$ is the only perfect entangler.

FTuC7 • 9:45 a.m.

Quantum Computing with Zero Entanglement, *B. P. Lanyon[2], M. Barbieri[2], M. P. Almeida[2], A. G. White[2], M. E. Goggin[1,2]; [1]Truman State Univ., USA, [2]Univ. of Queensland, Australia.* We experimentally implement a deterministic quantum computation algorithm and explicitly characterize the non-classical correlations generated. Although there is no entanglement the algorithm produces other non-classical correlations. We also discuss the application to quantum chemistry.

FTuD • Imaging of Mice and Men I—Continued

FTuD4 • 9:30 a.m.

A Model-Based Non-Iterative Reconstruction Approach for Optical Tomography, *Guangzhi Cao, Vaibhav Gaind, Charles A. Bouman, Kevin J. Webb; Purdue Univ., USA.* A model-based non-iterative reconstruction approach is developed for optical tomography through a sparse representation for the inverse matrix. Source coding theory is used to efficiently restore the inverse matrix, thereby substantially improving computation speed.

FTuD5 • 9:45 a.m.

Fluorescence Resonance Energy Transfer Imaging in Scattering Media Using Optical Diffusion Tomography, *Vaibhav Gaind, Guangzhi Cao, Kevin J. Webb, Charles A. Bouman; Purdue Univ., USA.* Simulation results for intramolecular fluorescence resonance energy transfer (FRET) imaging in a scattering medium are presented. The donor-acceptor distance for rigid and distance distributions for flexible linkers are reconstructed.

FTuE • Optical Manipulation of Biosystems I—Continued

FTuE5 • 9:30 a.m. Invited

Ultra-Short Laser Pulses as a Tool to Measure as well as Perturb Neurovascular Activity in the Rodent Brain, *Philbert S. Tsai, Pablo Blinder, Benjamin Migliori, David Kleinfeld; Univ. of California at San Diego, USA.* We summarize the use of ultra-short laser pulses to probe the structure and function of neuronal vasodynamics through two-photon laser scanning microscopy of fluorescently labeled blood serum and tissue in conjuction with plasma-mediated laser ablation.

Tuesday, October 21

9:30 a.m.–12:00 p.m. Student Event: Building Your Future in Optics, *Grand Ballroom C, Hyatt Regency Rochester*

10:00 a.m.–10:30 a.m. Coffee Break, *Empire Hall, Rochester Riverside Convention Center*

10:00 a.m.–4:00 p.m. Exhibit Open, *Empire Hall, Rochester Riverside Convention Center*

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO		LS			META

FTuF • Systems for Optical Manipulation I—Continued

FTuF5 • 9:30 a.m.
Concentric Optical-Vortex Traps Generated by Reducing Sidelobes of Optical Vortices, *Jiao Lin[1], Xiao-Cong Yuan[2], [1]Nanyang Technological Univ., Singapore, [2]Nankai Univ., China.* A full-aperture design of phase mask is proposed and implemented to produce concentric optical-vortex traps. The radius of the focused optical vortex can be controlled by the radial modulation of the phase mask.

FTuF6 • 9:45 a.m.
Extended Study on Photoanisotropic Polarization Gratings beyond the Small Angle Approximation, *Man Xu[1], H. Paul Urbach[1], Chris M. van Heesch[2], Dick K. G. de Boer[2]; [1]Delft Univ. of Technology, Netherlands, [2]Philips Res. Lab, Netherlands.* Polarization gratings can be achieved by polarization holographic recording on photoanisotropic materials. We compute the position dependent permittivity tensor induced by the interference of two arbitrary plane waves. Diffraction is studied with rigorous diffraction theory.

FTuG • Fiber Lasers and Amplifiers—Continued

FTuG7 • 9:30 a.m.
***In situ* Thermal/Brillouin Characterization of a High-Power Fiber Laser Based on Brillouin Optical Time Domain Analysis,** *C. Jauregui[1,2], D. J. Richardson[2], J. Nilsson[2], Y. Jeong[2]; [1]Inst. of Applied Physics, Friedrich-Schiller Univ., Germany, [2]Optoelectronics Res. Ctr., Univ. of Southampton, UK.* We demonstrate an *in situ* thermal/Brillouin characterization of an ytterbium-doped fiber laser operating at 1.09 μm using a Brillouin optical time domain analysis technique, where we utilize 1.55-μm wavelength light as Brillouin pump and probe beams.

FTuG8 • 9:45 a.m.
Characterization of Er^{3+}-Doped Tellurite Fiber Samples for Broadband Amplification at 1550 nm, *Reginaldo Silva[1], Enver F. Chillcce[2], Carlos L. César[2], Luiz C. Barbosa[2], Aldário C. Bordonalli[1]; [1]School of Electrical and Computer Engineering, Univ. of Campinas, Brazil, [2]Gleb Wataghin Physics Inst., Univ. of Campinas, Brazil.* A spectral characterization of standard and microstructured Er^{3+}-doped tellurite fibers pumped at 980 nm is presented. The samples offered bandwidth up to 95 nm around 1550 nm and potential amplification up to 15 dB.

LTuA • Innovative Lasers and Spectroscopy—Continued

LTuA5 • 9:30 a.m.
Highly-Efficient Diode-Pumped Q-Switched Intracavity KTP Frequency-Doubled Nd:YAG/$SrWO_4$ Raman Laser, *Xingyu Zhang, Qingpu Wang, Shutao Li, Jun Chang, Zhenhua Cong, Zhaojun Liu, Shuzhen Fan, Xiaohan Chen, Haifeng Qi; School of Information Science and Engineering, Shandong Univ., China.* A diode-pumped intracavity frequency-doubled Raman laser generates 1.4 W 590 nm laser output at an incident pump power of 12.6 W. The conversion efficiency of 11.1% is the highest in intracavity frequency-doubled Raman lasers.

LTuA6 • 9:45 a.m.
Continuous Tunable Laser Operation in Both 1.31 μm and 1.55 μm Telecommunication Windows in LiIn(Si/Ge)O_4 Olivines Doped with Trivalent Chromium, *Mikhail Y. Sharonov, Alexei B. Bykov, Vladimir Petricevic, Robert R. Alfano; Inst. for Ultrafast Spectroscopy and Lasers, Dept. of Physics, City College and Graduate School of the City Univ. of New York, USA.* Tunable laser operation was achieved for both 1.33 μm and 1.55 μm telecommunication windows from a single optical center (trivalent chromium). The range is 1160-1620 nm for $LiInSiO_4$ and 1150-1600 nm for $LiInGeO_4$ crystals.

LTuB • Lasers in Fundamental Physics I—Continued

LTuB5 • 9:30 a.m.
Laser-Based Beam Profile Diagnostics in the Spallation Neutron Source (SNS) Superconducting Linear Accelerator, *Yun Liu, Cary Long, Warren Grice, Willem Blokland, Saeed Assadi; Oak Ridge Natl. Lab, USA.* A laser-based diagnostics system is implemented in the SNS superconducting accelerator. The system measures the H^- beam profiles at 9 different energy levels (200 MeV - 1 GeV) using a single laser.

LTuB6 • 9:45 a.m.
A Universal Detection Scheme for Sub-Shot-Noise Interferometry, *Yang Gao, Hwang Lee; Louisiana State Univ., USA.* We show that the parity measurement can be used as a universal detection scheme for the sub-shot-noise limit interferometry. The efforts to produce the desired input states can then be much reduced accordingly.

LTuC • Spectroscopy of Semiconducting Quantum-Confined Structures—Continued

LTuC5 • 9:30 a.m.
Observation of Coarse and Fine Structure of Biexcitons in Strongly Confined Quantum Dots, *Patanjali Kambhampati, Samuel L. Sewall, Ryan R. Cooney, D. M. Sagar; McGill Univ., Canada.* We show that biexcitons in quantum dots posses a coarse and fine structure. The intrinsic fine structure of biexcitons has not been previously observed in any system and is the controlling parameter for optical gain.

MTuA • Metamaterials I—Continued

MTuA7 • 9:45 a.m.
Surface Plasmons and Casimir Forces Between Metamaterials, *Francesco Intravaia, Carsten Henkel; Univ. Potsdam, Germany.* The Casimir force is significantly modified for mirrors made from metamaterials. It becomes much smaller in magnitude and may reverse its sign. We link this behavior to the surface modes of the metamaterial (plasmon polaritons).

9:30 a.m.–12:00 p.m. Student Event: Building Your Future in Optics, *Grand Ballroom C, Hyatt Regency Rochester*

10:00 a.m.–10:30 a.m. Coffee Break, *Empire Hall, Rochester Riverside Convention Center*

10:00 a.m.–4:00 p.m. Exhibit Open, *Empire Hall, Rochester Riverside Convention Center*

Lilac Ballroom North	Highland A	Highland B	Highland C	Highland D	Highland E
FiO					

10:30 a.m.–12:00 p.m.
STuB • NASA at 50: Future Telescopes

Bruce Dean; NASA Goddard Space Flight Ctr., USA, Presider

STuB1 • 10:30 a.m. Invited

Large Space Optics: From Hubble to JWST and Beyond, *H. Philip Stahl; NASA Marshall Space Flight Ctr., USA.* Evolution of large space optics from medium weight monolithic egg-crate mirrors for Hubble to lightweight segmented mirrors for JWST to future architectures ranging from ultra-lightweight membrane mirrors to massive mirrors launched via planned Ares V.

STuB2 • 11:00 a.m. Invited

Sparse Aperture Space Telescopes, Interferometry and Astrometry, *Michael Shao; JPL, USA.* I describe SIM-lite, designed to detect the wobble of a star caused by an orbiting Earth-sized planet in the habitable zone, and DAVINCI, a dilute-aperture-coronagraph designed to detect reflected sunlight and spectra from an exo-Earth.

10:30 a.m.–11:45 a.m.
FTuH • Novel Modulation Formats

Xiang Liu; Bell Labs, Alcatel-Lucent, USA, Presider

FTuH1 • 10:30 a.m. Invited

Design Tradeoffs in Optical OFDM Transmission Systems, *Itsuro Morita, Sander Jansen, Hideaki Tanaka; KDDI R&D Labs, Japan.* Optical orthogonal frequency division multiplexing for long-haul optical transmission systems is reviewed. We discuss some important aspects of the systems and present a demonstration of long-haul transmission at 122 Gb/s without dispersion compensation.

FTuH2 • 11:00 a.m.

Nonlinear Phase Noise in DPSK Systems: BER Calculation, *Arash Mafi, Sergey Lobanov, Srikanth Raghavan; Corning Inc., USA.* We evaluate the impact of nonlinear phase noise on the performance of DPSK modulated systems, using a novel generalization of the Eigenfunction Expansion Method.

10:30 a.m.–12:00 p.m.
FTuI • Fundamental Nonlinear Optics

Sean J. Bentley; Adelphi Univ., USA, Presider

FTuI1 • 10:30 a.m.

Hanbury-Brown and Twiss Interferometry with Interacting Photons, *Yaron Bromberg, Yoav Lahini, Yaron Silberberg; Weizmann Inst. of Science, Israel.* We experimentally study the effect of interactions between photons on Hanbury-Brown and Twiss interferometry. We measure intensity correlations of light propagating in a nonlinear medium, and discuss the effect of attractive and repulsive interactions.

FTuI2 • 10:45 a.m.

Comparison of *Ab Initio* Laser Theory with Exact Simulation, *Robert J. Tandy, Li Ge, Alfred D. Stone; Yale Univ., USA.* A recent *ab initio* laser theory is compared to exact numerical simulation of the Maxwell-Bloch equations. Results are in excellent agreement for the 1-D slab geometry of an edge-emitting laser.

FTuI3 • 11:00 a.m.

Generation of Higher Order Gauss-Laguerre Modes in Single-Pass Second Harmonic Generation, *Preben Buchhave, Peter Tidemand-Lichtenberg, Christian Pedersen; Technical Univ. of Denmark, Denmark.* We present a realistic method for dynamic simulation of interactions in a nonlinear crystal. The deformation of the wave fronts due to the nonlinear interaction is expressed by expansion in higher order Gauss-Laguerre modes.

10:30 a.m.–12:00 p.m.
FTuJ • Beam Combining I

Johan Nilsson; Univ. of Southampton, UK, Presider

FTuJ1 • 10:30 a.m. Tutorial

Beam Combining of Fiber Lasers, *Tso Yee Fan; MIT Lincoln Lab, USA.* Significant progress has been made using wavelength and coherent beam combining, leading to combining of laser arrays with diffraction-limited output. This tutorial provides an overview of fiber beam combining and the trades among various techniques.

Tso Yee Fan is the Associate Leader of the Laser Technology and Applications Group at MIT Lincoln Laboratory, Lexington, MA. He has contributed broadly in solid-state laser and nonlinear optics technology. He is widely recognized for his pioneering work in diode-pumped solid-state lasers, in the development of Yb:YAG lasers, in characterization of laser and nonlinear optical materials, and for advances in laser beam combining. Dr. Fan is a Fellow of the Optical Society. He served as an Elected Member of the IEEE/LEOS Board of Governors from 1994-1996 and was the Topical Editor, Lasers for *Optics Letters* from 1994-1999. He served as Division Editor for the Lasers, Photonics, and Environmental Optics Division of *Applied Optics*. Dr. Fan received S.B. degrees in electrical engineering and materials science and engineering from Massachusetts Institute of Technology and M.S. and Ph.D. degrees in electrical engineering from Stanford University.

10:30 a.m.–12:00 p.m.
FTuK • Light Propagation Models for Therapy and Diagnosis

Yen-Yen Lin; Natl. TsingHua Univ., Taiwan, ,Presider

FTuK1 • 10:30 a.m.

Understanding Light Propagation in Bone for Photodynamic Therapy of Osteosarcoma, *Vincent M. Rossi[1,2], Scott B. Gustafson[3], Steven L. Jacques[2]; [1]Dept. of Physics, Oregon State Univ., USA, [2]Biomedical Engineering Dept., Oregon Health and Science Univ., USA, [3]VCA Raleigh Hills Animal Hospital, USA.* Reflectance spectroscopy is used to characterize light propagation in bone. Results are applied to a cylindrically symmetric Monte Carlo model, guiding light delivery within bone to treat osteosarcoma with photodynamic therapy in small animal clinics.

FTuK2 • 10:45 a.m.

Monte Carlo Simulations of Raman Scattering from Bone within a Multi-Layered Tissue Model, *Robert H. Wilson, Michael D. Morris, Mary-Ann Mycek; Univ. of Michigan, USA.* A Monte Carlo model of photon transport in layered biological tissue predicted the detected Raman signal from an underlying bone layer. Simulations quantified the effect of each tissue layer's optical properties on the detected signal.

FTuK3 • 11:00 a.m.

Semi-Analytical Method for Rapid Simulation of Time-Resolved Reflectance in Layered Epithelial Tissues, *Robert H. Wilson, Karthik Vishwanath, Mary-Ann Mycek; Univ. of Michigan, USA.* A novel, real-time, semi-analytical technique (PI-scaling) utilized a combination of absorption scaling and path integrals (PI) to create a weighting formula for rapid construction of libraries of time-resolved reflectance curves from bi-layered epithelial tissue models.

10:30 a.m.–12:00 p.m.
FTuL • Optical Manipulation of Biosystems II

Chris Schaffer; Cornell Univ., USA, Presider

FTuL1 • 10:30 a.m. Invited

Novel Methods for Cellular Transfection with Femtosecond Laser Pulses, *Kishan Dholakia, Xanthi Tsampoula, Dave Stevenson, C. T. Brown, Frank J. Gunn-Moore; Univ. of St. Andrews, UK.* This talk will explore the use of novel light modes and fiber geometries for cell transfection. Using "non-diffracting" Bessel beams and such fiber delivery we can broaden the applicability of this method for biologists.

FTuL2 • 11:00 a.m.

Ablation of the Mauthner Cell Lateral Dendrite Using Femtosecond Laser Pulses, *Jennifer Shum, Nozomi Nishimura, Joseph R. Fetcho, Chris B. Schaffer; Cornell Univ., USA.* Femtosecond laser ablation is used to cut the lateral dendrite of the Mauthner cell in the zebrafish hindbrain to study how sensory inputs are integrated by the cell to produce the fast start escape behavior.

Highland F

FiO

10:30 a.m.–12:00 p.m.
FTuM • Systems for Optical Manipulation II
Jungsang Kim; Duke Univ., USA, Presider

FTuM1 • 10:30 a.m. Invited
Tiny Hands for Light Work: A Fingertip Interface for Holographic Optical Tweezers, *Miles Padgett, Graham Gibson, Stephen Keen, Jonathan Leach; Univ. of Glasgow, UK.* We use a fingertip interface to control multi-trap holographic tweezers to manipulate inert and biological structures. We incorporate high-speed video imaging to make multi-point measurements of particle position, fluid flow, forces and viscosity.

FTuM2 • 11:00 a.m.
Observations of Accelerating Parabolic Beams, *Jeffrey A. Davis[1], Mark J. Mitry[1], Miguel A. Bandres[2]; [1]San Diego State Univ., USA, [2]Caltech, USA.* We report the first experimental observations of accelerating diffraction-free parabolic beams. They are similar to Airy beams because they also show a quadratic transverse shift during propagation. Experimental results agree with theory.

Highland G

FiO

10:30 a.m.–12:00 p.m.
FTuN • Quantum Dot Semiconductor Optical Amplifiers
Christophe Kazmierski; Alcatel-Thales III-V Lab, France, Presider

FTuN1 • 10:30 a.m. Invited
Semiconductor Optical Amplifiers with Nanostructured Gain Material, *Johann Peter Reithmaier[1], Gadi Eisenstein[2]; [1]Technische Physik Univ. Kassel, Germany, [2]Technion - Israel Inst. of Technology, Israel.* We describe state-of-the-art semiconductor optical amplifiers based on nanostructured gain media. We highlight the broad bandwidth and the complex cross saturation dynamics which enable multi-wavelength amplification and signal processing.

FTuN2 • 11:00 a.m.
Optical Logic Using Quantum Dot Semiconductor Optical Amplifier, *Shaozhen Ma, Hongzhi Sun, Zhe Chen, Niloy K. Dutta; Univ. of Connecticut, USA.* The performance of optical logic such as XOR is analyzed by solving rate equations of quantum dot SOA. Results show SOA with quantum dots active region can greatly increase the operation frequency limiting regular SOAs.

Highland H

FiO

10:30 a.m.–12:00 p.m.
FTuO • HHG and Attosecond Pulses I
Mette B. Gaarde; Louisiana State Univ., USA, Presider

FTuO1 • 10:30 a.m. Tutorial
From Attoseconds to Controlled Dynamics: Recent Advances in XUV Sources, *Mauro Nisoli; Politecnico di Milano, Italy.* We will review recent experimental progress in the generation, characterization and application of XUV pulses, produced by high-order harmonic generation in gases, with duration down to the attosecond time scale.

From 1991 to 2000 Mauro Nisoli was a research scientist with the Center of Quantum Electronic and Electronic Instrumentation of the Italian National Research Council. Since 2001 he has been an associate Professor at Politecnico di Milano (Italy). His current research interests include: ultrashort-pulse laser technology; attosecond physics: generation and application of isolated attosecond pulses; production of coherent XUV radiation by high-order harmonic generation in gases; control and real-time observation of electronic motion in atoms and molecules. He is co-author of 130 research papers in international journals.

Highland J

LS

10:30 a.m.–12:00 p.m.
LTuD • Lasers in Fundamental Physics II
Dallin S. Durfee; Brigham Young Univ., USA, Presider

LTuD1 • 10:30 a.m. Invited
New Results from the Fundamental-Physics Tests at Berkeley: Atomic Parity Violation, Searches for Variation of α and a Bose-Einstein-Statistics Violation by Photons, *Dmitry Budker[1,2]; [1]Univ. of California at Berkeley, USA, [2]Nuclear Science Div., Lawrence Berkeley Natl. Lab, USA.* The status of experiments on parity violation in atomic ytterbium, variation of alpha with radio-frequency transitions in dysprosium, and testing Bose-Einstein-statistics for photons will be presented.

LTuD2 • 11:00 a.m. Invited
An Electron Electric Dipole Moment with Atoms in Optical Lattices, *Neal Meyer, Kunyan Zhu, Fang Fang, David Weiss; Penn State Univ., USA.* We will describe a search for the electron electric dipole moment using laser cooled Cs and Rb atoms trapped in two parallel 1-D optical lattices.

Highland K

LS

10:30 a.m.–11:45 a.m.
LTuE • Spectroscopy in Single Semiconducting Nanoparticles
Frank Wise; Cornell Univ., USA, Presider

LTuE1 • 10:30 a.m. Invited
Continuous Fluorescence from Single Colloidal Semiconductor Nanocystals, *Xiaoyong Wang[1], Megan Hahn[1], Todd Krauss[1], Keith Kahen[2], Xiaofan Ren[2], Manju Rajeswaran[2], Alexander L. Efros[3]; [1]Univ. of Rochester, USA, [2]Eastman Kodak Co., USA, [3]NRL, USA.* We have synthesized CdZnSe/ZnSe nanocrystals that on the single molecule level exhibit complete suppression of fluorescence blinking, extremely short radiative lifetimes, and multiple emission peaks. Possible mechanisms for these unique optical properties will be discussed.

LTuE2 • 11:00 a.m. Invited
Exciton Dynamics in (6,5) Carbon Nanotubes, *Anna Swan[1], A. G. Walsh[1], J. Schneck[1], A. A. Green[2], M. C. Hersam[2], L. D. Ziegler[1]; [1]Boston Univ., USA, [2]Northwestern Univ., USA.* Relaxation dynamics in carbon nanotubes, measured by transient absorption spectroscopy, are shown to exhibit stretched exponential behavior. The power dependence of the zero time delay signal is shown to behave as a two level system.

Hyatt Grand Ballroom A/B

META

10:30 a.m.–12:00 p.m.
MTuB • Control of Plasmonic Fields
Sergey I. Bozhevolnyi; Aalborg Univ., Denmark, Presider

MTuB1 • 10:30 a.m.
Generation of Non-Classical Surface-Plasmon Polaritons, *Alexander Huck, Stephan Smolka, Peter Lodahl, Alexandra Boltasseva, Ulrik Lund Andersen; Technical Univ. of Denmark, Denmark.* We successfully generate non-classical surface-plasmon polaritons (SPP) by exciting them with a squeezed optical light field. SPPs are efficiently excited and quantum fluctuations of -0.5dB below the shot noise limit are measured.

MTuB2 • 10:45 a.m.
Nano "Light Well": A Free-Electron Light Source On-a-Chip , *Kevin F. MacDonald[1], Giorgio Adamo[1], Nikolay I. Zheludev[1], Francisco J. García de Abajo[2], Yuan H. Fu[3], Chih M. Wang[3], Din P. Tsai[3]; [1]Univ. of Southampton, UK, [2]CSIC, Spain, [3]Natl. Taiwan Univ., Taiwan.* A beam of free electrons passing through a nano-hole in a periodically layered structure creates a nanoscale source of visible light—a nano "light well."

MTuB3 • 11:00 a.m. Invited
Adaptive Control in Nanoplasmonics, *Walter Pfeiffer[1], Tobias Brixner[2], Dmitri V. Voronine[2], F. Javier García de Abajo[3], Martin Aeschlimann[4], Michael Bauer[5]; [1]Univ. of Bielefeld, Germany, [2]Univ. Würzburg, Germany, [3]Inst. de Optica, Spain, [4]Technische Univ. Kaiserslautern, Germany, [5]Univ. Kiel, Germany.* Control of spatial and temporal properties of near-fields provides fascinating possibilities for nanoscale spectroscopy and manipulation of quantum systems. Recent progress to flexibly control such near-fields using optimally polarization-shaped femtosecond laser pulses is presented.

STuB • NASA at 50: Future Telescopes—Continued

STuB3 • 11:30 a.m. Invited

NASA High Contrast Imaging for Exoplanets, *Richard Lyon; NASA Goddard Space Flight Ctr., USA.* Described is NASA's ongoing program for detection and characterization of exo-solar planets via high-contrast imaging. Some of the more promising proposed techniques under assessment may enable detection of life outside our solar system.

FTuH • Novel Modulation Formats—Continued

FTuH3 • 11:15 a.m. Invited

Toward the Shannon Limit Optical Communication, *Masataka Nakazawa; Res. Inst. of Electrical Communication, Tohoku Univ., Japan.* Recent progress on coherent QAM transmission aiming a high spectral efficiency is described, focusing on a polarization-multiplexed 1-Gsymbol/s, 128 QAM transmission. A 14-Gbit/s data signal can be transmitted within an optical bandwidth of 1.4-GHz.

FTuI • Fundamental Nonlinear Optics—Continued

FTuI4 • 11:15 a.m.

Experimental Separation of Microscopic Cascading Induced by Local-Field Effects, *Ksenia Dolgaleva[1], Heedeuk Shin[1], Robert W. Boyd[1], John E. Sipe[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Physics, Univ. of Toronto, Canada.* We report on an experiment on separation of the local-field-induced cascaded contributions from the third-order microscopic hyperpolarizability to the fifth-order susceptibility.

FTuI5 • 11:30 a.m.

Signature of the Microcavity Exciton Polariton Relaxation Mechanism in the Polarization of Emitted Light, *Georgios Roumpos[1], Chih-Wei Lai[1,2], T. C. H. Liew[3], Yuri G. Rubo[3,4], A. V. Kavokin[3,5], Yoshihisa Yamamoto[1,2]; [1]Stanford Univ., USA, [2]Natl. Inst. of Informatics, Japan, [3]Univ. of Southampton, UK, [4]Univ. Nacional Autonoma de Mexico, Mexico, [5]Univ. of Rome II, Italy.* We have performed real and momentum space spin-dependent spectroscopy of spontaneously formed exciton polariton condensates in a GaAs quantum well microcavity. The polarization of the final state reflects the spin-dependent polariton-polariton interactions.

FTuI6 • 11:45 a.m.

All-Optical Zero to Pi Phase Jump, *Ryan M. Camacho[1], P. Ben Dixon[1], Ryan T. Glasser[2], Andrew N. Jordan[1], John C. Howell[1]; [1]Univ. of Rochester, USA, [2]Louisiana State Univ., USA.* By performing a pre-selection, an optically-induced unitary transformation, and then a post-selection on the polarization degree of freedom, the phase of a beam acquires either a zero or pi phase shift.

FTuJ • Beam Combining I—Continued

FTuJ2 • 11:15 a.m.

Kilowatt-Level PM Amplifiers for Beam Combining, *John Edgecumbe, David Björk, Joshua Galipeau, Gary Boivin, Scott Christensen, Bryce Samson, Kanishka Tankala; Nufern, USA.* The performance of a kilowatt-level, Yb-doped, fiber amplifier is reported. Monolithic design, excellent beam quality, polarization-maintaining capability, and high speed safety interlocks make this amplifier an ideal building block for high power beam combining experiments.

FTuJ3 • 11:30 a.m.

Comparison of Spectral Beam Combining Approaches for High Power Fiber Laser Systems, *Pratheepan Madasamy[1], Alison Thomas[1], Thomas Loftus[2], Eric Honea[1]; [1]Aculight Corp., USA, [2]Univ. of Washington, USA.* Spectral Beam Combination (SBC) of multiple fiber laser outputs is an effective way to scale the power of fiber laser systems while maintaining near-diffraction-limited beam quality. Here, we compare the different approaches for fiber SBC.

FTuJ4 • 11:45 a.m.

A Fiber Figure Eight Laser Using Nonlinear Polarization Phase Interference, *Baldemar Ibarra-Escamilla[1], Evgeny Kuzin[1], Olivier Pottiez[2], Joseph Haus[3]; [1]INAOE, Mexico, [2]CIO, Mexico, [3]Univ. of Dayton, USA.* We experimentally investigate picosecond pulse generation in an all-fiber mode-locked laser based on a nonlinear polarization asymmetry in a fiber loop configuration. The laser generates 9 ps pulses at a 0.78 MHz repetition frequency.

FTuK • Light Propagation Models for Therapy and Diagnosis—Continued

FTuK4 • 11:15 a.m.

Integrated Spectroscopy and PDT Delivery for Various Treatment Geometries, *Tammy K. Lee[1], Thomas H. Foster[1,2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Imaging Sciences, Univ. of Rochester, USA.* We present the design of portable instrumentation that integrates spectroscopy with PDT delivery. The flexibility of the system accommodates probes for various surface and interstitial PDT geometries.

FTuK5 • 11:30 a.m.

Modeling Reflectance and Fluorescence Spectra of Human Pancreatic Tissues for Cancer Diagnostics, *Robert H. Wilson, Malavika Chandra, James Scheiman, David Heidt, Diane Simeone, Barbara McKenna, Mary-Ann Mycek; Univ. of Michigan, USA.* Reflectance and fluorescence spectroscopy were used in a limited pilot study to probe freshly excised human pancreatic tissues; mathematical modeling of the data quantitatively showed biologically relevant physical differences between normal tissue, pancreatitis, and cancer.

FTuK6 • 11:45 a.m.

Simulated Fiber-Optic Interrogation of Autofluorescence from Superficial Layer of Tissue-Engineered Construct, *Robert H. Wilson, Malavika Chandra, Wen-Liang Lo, Karthik Vishwanath, Kenji Izumi, Stephen E. Feinberg, Mary-Ann Mycek; Univ. of Michigan, USA.* Monte Carlo simulations were used to predict optimal fiber-optic probe configurations for selectively interrogating autofluorescence from the superficial (50 μm) middle layer of a tissue-engineered construct with a different native fluorophore in each layer.

FTuL • Optical Manipulation of Biosystems II—Continued

FTuL3 • 11:15 a.m. Invited

Channel Rhodopsin, *Karl Deisseroth; Stanford Univ., USA.* Abstract not available.

FTuL4 • 11:45 a.m.

All Optical Platform for Parallel and Spatiotemporal Control of Neuronal Activity, *Sheng Wang[1], Yuan Wang[1], Stephanie Szobota[1], Matthew Volgraf[1], Zhaowei Liu[1], Cheng Sun[1], Dirk Trauner[1,2], Ehud Y. Isacoff[1,2], Xiang Zhang[1]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* The platform is realized by delivering spatiotemporally complex optical stimuli through a digital micromirror spatiotemporal light modulator to cells expressing the light-activated channels, which have been labeled with a calcium dye to report of activity.

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

12:00 p.m.–1:30 p.m. OSA Fellow Member Lunch, *Regency Ballroom, Hyatt Regency Rochester*

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

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B
FiO			LS		META
FTuM • Systems for Optical Manipulation II—Continued	**FTuN • Quantum Dot Semiconductor Optical Amplifiers—Continued**	**FTuO • HHG and Attosecond Pulses I—Continued**	**LTuD • Lasers in Fundamental Physics II—Continued**	**LTuE • Spectroscopy in Single Semiconducting Nanoparticles—Continued**	**MTuB • Control of Plasmonic Fields—Continued**
FTuM3 • 11:15 a.m. **A Tunable Micro Ring Resonator Driven by Electrowetting,** *Romi Shamai, Uriel Levy; Hebrew Univ. of Jerusalem, Israel.* We demonstrate the tuning of an on chip micro ring resonator (MRR) by changing the cladding of the ring from air to water, using electrowetting.	**FTuN3 • 11:15 a.m.** Invited **Nonlinear Properties of Quantum Dot Semiconductor Optical Amplifiers at 1.3 μm,** *Dieter H. Bimberg, Christian Meuer, Matthias Laemmlin; Technical Univ. Berlin, Germany.* Cross-gain and cross-phase modulation as well as four-wave mixing in quantum dot semiconductor optical amplifiers are investigated. Dynamical small signal measurements demonstrate XGM being suitable for high-speed signal processing at 40 GHz.	**FTuO2 • 11:15 a.m.** **Controlling the Sub-Optical Cycle Electron Dynamics in a Strong Field: The Perfect Wave for HHG,** *Jon P. Marangos, Luke Chipperfield, Peter L. Knight, Joseph Robinson, John Tisch; Imperial College London, UK.* Techniques for measuring the sub-optical cycle electron dynamics from the HHG spectrum are identified and control methods to optimize HHG, which may soon be used in practice, are treated theoretically.			
FTuM4 • 11:30 a.m. **Digital Reconstruction of Nonlinear Beam Propagation,** *Christopher Barsi, Wenjie Wan, Jason W. Fleischer; Princeton Univ., USA.* We extend the technique of digital holography to the case of propagation through nonlinear media. We experimentally verify the technique by reconstructing nonlinear dynamics within a self-defocusing medium and nonlinearly imaging through it.		**FTuO3 • 11:30 a.m.** Invited **High-Harmonic Generation from Excited Molecules: X-Ray Spectra Control and Dynamical Imaging,** *Mikhail Yu. Emelin, Arkady A. Gonoskov, Ivan A. Gonoskov, Mikhail Yu. Ryabikin, Alexander M. Sergeev; Inst. of Applied Physics, Russian Acad. of Sciences, Russian Federation.* Sensitivity of high-harmonic yield on molecule configuration in excited states, based on interference phenomena for both de Broglie waves and electromagnetic waves, provides opportunities for coherent X-ray emission control and dynamical imaging of molecules.	**LTuD3 • 11:30 a.m.** **A Superluminal Ring Laser for Rotation Sensing,** *Selim M. Shahriar, Mary Salit; Northwestern Univ., USA.* We show that a dip in the gain profile, as a function of frequency, can be used to realize a superluminal ring laser, requiring a critical, non-trivial balance between the cavity-Q and the gain profile.	**LTuE3 • 11:30 a.m.** **Antenna-Coupled Quantum Dot Fluorescence,** *Palash Bharadwaj, Lukas Novotny; Inst. of Optics, Univ. of Rochester, USA.* Colloidal quantum dots are known to fluoresce intermittently ("blinking") when irradiated by laser radiation. In this paper, we investigate the effect of a nanoplasmonic antenna on the fluorescence blinking of a single quantum dot.	**MTuB4 • 11:30 a.m.** **Highly Efficient Spatio-Temporal Coherent Control in Nanoplasmonics on Nanometer-Femtosecond Scale by Time-Reversal,** *Mark I. Stockman, Xiangting Li; Georgia State Univ., USA.* We propose an efficient method to impose coherent control of the spatiotemporal localization of optical excitation energy in nanoplasmonic systems on the nanometer spatial and femtosecond temporal scales. This approach is based on time reversal.
FTuM5 • 11:45 a.m. **Reducing the Crosstalk and Reflection at the Dielectric Waveguide Cross by Topology Design,** *Jingjing Li, David A. Fattal, Raymond G. Beausoleil; Hewlett-Packard Res. Lab, USA.* We propose an economic and efficient method to reduce the crosstalk and reflection at dielectric waveguide cross by means of topology design. More than 85% crosstalk energy reduction and 90% reflection energy reduction are observed.	**FTuN4 • 11:45 a.m.** **Tunneling Transport in Asymmetric Multiple Quantum Well Heterostructures,** *Oleksiy V. Shulika[1], Volodymyr V. Lysak[1,2], Igor A. Sukhoivanov[1,3]; [1]Kharkov Natl. Univ. of Radioelectronics, Ukraine, [2]Gwangju Inst. of Science and Technology, Republic of Korea, [3]Univ. de Guanajuato, Mexico.* We analyzed tunneling in InGaAsP AMQW and found that tunneling times are in subpicosecond region making competition to intraband processes in population and gain dynamics of AMQW-SOA. Theoretical and experimental gains are in close agreement.		**LTuD4 • 11:45 a.m.** **Controlling the Motion of Optical Elements with Laser Light,** *Carsten Henkel, Maria Martin, Marc Herzog; Univ. Potsdam, Germany.* We analyze phase synchronization between a "breathing" microcavity and a modulated laser field. In addition, we discuss the optical force on a membrane placed into a ring cavity.		**MTuB5 • 11:45 a.m.** **Trapping and Releasing of Telecom Rainbow,** *Qiaoqiang Gan, Zhan Fu, Yujie Ding, Filbert Bartoli; Lehigh Univ., USA.* We show how the graded grating structures developed for "trapped rainbow" in THz domain can be transferred to telecom frequencies for future possible optical communication and various nano photonic applications.

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

12:00 p.m.–1:30 p.m. OSA Fellow Member Lunch, *Regency Ballroom, Hyatt Regency Rochester*

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

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
FiO					
1:30 p.m.–3:30 p.m. **STuC • NASA at 50: NASA and Space Science** *James B. Breckinridge[1,2]; [1]JPL, USA, [2]Caltech, USA, Presider*	**1:30 p.m.–3:15 p.m.** **FTuP • Photonic Bandgap Engineering II** *Nikolay Zheludev; Univ. of Southampton, UK, Presider*	**1:30 p.m.–3:30 p.m.** **FTuQ • Quantum Measurement and Entanglement** *Paul Kwiat; Univ. of Illinois, USA, Presider*	**1:30 p.m.–3:30 p.m.** **FTuR • Imaging of Mice and Men II** *Turgut Durduran; Univ. of Pennsylvania, USA, Presider*	**1:30 p.m.–3:30 p.m.** **FTuS • Microscopy Superresolution and Source Engineering I** *Lahsen Assoufid; Argonne Natl. Lab, USA, Presider*	**1:45 p.m.–3:00 p.m.** **FTuT • Frequency Conversion and Optical Gain** *Presider to Be Announced*
STuC1 • 1:30 p.m. Invited **Evolution of Optical Systems for Planetary Science from Ranger to the Present,** *Fred E. Vescelus[1,2]; [1]JPL, USA, [2]Caltech, USA.* This paper is a brief description of the history of the United States planetary imaging missions and their related optical systems and design progression over the last 45 years.	**FTuP1 • 1:30 p.m.** **Smart Simulation of LED Radiation Using Reciprocity,** *Olaf T. A. Janssen, Paul Urbach; Delft Univ. of Technology, Netherlands.* Using the reciprocity theorem, we calculate the incoherent emission in a single direction of a periodically structured LED, by performing two small simulations on a single unit cell.	**FTuQ1 • 1:30 p.m.** Invited **Quantum Measurement and Cloning with Continuous Variables,** *Christoffer Wittman[1], Ruifang Dong[1], Metin Sabuncu[1,2], Mikael Lassen[1,2], Ulrik Andersen[1,2], Gerd Leuchs[1]; [1]Inst. für Optik, Information und Photonik, Univ. Erlangen-Nuernberg, Germany, [2]Technical Univ. of Denmark, Denmark.* Amplification, cloning, quantum teleportation and telecloning are related quantum information protocols which benefit from measurement based feed-forward strategies. This approach leads to partial recovery of quantum states having passed through a channel with non-Gaussian noise.	**FTuR1 • 1:30 p.m.** Invited **Mouse Organ Imaging,** *Elizabeth M. C. Hillman; Columbia Univ., USA.* By exploiting the dynamics of near infrared dyes *in vivo*, we have shown that it is possible to significantly enhance the contrast of internal organs within mice. These dynamics also confer information about organ function.	**FTuS1 • 1:30 p.m.** Invited **New Developments in STED Microscopy,** *Stefan W. Hell, Alexander Egner, Roman Schmidt; Max-Planck-Inst. für Biophysik Chemie, Germany.* I will discuss novel physical concepts that radically break the diffraction barrier in focusing fluorescence microscopy. They share a common strategy: exploiting molecular transitions of the fluorescent marker to neutralize the limiting role of diffraction.	
	FTuP2 • 1:45 p.m. **Study of Angle Dependent Reflection from a 3-D Quasi-Ordered Photonic Crystal,** *Heeso Noh[1], Richard O. Prum[2], Eric R. Dufresne[2], Hui Cao[1,2]; [1]Northwestern Univ., USA, [2]Yale Univ., USA.* We measured angle-resolved specular reflection, backward reflection and diffusive reflection from bird feathers with quasi-ordered structures. The angular dependences of reflection spectra are distinct from those of 3-D photonic crystal, due to isotropic short-range order.				**FTuT1 • 1:45 p.m.** **Efficient Ultrashort-Pulse Generation Overcoming the Limit of Fluorescence Spectrum of the Gain Material,** *Shinichi Matsubara[1], Masaki Takama[1], Masahiro Inoue[1], Sakae Kawato[1], Yuzo Ishida[2]; [1]Graduate School of Engineering, Univ. of Fukui, Japan, [2]Inst. of Physical and Chemical Res. (RIKEN), Japan.* 110-fs and 72-fs pulse-widths were obtained directly from a low-brightness-laser-diode-pumped, mode-locked Yb:YAG laser with SESAM and without SESAM, respectively. The laser-spectrum-center and the fluorescence-center were almost same. The laser-spectra were much broader than the fluorescence.
STuC2 • 2:00 p.m. Invited **Spitzer and Other Planetary Systems,** *George H. Rieke; Univ. of Arizona, USA.* I will describe advances made with the Spitzer Telescope in two general classes of observation of other planetary systems: study of transits of giant planets and of debris disks maintained by collisions of smaller bodies.	**FTuP3 • 2:00 p.m.** Invited **Photonic Quasicrystals, Some Properties and Applications,** *Stefan Enoch[1], Alessandro Della Villa[1,2], Gérard Tayeb[1], Filippo Capolino[2], Vincenzo Pierro[3], Vincenzo Galdi[3]; [1]CNRS, Inst. Fresnel, France, [2]Univ. of Siena, Italy, [3]Univ. of Sannio, Italy.* We show that the LDOS of a Penrose-type quasicrystal exhibits small additional band gaps. We also investigate the properties of the resonant modes that occur in the transparency bands of photonic quasicrystals.	**FTuQ2 • 2:00 p.m.** **Delay of Continuous Variable Entanglement,** *Alberto M. Marino, Raphael C. Pooser, Vincent Boyer, Paul D. Lett; NIST, USA.* We use a four-wave mixing process in an atomic system to delay continuous variable entanglement present in twin beams. We have obtained delays of over 25 ns while preserving the quantum correlations.	**FTuR2 • 2:00 p.m.** **Hyperoxic Gas Inhalation Coupled with Differential Optical Imaging for Breast Cancer,** *Sanhita S. Dixit[1], Hanyoup Kim[1], Christopher Comstock[2], Gregory W. Faris[1]; [1]SRI Intl., USA, [2]Univ. of California at San Diego, USA.* We employ differential optical imaging for breast cancer. The proposed technique exploits tumor vascular response to inspired hyperoxic gases to provide contrast. Results from preliminary clinical trials are presented.	**FTuS2 • 2:00 p.m.** **isoSTED Microscopy,** *Roman Schmidt, Alexander Egner, Stefan W. Hell; Max Planck Inst. for Biophysical Chemistry, Germany.* We introduce a fluorescence microscope featuring a spherical focal spot that can be arbitrarily downscaled in size, and demonstrate the unique, non-invasive dissection of sub-wavelength sized cell organelles.	**FTuT2 • 2:00 p.m.** **Generating Optical Near-Fields from Afar via Absorbance Modulation,** *Rajesh Menon, Hsin-Yu Tsai, Trisha L. Andrews; MIT, USA.* We present experimental results validating absorbance modulation, a technique to overcome the far-field diffraction barrier. Potential applications abound in optical nanopatterning and optical nanoscopy.

Highland G — FiO

1:30 p.m.–3:30 p.m.
FTuU • Silicon Photonics II
Pieter Dumon; Ghent Univ., Belgium, Presider

FTuU1 • 1:30 p.m.
Silicon-Chip-Based Single-Shot Ultrafast Optical Oscilloscope, *Mark A. Foster, Reza Salem, David F. Geraghty, Amy C. Turner-Foster, Michal Lipson, Alexander L. Gaeta; Cornell Univ., USA.* We demonstrate a single-shot ultrafast optical oscilloscope using a four-wave-mixing-based parametric time-lens integrated on a CMOS-compatible silicon photonic chip. We experimentally demonstrate measurement with a 100-ps record length and 220-fs resolution.

FTuU2 • 1:45 p.m.
Compact 1 x 32 Splitter Network and Ring Resonator for Silicon-On-Insulator Rib Waveguide, *Seunghyun Kim, Yusheng Qian, Jiguo Song, Gregory P. Nordin; Brigham Young Univ., USA.* We demonstrated compact 1 x 32 splitter network and ring resonator for silicon-on-insulator (SOI) rib waveguide with trench-based bends and splitters which occupied areas of only 700μm x 1600μm and 30μm x 30μm, respectively.

FTuU3 • 2:00 p.m. Invited
Slow Light for Switching and Nonlinear Effects on SOI, *Thomas F. Krauss[1], Daryl Beggs[1], Andrea di Falco[1], Tom White[1], Liam O'Faolain[1], Christelle Monat[2], Michael Lee[2], Benjamin Eggleton[2]; [1]SUPA, Univ. of St. Andrews, UK, [2]CUDOS, School of Physics, Univ. of Sydney, Australia.* The phenomenon of slow light in photonic crystal waveguides is used for miniaturized (5μm long) optical switches as well as the broadband (5-10 nm) enhancement of nonlinear effects such as self-phase modulation.

Highland H / Highland J / Highland K — LS

1:30 p.m.–3:30 p.m.
LTuF • Optical Combs, Frequency References and Spectroscopy
Nan Yu; JPL, USA, Presider

LTuF1 • 1:30 p.m. Invited
Physics and Applications of Laser-Atomic Oscillator, *Yuan-Yu Jau; Princeton Univ., USA.* We report a new technique, laser-atomic oscillator. The oscillation frequency is photonically locked to an atomic resonance, and oscillations are generated as the modulated laser light and the modulated impedance of the semiconductor gain element.

LTuF2 • 2:00 p.m. Invited
Optical Frequency Comb Generation in HNLF Cavities, *Danielle A. Braje[1], Tobias Kippenberg[2], Pascal Del'Haye[2], Leo Hollberg[1], Scott Diddams[1]; [1]NIST, USA, [2]Max-Planck-Inst. fur Quantenoptik, Germany.* A 150-nm bandwidth frequency comb at 1.5 μm with tailorable mode spacing is generated with a cw-pumped, 5-cm-long highly nonlinear fiber cavity. A comb with both THz and GHz spacings is produced.

1:30 p.m.–3:30 p.m.
LTuG • Microchips for Laser-Cooled Atoms
Pierre Meystre; Univ. of Arizona, USA, Presider

LTuG1 • 1:30 p.m. Invited
Atom Chip Technology, *Dana Anderson; Univ. of Colorado at Boulder, USA.* Technology advances have enabled miniature ultracold atom systems less than one liter in volume, capable of producing ultracold atom fluxes comparable to much larger systems. Such systems target inertial sensing and similar cold atom applications.

LTuG2 • 2:00 p.m. Invited
Optical Microcavities on Atom Chips, *Ed Hinds; Imperial College London, UK.* Cold atoms trapped and manipulated on atom chips can provide a basis for sensitive detection and for quantum information processing devices.

2:00 p.m.–3:30 p.m.
LTuH • PRL 50th Anniversary Celebration
George Basbas; American Physical Society, USA, Presider

LTuH1 • 2:00 p.m. Invited
50 More Years of PRL: How to Gauge a Journal's Success?, *Deniz van Heijnsbergen; American Physical Society, USA.* PRL's goal is to publish short and readable physics articles of importance and broad interest. Soon after its beginning this goal became synonymous with prestige and recognition for authors, and with keeping abreast of the latest in physics for readers. In this presentation I will cover the current status of the journal and discuss the factors that determine a journal's success, leading to new ideas on how to keep PRL at the forefront of physics publication.

Hyatt Grand Ballroom A/B — META

1:30 p.m.–3:30 p.m.
MTuC • Towards 3-D Photonic Metamaterials
Harry Atwater; Caltech, USA, Presider

MTuC1 • 1:30 p.m. Invited
Optical Properties of 3-D Metamaterials: Coupling Matters! *Harald Giessen; Univ. Stuttgart, Germany.* We present optical properties of laterally and vertically stacked metamaterials. Ferro- and antiferromagnetism at optical frequencies is observed in vertically coupled structures. Magneto- and electroinductive coupling with narrow resonances is possible in laterally coupled systems.

MTuC2 • 2:00 p.m.
Negative Refraction in Bulk Anisotropic Metamaterials at Visible Frequency, *Jie Yao[1], Zhaowei Liu[1], Yongmin Liu[1], Yuan Wang[1], Cheng Sun[1], Guy Bartal[1], Angelica M. Stacy[2], Xiang Zhang[1]; [1]NSF Nano-scale Science and Engineering Ctr., Univ. of California at Berkeley, USA, [2]Dept. of Chemistry, Univ. of California at Berkeley, USA.* Bulk metamaterials consisting of silver wire arrays in alumina matrix were fabricated. Electro-magnetic waves propagating along the nanowires exhibit relatively low-loss negative refraction, at a broad band of frequency for all angles.

Hyatt Grand Ballroom E/F — OF&T

1:30 p.m.–3:30 p.m.
OTuA • Keynote Session on Mid-Spatial Frequencies and PSD*
Stephen Jacobs; Univ. of Rochester, USA, Presider

OTuA1 • 1:30 p.m. Invited
Specification and Control of Mid-Spatial Frequency Wavefront Errors in Optical Systems, *David Aikens[1], Jessica E. DeGroote[2], Richard N. Youngworth[3]; [1]Savvy Optics, USA, [2]Optimax Systems Inc., USA, [3]Light Capture Inc., USA.* An introduction to the specification and tolerancing of Mid-spatial frequency (MSF) ripple or waviness. This includes a derivation of spatial frequency bands of interest, specifications methods and notations, and relative amplitudes for typical manufacturing processes.

OTuA2 • 1:50 p.m. Invited
Calibration of Modulation Transfer Function of Surface Profilometers with 1-D and 2-D Binary Pseudo-Random Array Standards, *Valeriy Yashchuk[1], Wayne R. McKinney[1], Peter Z. Takacs[2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Brookhaven Natl. Lab, USA.* We suggest and describe the use of a binary pseudo-random grating as a standard test surface for calibration of the modulation transfer function of microscopes. Results from calibration of a Micromap™-570 interferometric microscope are presented.

This session is dedicated to the memaory of Jean M. Bennett (1930–2008).

STuC • NASA at 50: NASA and Space Science—Continued

STuC3 • 2:30 p.m. Invited

The James Webb Space Telescope, *Mark Clampin; NASA Goddard Space Flight Ctr., USA.* Dr. Clampin is the James Webb Space Telescope (JWST) Observatory Project Scientist at GSFC. Dr. Clampin served earlier as an Instrument Scientist for WFPC2, followed by STIS, and then as the Advanced Camera for Surveys Group Manager, Co-Investigator and Detector Scientist.

FTuP • Photonic Bandgap Engineering II—Continued

FTuP4 • 2:30 p.m. Invited

Fabrication of Three-Dimensional Photonic Crystals by Templated Atomic Layer Deposition, *Christopher J. Summers, Elton Graugnard, Davy P. Gaillot, John Blair; Georgia Tech, USA.* We report investigations of atomic layer deposition for 3-D structure modification. Application to opal templates shows that dielectric inversion, large pore structures and conformal backfilling significantly enhance the photonic band gap and optical functionality.

FTuQ • Quantum Measurement and Entanglement—Continued

FTuQ3 • 2:15 p.m.

Photon-Hole Quantum Nondemolition Measurement, *Alex Hayat, Pavel Ginzburg, David Neiman, Serge Rosenblum, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* We propose a photon-hole quantum nondemolition measurement system by electromagnetically-induced transparency. The photon-hole disrupts the destructive interference of electron transitions, resulting in drive photon absorption, while preserving the photon-hole state.

FTuQ4 • 2:30 p.m. Invited

Dispersion Cancellation and Manipulation in Quantum Interferometry, *Alexander Sergienko[1], Olga Minaeva[1,2], Cristian Bonato[1,3], Bahaa E. A. Saleh[1], Paolo Villoresi[3]; [1]Boston Univ., USA, [2]Moscow State Pedagogical Univ., Russian Federation, [3]Univ. of Padova, Italy.* We demonstrate simultaneous even- and odd-order spectral dispersion cancellation in a single experiment. We also present a spatial counterpart of the dispersion cancellation effect that leads to the removal of even-order aberrations in quantum interference.

FTuR • Imaging of Mice and Men II—Continued

FTuR3 • 2:15 p.m. Invited

Optical Imaging of Breast Cancer by Spectral and Fluorescence Diffuse Optical Tomography, *Martin B. van der Mark[1], Anais Leproux[1], Tim Nielsen[2], Marjolein van der Voort[1], Leon Bakker[3], Michiel van Beek[1], Claas Bontus[2], Bernhard Brendel[2], Rik Harbers[1], Thomas Koehler[2], Falk Uhlemann[2], Andrea Wiethoff[4], Ronny Ziegler[2], Andy Ziegler[2], Lueder Fels[5], Martin Pessel[5], Stephanie van de Ven[6], Sjoerd Elias[6], Willem Mali[6], Peter Luijten[6]; [1]Philips Res. Europe, Netherlands, [2]Philips Res. Europe, Germany, [3]Philips Res. Asia, China, [4]King's College London, Div. of Imaging Sciences, UK, [5]Bayer Schering Pharma AG, Germany, [6]Univ. Medical Ctr. Utrecht, Netherlands.* We describe a diffuse optical tomography system having both spectroscopic and fluorescence imaging capability. Some test results obtained in phantoms studies as well as our initial experience in patients are discussed.

FTuR4 • 2:45 p.m. Invited

Time Domain Diffuse Optical Imaging and Spectroscopy: From Lab to Clinic, *Rinaldo Cubeddu, Antonio Pifferi, Alessandro Torricelli, Paola Taroni, Lorenzo Spinelli; Politecnico di Milano, Italy.* Time domain approach to diffuse optical imaging and spectroscopy will be discussed. Laboratory and clinical systems will be presented together with recent results in tissue spectroscopy, mammography and brain functional imaging.

FTuS • Microscopy Superresolution and Source Engineering I—Continued

FTuS3 • 2:15 p.m. Invited

Nanoscopic Imaging of Biomolecules, Cells and Tissues with STORM, *Xiaowei Zhuang; Harvard Univ., USA.* We have developed a new form of super-resolution light microscopy, stochastic optical reconstruction microscopy (STORM), and achieved three-dimensional multi-color fluorescence imaging of cells and tissues with ~20 nm lateral and ~50 nm axial resolutions.

FTuS4 • 2:45 p.m.

Antenna-Based Near-Field Nanoscopy of Individual Membrane Proteins in Erythrocytes, *Christiane Höppener, Lukas Novotny; Inst. of Optics, Univ. of Rochester, USA.* Antenna-based near-field microscopy uses nanoscopic metal particles to localize incident laser radiation down to 50 nm. Imaging erythrocyte plasma-membranes with this technique identifies individual calcium ion pumps and reveals their inhomogeneous distribution within the plasma-membrane.

FTuT • Frequency Conversion and Optical Gain—Continued

FTuT3 • 2:15 p.m.

Dynamics of Spatial Beam Collapse in Nonlinear Medium with Nonlocal Response, *Can Sun, Christopher Barsi, Jason W. Fleischer; Princeton Univ., USA.* We study wave collapse in a nonlinear self-focusing medium with nonlocal response. The nonlocality arrests catastrophic collapse and creates focusing-defocusing oscillations. Right before maximum collapse, we observe a transverse peakon-like profile with exponentially-decaying tails.

FTuT4 • 2:30 p.m.

Wavelength Conversion Based on Stimulated Raman Scattering (SRS), *Cyril L. Guintrand, Jean Toulouse; Lehigh Univ., USA.* We describe a scheme for wideband conversion of optical signals in optical fibers. The wavelength dependence and modulation speed of the process are investigated experimentally and theoretically, including the effect of the pump-probe velocity mismatch.

FTuT5 • 2:45 p.m.

Coherent Optical Pulse Propagation in a Four-Level Medium, *E. A. Groves, B. D. Clader, J. H. Eberly; Univ. of Rochester, USA.* We investigate the coherent propagation of four laser pulses through a medium of resonant four-level atoms. A particular analytic solution is found and shown to be naturally described in three distinct regimes.

Highland G

FiO

FTuU • Silicon Photonics II—Continued

FTuU4 • 2:30 p.m. Invited

Silicon-on-Insulator Technology as a Platform for Advanced Electronics and Photonics, *George K. Celler; SOITEC USA, USA.* Silicon on Insulator (SOI) substrates are widely used in high performance microprocessors and in many other electronic applications. They are also an excellent platform for emerging photonic circuits. Fabrication of SOI will be reviewed here.

Highland H

LS

LTuF • Optical Combs, Frequency References and Spectroscopy—Continued

LTuF3 • 2:30 p.m.

New Scheme for Independently Stabilizing the Repetition Rate and Optical Frequency of a Laser Using a Regenerative Mode-Locking Technique, *Masataka Nakazawa, Masato Yoshida; Res. Inst. of Electrical Communication, Tohoku Univ., Japan.* We newly report independent control of the repetition rate and optical frequency of a pulse laser by employing a 40 GHz, picosecond harmonically and regeneratively mode-locked fiber laser at 1.55 μm.

LTuF4 • 2:45 p.m.

Resolved Frequency Comb Spectroscopy with a 10 GHz Ti:Sapphire Femtosecond Laser, *Dirk C. Heinecke[1,2], Albrecht Bartels[2,3], Scott A. Diddams[1]; [1]NIST, USA, [2]Ctr. for Applied Photonics, Univ. of Konstanz, Germany, [3]Gigaoptics GmbH, Germany.* A 10 GHz passively modelocked Ti:sapphire laser is demonstrated. The associated frequency comb is resolved, and spectroscopy of rubidium enables the identification of single modes. The spectrum is broadened in microstructured fibers to 250nm.

Highland J

LTuG • Microchips for Laser-Cooled Atoms—Continued

LTuG3 • 2:30 p.m. Invited

Single Atoms and Condensates Strongly Coupled to an Optical Cavity on an Atom Chip, *Yves Colombe[1,2]; [1]Lab Kastler-Brossel, France, [2]NIST, USA.* We detect single atoms and Bose-Einstein condensates trapped on an atom chip using a high finesse fiber-Fabry-Perot resonator.

Highland K

LTuH • PRL 50th Anniversary Celebration—Continued

LTuH2 • 2:30 p.m. Invited

***Physical Review Letters*, AMO, and the Law of Unintended Consequences,** *Daniel Kleppner; MIT, USA. Physical Review Letters* was an immediate success but its popularity brought problems. Sam Goudsmit turned to the American Physical Society for help. The APS committee's advice wonderfully illustrates the law of unintended consequences.

Hyatt Grand Ballroom A/B

META

MTuC • Towards 3-D Photonic Metamaterials—Continued

MTuC3 • 2:15 p.m.

Photonic Metamaterial Structures by 3-D Direct Laser Writing, *Michael S. Rill[1], Christine Plet[1], Michael Thiel[1], Isabelle Staude[1], Martin Wegener[1], Georg von Freymann[2], Stefan Linden[2]; [1]Univ. Karlsruhe (TH), Germany, [2]Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, Inst. für Nanotechnologie, Germany.* We fabricate magnetic metamaterials by direct laser writing (DLW) of polymeric templates and subsequent metal coating via silver chemical vapor deposition. Also, we discuss negative-index structures and first attempts regarding the fabrication of optical cloaks.

MTuC4 • 2:30 p.m.

Negative Index Photonic Metamaterials for Direct Laser Writing, *Durdu O. Guney[1,2], Thomas Koschny[1,2,3,4], Maria Kafesaki[3,4], Costas M. Soukoulis[1,2,3,4]; [1]Ames Lab, U.S. Dept. of Energy, USA, [2]Dept. of Physics, Iowa State Univ., USA, [3]Inst. of Electronic Structure and Laser, Foundation for Res. and Technology Hellas (FORTH), Greece, [4]Dept. of Materials Science and Technology, Univ. of Crete, Greece.* We present a design and simulation of one- and two-dimensional photonic negative index metamaterials around telecom wavelengths. Designed bulk structures are inherently connected, which render their fabrication feasible by direct laser writing.

MTuC5 • 2:45 p.m.

Preparation of Metallo-Dielectric Metamaterials by Multi-Photon Direct Laser Writing, *Stephen M. Kuebler, Amir Tal, Yun-Sheng Chen; Univ. of Central Florida, USA.* Three-dimensional metallo-dielectric photonic crystals were created by preparing a polymeric micro-scaffold using multi-photon direct laser writing and conformally metallizing the structures by electroless deposition. The resulting metamaterials behave at infrared wavelengths like metal photonic crystals.

Hyatt Grand Ballroom E/F

OF&T

OTuA • Keynote Session on Mid-Spatial Frequencies and PSD—Continued

OTuA3 • 2:10 p.m. Invited

Methods and Challenges in Quantifying Mid-Spatial Frequencies, *Paul Murphy; QED Technologies, USA.* Mid-spatial frequencies (MSFs) are of increasing importance in optical applications. We discuss common means for specifying and evaluating MSFs, as well as some of the concerns in measuring them.

OTuA4 • 2:30 p.m. Invited

Measurement and Calibration of PSD with Phase-Shifting Interferometers, *John P. Lehan[1,2]; [1]NASA Goddard Space Flight Ctr., USA, [2]Univ. of Maryland, Baltimore County, USA.* We discuss the instrumental aspects affecting the measurement accuracy when determining PSD with phase shifting interferometers. The use of a calibration standard will also be discussed and a recommended measurement and data handling procedure.

OTuA5 • 2:50 p.m. Invited

Characterization of Surface and Thin-Film Roughness Using PSD Functions, *Angela Duparré; Fraunhofer Inst., Applied Optics and Precision Engineering, Germany.* Power Spectral Density functions obtained from measurements at different spatial frequency ranges and by different techniques are combined to yield comprehensive descriptions of surface structures.

STuC • NASA at 50: NASA and Space Science—Continued

STuC4 • 3:00 p.m. Invited

The Future of Astronomy in Space, *Lee D. Feinberg; NASA Goddard Space Flight Ctr., USA.* This talk will address a science-driven technology roadmap for space optical astronomy in the coming decades including a 2005 Advanced Telescopes and Observatories NASA roadmap and more recent progress in this area.

FTuP • Photonic Bandgap Engineering II—Continued

FTuP5 • 3:00 p.m.

Modal Characteristics of Coupled Metallic Nanoscale Apertures, *Triranjita Srivastava, Arun Kumar; Indian Inst. of Technology, India.* We examine the modal characteristics of coupled metallic nanoscale apertures. The coupling between the apertures results in a surface plasmon polariton (SPP) mode having significantly large propagation length, which can be used for SPP guidance.

FTuQ • Quantum Measurement and Entanglement—Continued

FTuQ5 • 3:00 p.m.

Entanglement-Seeded-Dual Optical Parametric Amplification: Applications to Quantum Communication, Imaging, and Metrology, *Ryan T. Glasser[1], Hugo Cable[1], Jonathan P. Dowling[1,2], Fabio Sciarrino[3], Chiara Vitelli[3], Francesco De Martini[3]; [1]Louisiana State Univ., USA, [2]Univ. of Rome "La Sapienza", Italy, [3]Univ. of Rome, Italy.* We present a dual-optical parametric amplifier scheme seeded with a maximally path entangled state. The outcome is a variety of quantum states useful in quantum imaging, metrology and cryptography.

FTuQ6 • 3:15 p.m.

Sudden Death at High NOON, *Asma Al-Qasimi, Daniel F. V. James; Univ. of Toronto, Canada.* Entanglement sudden death (ESD) is the disappearance of entanglement in finite time. We show that in continuous variable quantum systems (CVQS), NOON states and other two-mode N-photon states, dephasing induced ESD does not occur.

FTuR • Imaging of Mice and Men II—Continued

FTuR5 • 3:15 p.m.

Standardized Quantification for Liver Fibrosis Assessment Using Second Harmonic Generation Microscopy, *Dean Tai[1], Shuoyu Xu[1,2], Chiang Huen Kang[1], Nancy Tan[3,4], Ser Mien Chia[4], Chee Leong Cheng[3], Hanry Yu[1,2,4,5,6,7]; [1]Inst. of Bioengineering and Nanotechnology, Singapore, [2]Singapore-MIT Alliance, Singapore, [3]Dept. of Pediatrics, KK Women's and Children's Hospital, Singapore, [4]Dept. of Physiology, Yong Loo Lin School of Medicine, Singapore, [5]NUS Graduate Programme in Bioengineering, NUS Graduate School for Integrative Science and Engineering, Singapore, [6]Tissue-Engineering Programme, DSO Labs, Singapore, [7]Dept. of Haematology-Oncology, Natl. Univ.Hospital, Singapore.* We have developed a standardized quantification technique for assessing the progression of liver fibrosis by combining second harmonic generation microscopy and automated quantification algorithms. We have also validated the technique using animal models.

FTuS • Microscopy Superresolution and Source Engineering I—Continued

FTuS5 • 3:00 p.m.

Imaging Single Molecule Spectroscopy in Densely Labelled Samples, *Andreas Schoenle; Max Planck Inst. for Biophysical Chemistry, Germany.* We present imaging single-molecule fluorescence spectroscopy in samples labelled densely enough for simultaneous far-field nanoscopy by exploiting the spectroscopical properties of dyes that allow reversible light-induced switching between a detectable and a dark state.

FTuS6 • 3:15 p.m.

Light-Controlled Switching of Fluorescence from Mn-Doped ZnSe Quantum Dots, *Scott E. Irvine[1], Thorsten Staudt[1,2], Eva Rittweger[1], Johann Engelhardt[2], Stefan W. Hell[1,2]; [1]Max-Planck Inst. for Biophysical Chemistry, Germany, [2]German Cancer Res. Ctr., Germany.* We report on the optical and fully-reversible control over fluorescence from Mn-doped ZnSe quantum nanocrystals. Such optical control over electronic transitions within these nanocrystals enables, for the first time, diffraction unlimited imaging using quantum dots.

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

3:30 p.m.–5:30 p.m. Meet the APS Journal Editors and Celebrate 50 Years of PRL, *Riverside Court, Rochester Riverside Convention Center*

Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
FiO	LS			META	OF&T

FTuU • Silicon Photonics II—Continued

FTuU5 • 3:00 p.m.
Large Temporal Magnification Using Four-Wave Mixing on a Silicon Chip, *Reza Salem, Mark A. Foster, Edgar A. Peralta, David F. Geraghty, Alexander L. Gaeta, Amy C. Turner, Michal Lipson; Cornell Univ., USA.* We demonstrate a technique for temporal magnification of ultrafast signals based on four-wave mixing in silicon nanowaveguides. Magnification factors as high as 440 are achieved, which allow for sub-picosecond characterization using standard electronic detection.

FTuU6 • 3:15 p.m.
Concentric Octagonal CMOS Photodiodes for Direct Detection of Spatially Multiplexed Optical Fiber Channels, *Syed H. Murshid, Jamil Iqbal; Florida Inst. of Technology, USA.* Standard CMOS technology based array of octagonal concentric photodiodes is developed to serve as de-multiplexer for spatially multiplexed fiber optic communication channels. The unique structure of these photodiodes and their responsivity is presented.

LTuF • Optical Combs, Frequency References and Spectroscopy—Continued

LTuF5 • 3:00 p.m.
Laser Linewidth Reduction at 1550nm Using the Pound-Drever-Hall Technique, *Evan M. Lally, Bo Dong, Anbo Wang; Virginia Tech, USA.* An active feedback system is shown to significantly reduce the linewidth of a 1550nm DBR fiber laser. The laser is referenced to an ultra-stable Fabry-Perot cavity and its frequency is controlled via the Pound-Drever-Hall technique.

LTuF6 • 3:15 p.m.
Properties of Halo Nuclei from Laser Spectroscopy, *Gordon W. Drake; Univ. of Windsor, Canada.* High precision laser-resonance pectroscopy and the isotope shift, in combination with high precision atomic theory, are used as a unique measurement tool to determine the nuclear charge radii of light halo nuclei.

LTuG • Microchips for Laser-Cooled Atoms—Continued

LTuG4 • 3:00 p.m.
Runaway Evaporative Cooling to Bose-Einstein Condensation of Cesium Atoms in Optical Traps, *Chen-Lung Hung, Xibo Zhang, Nathan Gemelke, Cheng Chin; Univ. of Chicago, USA.* We demonstrate a simple scheme to achieve fast, runaway evaporative cooling to Bose-Einstein condensation with ~10^5 optically trapped cesium atoms in 2~4 seconds by tilting an optical potential with a magnetic field gradient.

LTuG5 • 3:15 p.m.
Quantum Brownian Motion in a BEC, *Peter Drummond, Scott Hoffmann; Univ. of Queensland, Australia.* We analyze the conditions for observation of quantum Brownian motion in an ultra-cold atomic environment, in which the moving particle or impurity and the quantum fluid are both treated quantum mechanically.

LTuH • PRL 50th Anniversary Celebration—Continued

LTuH3 • 3:00 p.m. Invited
Highlights from 50 Years of PRL, *Wolfgang Schleich; Dept. of Quantum Physics, Univ. of Ulm, Germany.* We briefly discuss highlights from PRL in the field of atomic and molecular physics as well as quantum optics. Also a few amusing blunders of PRL are presented.

MTuC • Towards 3-D Photonic Metamaterials—Continued

MTuC6 • 3:00 p.m.
Negative Refractive Index in a Bulk Optical Metamaterial, *Jason Valentine, Shuang Zhang, Thomas Zentgraf, Erick Ulin-Avila, Dentcho A. Genov, Guy Bartal, Xiang Zhang; Univ. of California at Berkeley, USA.* We report experimental realization of the first bulk optical negative index metamaterial. The index is determined by measuring the refractive angle at the exiting side of a prism, demonstrating negative phase propagation in the metamaterial.

MTuC7 • 3:15 p.m.
Anomalous Diffraction and Imaging Properties of Metamaterials, *Thomas Paul, Carsten Rockstuhl, Christoph Menzel, Falk Lederer; Inst. of Condensed Matter Theory and Solid State Optics, Germany.* Upon evaluating the dispersion relation of light propagating in metamaterials, we elucidate the impact of encountered normal and anomalous diffraction regimes on refraction, diffraction and the imaging properties of metamaterials.

OTuA • Keynote Session on Mid-Spatial Frequencies and PSD—Continued

OTuA6 • 3:10 p.m. Invited
Surface Artifacts in Manufacturing and Use of Large Imaging Optics, *Terrance J. Kessler; Lab for Laser Energetics, Univ. of Rochester, USA.* Deterministic finishing yields satisfactory optics for imaging laser light. When uniform irradiance and phase are required over a large aperture, finishing and metrology methods are challenged. Holographic recording provides high space-bandwidth-product for locating artifacts.

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

3:30 p.m.–5:30 p.m. Meet the APS Journal Editors and Celebrate 50 Years of PRL, *Riverside Court, Rochester Riverside Convention Center*

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
FiO					

4:00 p.m.–5:30 p.m.
STuD • NASA at 50: NASA and Earth Science
Peter Blake; NASA Goddard Space Flight Ctr., USA, Presider

STuD1 • 4:00 p.m. Invited
Historical Overview of Earth Science from Space, *Stanley Q. Kidder; Cooperative Inst. for Res. in the Atmosphere (CIRA), Colorado State Univ., USA.* Over the past 50 years, Earth observations from space have fundamentally transformed our knowledge of Earth. I present the findings of the National Research Council Committee on Scientific Accomplishments of Earth Observations from Space.

4:00 p.m.–5:15 p.m.
FTuV • Ultrafast Nonlinear Optics
Mário F. Ferreira; Univ. of Aveiro, Portugal, Presider

FTuV1 • 4:00 p.m.
Solitary Wave Solutions for Ultrashort Optical Pulses, *Shalva Amiranashvili, Andrei Vladimirov, Uwe Bandelow; Weierstrass Inst. for Applied Analysis and Stochastics, Germany.* We consider the propagation of ultrashort optical pulses in nonlinear dispersive media without using slow envelope approximations. Shortest and most intense pulses propagating in a stationary manner are found as well as classical envelope solitons.

FTuV2 • 4:15 p.m.
Spatio-Temporal Characterization of Nonlinear Propagation of Femtosecond Pulses, *Daniel E. Adams, Thomas A. Planchon, Alexander Hrin, Jeffrey A. Squier, Charles G. Durfee; Colorado School of Mines, USA.* Nonlinear propagation through optically transparent media is characterized using two-dimensional spectral interferometry. Spatio-temporal coupling and differences in nonlinear effect versus the polarization state are quantified.

4:00 p.m.–5:30 p.m.
FTuW • Beam Combining II
Steven J. Augst; MIT Lincoln Lab, USA, Presider

FTuW1 • 4:00 p.m. Invited
Advances and Limitations in Fiber Laser Beam Combination, *Gregory D. Goodno, Joshua E. Rothenberg; Northrop Grumman Space Technology, USA.* Many methods have been proposed to combine high power fiber beams with near diffraction limited beam quality, including active and passive phasing, and spectral combination. These methods and approaches to address their limitations are discussed.

4:00 p.m.–5:00 p.m.
FTuX • Biosensing
Renu Tripathi; Delaware State Univ., USA, Presider

FTuX1 • 4:00 p.m.
Optical Molecular Profiling with Ultrashort Pulse Fiber-Based Multispectral Nonlinear Optical Microscopy, *Adam M. Larson[1], Po-Feng Lee[1], Anthony Lee[1], Kayla J. Bayless[2], Alvin T. Yeh[1]; [1]Dept. of Biomedical Engineering, Texas A&M Univ., USA, [2]Dept. of Molecular and Cellular Medicine, Texas A&M Health Science Ctr., USA.* Sub-10-fs laser pulses are delivered through single-mode optical fiber to efficiently excite multiple fluorescent proteins simultaneously. Images of extracellular matrix and fluorescent protein expressing endothelial cells are spectrally resolved using a non-descanned 16 channel detector.

FTuX2 • 4:15 p.m.
Fully Distributed Fiber Optic Biosensing Based on a Traveling Long Period Grating, *Yunjing Wang, Ming Han, Yunmiao Wang, Anbo Wang; Virginia Tech, USA.* This paper reports a novel fully distributed fiber optic biosensing technique based on a long period grating (LPG) which travels along a single mode fiber, and preliminary experiment results for precursor polymer films are given.

4:00 p.m.–5:30 p.m.
FTuY • Microscopy Superresolution and Source Engineering II
Stefan Hell; Max-Planck-Inst. fur Biophysik Chemie, Germany, Presider

FTuY1 • 4:00 p.m. Invited
Technical and Biological Applications of Photoactivated Localization Microscopy (PALM), *Hari Shroff, Eric Betzig; Howard Hughes Medical Inst., Janelia Farm Res. Campus, USA.* Recent technical and biological developments in the super-resolution technique of photoactivated localization microscopy (PALM) will be presented.

4:00 p.m.–5:30 p.m.
FTuZ • Plasmas and Optical Combs
Tom Carruthers; Natl. Science Foundation, USA, Presider

FTuZ1 • 4:00 p.m.
Optical Coherence Effects that Limit Ultrafast-Laser Channel Etching, *Jesse Dean[1], Martin Bercx[1], Felix Frank[1], Rodger Evans[1], Santiago Camacho-López[1], Marc Nantel[1,2], Robin S. Marjoribanks[1]; [1]Univ. of Toronto, Canada, [2]Ctr. for Photonics, Ontario Ctrs. of Excellence, Inc., Canada.* When etching channels with ultrafast laser pulses, the etch-rate is known to decrease with increasing depth. We show that this depth-saturation is partly due to loss of spatial coherence incurred during propagation through the channel.

FTuZ2 • 4:15 p.m.
Coherent Control of Stokes and Anti-Stokes Generation by Chirped Pulse Raman Scattering in Gas-Filled Hollow Core Photonic Crystal Fiber, *Alexey V. Chugreev, Alexander Nazarkin, Amir Abdolvand, Johannes Nold, Philip St.J. Russell; Max-Planck Res. Group, Univ. of Erlangen-Nuremberg, Germany.* Using a chirped ps-pulse as pump and tunable CW-radiation as Stokes seed, we could control vibrational excitation of CH_4 molecules on the sub-T_2 time scale and manipulate the spectrum of generated Stokes and anti-Stokes components.

NOTES

Highland G / Highland H

FiO

4:00 p.m.–5:30 p.m.
FTuAA • Microcavities and Lasers

Christian Koos; Univ. of Karlsruhe, Germany, Presider

FTuAA1 • 4:00 p.m.
Designing Large-Area, High-Efficiency, Single-Defect-Mode Vertically-Emitting Annular Bragg Lasers, *Xiankai Sun, Amnon Yariv; Caltech, USA.* By a comprehensive coupled-mode approach, we pinpoint a flaw in the previous design guidelines of vertically-emitting annular Bragg lasers and suggest new design guidelines with numerical demonstration of large-area, high-efficiency, single-defect mode lasing.

FTuAA2 • 4:15 p.m.
A Solution Processed Flexible Microcavity Laser, *Matthew Luberto[1], Nikesh Valappil[1], Subhasish Chatterjee[2], Vinod M. Menon[1,2]; [1]Queens College of City Univ. of New York, USA, [2]Graduate Ctr. of City Univ. of New York, USA.* We report lasing from a flexible one-dimensional polymer microcavity embedded with InGaP/ZnS core/shell quantum dots realized via spin coating. Tunability of emission wavelength by bending the microcavity is also demonstrated.

4:00 p.m.–5:30 p.m.
FTuBB • HHG and Attosecond Pulses II

Jon Marangos; Imperial College London, UK, Presider

FTuBB1 • 4:00 p.m. Invited
Filamentation-Driven Time-Frequency Gating of Isolated Attosecond Pulses, *Mette B. Gaarde; Louisiana State Univ., USA.* Attosecond pulses are generated by a macroscopic number of ionizing atoms interacting with an intense laser pulse. We will focus on the influence of filamentation on isolated attosecond pulse generation via high harmonic generation.

Highland J

Highland K

LS

4:00 p.m.–5:30 p.m.
LTuI • Excited State Dynamics in Semiconducting Nanoparticles

Sergei Tretiak; Los Alamos Natl. Lab, USA, Presider

LTuI1 • 4:00 p.m. Invited
Photoinduced Dynamics in Carbon Nanotubes and Colloidal Quantum Dots, *Sergei Tretiak; Los Alamos Natl. Lab, USA.* The properties and photoinduced dynamics of nanoscale bound excitons, the primary excited states of low-dimensional materials such as carbon nanotubes and colloidal quantum dots, are explored using first principle quantum-chemical approaches.

Hyatt Grand Ballroom A/B

META

4:00 p.m.–6:00 p.m.
MTuD • Plasmonic Waveguides

Costas Soukoulis; Iowa State Univ., USA, Presider

MTuD1 • 4:00 p.m.
Gain-Induced Switching and Enhancement of Nonlinear Effects in Metal-Dielectric-Metal Plasmonic Waveguides, *Georgios Veronis[1], Zongfu Yu[2], Shanhui Fan[2], Mark L. Brongersma[2]; [1]Louisiana State Univ., USA, [2]Stanford Univ., USA.* We show that optical gain provides a mechanism for on/off switching in metal-dielectric-metal plasmonic waveguides. We also show that metal-dielectric-metal waveguides filled with nonlinear materials enhance nonlinear processes such as second harmonic generation.

MTuD2 • 4:15 p.m. Invited
Low-Dimensional Optical Waves and Plasmonic Waveguides, *Junichi Takahara; Osaka Univ., Japan.* We describe principles for guiding nano-sized optical beams in plasmonic waveguide from the viewpoint of low-dimensional optical waves and wavenumber surface. We review unique properties of plane (2-D) and cylindrical (1-D) types of plasmonic waveguides.

Hyatt Grand Ballroom E/F

OF&T

4:00 p.m.–6:00 p.m.
OTuB • Molded Optics

Shai N. Shafrir; Material Science Program, Dept. of Mechanical Engineering, Univ. of Rochester, USA; Presider

OTuB1 • 4:00 p.m. Invited
Elliptical Vibration Cutting of Hard Mold Materials, *Eiji Shamoto, Norikazu Suzuki; Nagoya Univ., Japan.* A cutting method named "elliptical vibration cutting" is introduced in the present paper. It has a superior cutting performance and has been successfully applied to practical ultraprecision/micro machining of hard/brittle materials.

NOTES

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
FiO					
STuD • NASA at 50: NASA and Earth Science—Continued	**FTuV • Ultrafast Nonlinear Optics—Continued**	**FTuW • Beam Combining II—Continued**	**FTuX • Biosensing—Continued**	**FTuY • Microscopy Superresolution and Source Engineering II—Continued**	**FTuZ • Plasmas and Optical Combs—Continued**
STuD2 • 4:30 p.m. Invited **Laser Measurement of Atmospheric Components,** *Norman P. Barnes; NASA Langley Res. Ctr., USA.* Lidar and DIAL systems can provide range resolved information on many atmospheric properties of interest. Information on atmospheric parameters of interest for the entire earth can be obtained by utilizing a polar orbiting satellite. Data at higher altitudes, where the thinner atmosphere generates less signal, can be more accurate than ground stations.	**FTuV3 • 4:30 p.m.** **Spatio-Temporal Dynamics in Ultrafast Crossed-Polarized-Wave Generation,** *Charles G. Durfee[1,2], Lorenzo Canova[2], Xiao-wei Chen[2], Alexandre Trisorio[2], Aurélie Jullien[2], Olivier Albert[2], Rodrigo Lopez-Martens[2], Stoyan Kourtev[3], Nikolay Minkovski[3], Solomon M. Saltiel[3]; [1]Colorado School of Mines, USA, [2]Lab d'Optique Appliquée, France, [3]Faculty of Physics, Univ. of Sofia, Bulgaria.* We experimentally and numerically investigate the strong effects of dispersive temporal focusing, temporal filtering and spatial self-focusing on the degenerate $\chi^{(3)}$ process of crossed-polarized wave generation with sub-30fs pulses.	**FTuW2 • 4:30 p.m.** **A Novel Approach to Coherent Combining of Fiber Lasers,** *R Steven Kurti, Ramesh K. Shori; Naval Air Warfare Ctr. Weapons Div., USA.* Coherent combining of fiber lasers has recently gained significant attention. A novel method is presented for beam shaping far field intensity distributions of coherently combined fiber arrays.	**FTuX3 • 4:30 p.m.** **Pulsed UV-Light Source for Auto-Fluorescence Diagnostics,** *Peter Tidemand-Lichtenberg[1], Christian Pedersen[2], Haynes Pakhay Cheng[2], Paul Michael Petersen[2], Preben Buchhave[1]; [1]DTU Physics, Technical Univ. of Denmark, Denmark, [2]DTU Fotonik, Risoe, Denmark.* Pulsed UV light generation based on SFG between the intra-cavity field of a 946 nm laser and a Q-switched 532 nm laser is presented. Pulsed output at 340 nm is generated through nonlinear cavity dumping.	**FTuY2 • 4:30 p.m.** **Stimulated Raman Scattering with Shaped Ultrafast Pulse Trains,** *Dan Fu[1], Warren S. Warren[2]; [1]Princeton Univ., USA, [2]Duke Univ., USA.* We explore the possibility of using stimulated Raman (SRS) as a new imaging contrast and compared it to two photon absorption (TPA). Potential advantages over coherent anti-stokes Raman scattering (CARS) imaging are discussed.	**FTuZ3 • 4:30 p.m.** **Production and Characterization of Femtosecond-Laser-Induced Air Plasma,** *David R. Armbruster, Matthew J. Bohn; Air Force Inst. of Technology, USA.* 800nm, 50-fs pulsed Ti:Sapphire produced air plasma, using a 40kHz ultrasonic transducer as plasma detector. SHG crystal enables THz production via FWM. Defined upper limit of THz power produced, and detected THz via electro-optic method.
	FTuV4 • 4:45 p.m. **Controlled Interactions of Femtosecond Light Filaments in Air,** *Bonggu Shim, Samuel E. Schrauth, Christopher J. Hensley, Pui Hui, Aaron D. Slepkov, Amiel A. Ishaaya, Luat T. Vuong, Alexander L. Gaeta; Cornell Univ., USA.* We investigate controlled interactions of two long-range filaments in air generated by ultrafast laser pulses. The filaments can display attraction, fusion, and repulsion depending on their relative phase, which is in good agreement with simulations.	**FTuW3 • 4:45 p.m.** Invited **Passive Beam Combining of Fiber Lasers,** *Asher A. Friesem, Nir Davidson; Weizmann Inst. of Science, Israel.* Methods for efficient self phase locking and coherent combining of several fiber lasers are presented. These involve passive phase elements, as well as free space configuration where damage to fiber and nonlinear effects are small.	**FTuX4 • 4:45 p.m.** **Fast Evaluation of Soil Toxicity by Photon-Counts of In-Dark Wheat Seedlings,** *Samuel R. Santos[1,2], Cristiano M. Gallep[1]; [1]DTT, Ctr. Superior de Educação Tecnológica, State Univ. of Campinas, Brazil, [2]FEAGRI, State Univ. of Campinas, Brazil.* The photon-count data of wheat germinating in waste-water solutions are analyzed and correlated with sprout development, for five experimental series. The procedure is based on a simple PMT-based apparatus, enabling real-time evaluation of germination vigor.	**FTuY3 • 4:45 p.m.** **Accessing Nonlinear Contrast in Imaging Using Rapid Pulse Shaping Techniques,** *Ivan R. Piletic, Martin C. Fischer, Prathyush Samineni, Warren S. Warren; Duke Univ., USA.* We have designed an interferometric acousto-optic pulse shaper capable of shaping individual pulses differently from a mode-locked laser. The design enables the measurement of weak nonlinear optical signals at megahertz (MHz) rates for imaging applications.	**FTuZ4 • 4:45 p.m.** **Generation of VUV Radiation in a Metal Vapour and its Applications to Spectroscopy,** *Gareth D. Dickenson[1], Erich G. Rohwer[1], Christene M. Steenkamp[1], Anton C. Nortje[1], A. du Plessis[2]; [1]Laser Res. Inst., Stellenbosch Univ., South Africa, [2]CSIR Natl. Laser Ctr., South Africa.* Tuneable vacuum ultraviolet (VUV) radiation is generated by four wave sum mixing in a metal vapour. It is used for laser induced fluorescence spectroscopy of four carbon monoxide isotopomers.
STuD3 • 5:00 p.m. Invited **Global Observations: One Perspective on the Future,** *Berrien Moore; Climate Central, USA.* Berrien Moore III, director of the Institute for the Study of Earth, Oceans, and Space at UNH, shared in the 2007 Nobel Peace Prize awarded to the Intergovernmental Panel on Climate Change (IPCC); Dr. Moore was the coordinating lead author for the final chapter, "Advancing our Understanding," of the IPCC's Third Assessment Report.	**FTuV5 • 5:00 p.m.** **Pulse Splitting of Temporal Super-Gaussian Pulses in the Anomalous Dispersion Regime,** *Samuel E. Schrauth, Bonggu Shim, Aaron D. Slepkov, Luat T. Vuong, Alexander L. Gaeta; Cornell Univ., USA.* We experimentally observe splitting of temporal super-Gaussian pulses undergoing collapse in the anomalous group-velocity-dispersion regime, which is in contrast to the behavior of temporal Gaussian pulses. These results are in good agreement with numerical simulations.			**FTuY4 • 5:00 p.m.** **Optimal Coherence Using Chirped Pulse Trains for Enhanced Imaging,** *Svetlana A. Malinovskaya; Dept. of Physics and Engineering Physics, Stevens Inst. of Technology, USA.* We propose adiabatic passage control scheme to maximize coherence in selected vibrational mode. We demonstrate possibility for sustaining high coherence in the presence of dephasing by two chirped pulse trains. Method may enhance CARS imaging.	**FTuZ5 • 5:00 p.m.** **High Average Power fs Frequency Comb via Injection Locked Amplification for Intracavity HHG,** *Justin Paul, Jane Lee, R. Jason Jones; College of Optical Sciences, Univ. of Arizona, USA.* We demonstrate a scalable approach for the generation of high average power ultrashort pulse trains (~7 W) by optically injection locking a fs amplification cavity. The source is used as a seed for intracavity HHG.

Highland G / Highland H — FiO

FTuAA • Microcavities and Lasers—Continued

FTuAA3 • 4:30 p.m.
Unidirectional Single-Frequency Laser Emission from Coupled Spiral-Shaped Microlasers, *Xiang Wu, Hao Li, Liying Liu, Lei Xu; State Key Lab for Advanced Photonic Materials and Devices, Dept. of Optical Science and Engineering, Fudan Univ., China.* A coupled spiral-shaped microlaser was fabricated. The microlaser uses a ring resonator to suppress the multi-whispering-gallery-modes of a spiral cavity coupling to the ring. As a result, unidirectional single-frequency laser emission is achieved.

FTuAA4 • 4:45 p.m.
Metal Coated Subwavelength Laser Resonators with Low Threshold Gain, *Amit Mizrahi, Vitaliy Lomakin, Boris A. Slutsky, Maziar P. Nezhad, Liang Feng, Yeshaiahu Fainman; Univ. of California at San Diego, USA.* We demonstrate that a low refractive index layer in metal coated laser resonators can significantly reduce the threshold gain. A subwavelength resonator with a sufficiently low threshold gain to lase at room temperature is presented.

FTuAA5 • 5:00 p.m.
Scattering of a Microsphere WGM Due to a Small Particle, *Lev I. Deych, Joel Rubin; Dept. of Physics, Queens College, USA.* The problem of scattering of whispering gallery modes in a microsphere due to a single dipole scatterer is solved exactly. The real origin of the double peak structure of experimentally observed scattering spectra is explained.

FTuBB • HHG and Attosecond Pulses II—Continued

FTuBB2 • 4:30 p.m.
High Order Harmonic Generation Based on Resonant Plasmon Field Enhancement, *Seungchul Kim, Jonghan Jin, In-Yong Park, Seung-Woo Kim; KAIST, Republic of Korea.* We demonstrate a new method that requires no extra cavities in HHG with the aid of resonant plasmons within a metallic nanostructure. The harmonics of higher than 15th could be observed with various gas jets.

FTuBB3 • 4:45 p.m. Invited
High-Order Harmonic Generation in Laser-Produced Plasma, *Rashid A. Ganeev; Scientific Assn. Akadempribor, Acad. of Sciences of Uzbekistan, Uzbekistan.* High-order harmonic generation (HHG) in low-ionized plasma is presented. The resonance enhancement of single harmonic and the application of doubly charged ions and nanoparticles for the HHG are discussed.

Highland J

Highland K — LS

LTuI • Excited State Dynamics in Semiconducting Nanoparticles—Continued

LTuI2 • 4:30 p.m. Invited
Measurement and Control of Ultrafast Relaxation in the Fine Structure of Nanocrystal Excitons, *Cathy Y. Wong, Jeongho Kim, Gregory D. Scholes; Univ. of Toronto, Canada.* We report studies of relaxation processes through the fine structure of the first excitonic state of semiconductor nanocrystals. A cross polarized, third-order transient grating method is used, and results are simulated using a kinetic model.

LTuI3 • 5:00 p.m.
Ultrafast Optical Preparation, Control, and Detection of a Single Hole Spin in a Quantum Dot, *Andrew J. Ramsay[1], Stephen J. Boyle[1], Roman S. Kolodka[1], A. Mark Fox[1], Maurice S. Skolnick[1], Hiu Yun Liu[2], Mark Hopkinson[2]; [1]Univ. of Sheffield, UK, [2]EPSRC Natl. Ctr. for III-V Technologies, UK.* We demonstrate the fast optical control of a single hole spin in an InGaAs quantum dot by using picosecond pulse excitation and photocurrent readout techniques. The optical control is implemented with 20ps gate time.

Hyatt Grand Ballroom A/B — META

MTuD • Plasmonic Waveguides—Continued

MTuD3 • 4:45 p.m.
A Hybrid Plasmonic Waveguide for Subwavelength Confinement and Long Range Propagation, *Rupert F. Oulton[1], Volker J. Sorger[1], Guy Bartal[1], Xiang Zhang[1,2]; [1]University of California at Berkeley, USA, [2]Materials Science Div., Lawrence Berkeley Natl. Lab, USA.* We describe the coupling between surface plasmons and semiconductor fiber modes across a nanoscale gap leading to "capacitor-like" energy storage for sub-wavelength transmission and long range propagation. The approach could enable nano-scale semiconductor-based plasmonics.

MTuD4 • 5:00 p.m.
Optical Interconnects via Long-Range Surface Plasmon Polariton Waveguides, *Jung Jin Ju[1], Suntak Park[1], Min-su Kim[1], Jintae Kim[1], Seung Gu Park[1], Jungsun Choi[1], M. H. Lee[2]; [1]Electronics and Telecommunications Res. Inst., Republic of Korea, [2]Sungkyunkwan Univ., Republic of Korea.* We investigate waveguide characteristics of very thin gold and silver strips embedded in a low loss polymer clad for optical interconnect applications at telecom wavelengths, and also demonstrate a TM-mode laser diode for transmitter.

Hyatt Grand Ballroom E/F — OF&T

OTuB • Molded Optics—Continued

OTuB2 • 4:30 p.m. Invited
Ultrasonic Vibration Assisted Polishing of Micro Aspherical Molds, *Hirofumi Suzuki; Chubu Univ., Japan.* Ultrasonic vibration-assisted polishing method with piezo-electric actuators was proposed and 4-axes (X,Y,Z,B) controlled machine was developed in order to finish the aspherical molds/dies of steep angles. In the experiment, the tungsten carbide molds were polished.

OTuB3 • 5:00 p.m.
Establishment of an ABAQUS Model to Predict Final Size and Shape of a Molded Glass Lens, *Scott W. Gaylord, Balajee Ananthasayanam, Laeticia Petit, Vincent Blouin, Paul Joseph, Kathleen Richardson; Clemson Univ., USA.* We present the development of a model used to predict final geometry of molded lenses using glass viscosity data, friction data determined from ring compression tests, and structural relaxation data from differential scanning calorimetry tests.

STuD • NASA at 50: NASA and Earth Science—Continued

FTuW • Beam Combining II—Continued

FTuW4 • 5:15 p.m.
A Novel Common Cavity Approach for Coherent Beam Combining with Reducing Path-Length Sensitivity, *Mercedeh Khajavikhan, James R. Leger; Laser and Micro-Optical Systems Lab, Dept. of Electrical and Computer Engineering, Univ. of Minnesota, USA.* We investigate a new beam-combining architecture with reduced sensitivity to path-length variations. Additional feedback allows the cavity to oscillate in several supermodes. By selecting the proper supermode, perfect coherence and higher output radiance is achieved.

FTuY • Microscopy Superresolution and Source Engineering II—Continued

FTuY5 • 5:15 p.m.
Quenching Processes in Fluorescence Nanoscopy, *Eva Rittweger, Brian R. Rankin, Scott E. Irvine, Volker Westphal, Stefan W. Hell; Max-Planck-Inst. for Biophysical Chemistry, Germany.* We prove that stimulated emission is the dominant depletion mechanism for super resolution microscopy induced by red-shifted illumination for fluorescent dyes in contrast to Mn-doped ZnSe quantum dots which exhibit depletion by excited state absorption.

FTuZ • Plasmas and Optical Combs—Continued

FTuZ6 • 5:15 p.m.
Direct Stabilization of a Microresonator Frequency Comb at Microwave Frequencies, *Pascal Del'Haye, Olivier Arcizet, Albert Schliesser, Tobias Kippenberg; Max-Planck-Inst. for Quantum Optics, Germany.* We demonstrate the generation of frequency combs with microwave mode spacing in monolithic silica resonators. Direct stabilization of the mode spacing using fast thermal effects is shown.

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

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

7:00 p.m.–8:30 p.m. OSA Member Reception, *Lilac Ballroom North and South, Rochester Riverside Convention Center*

7:00 p.m.–10:00 p.m. LS Banquet, *Triphammer Grill, 60 Browns Race, Rochester, Phone: 585.262.2700*

Highland G / Highland H — FiO

FTuAA • Microcavities and Lasers—Continued

FTuAA6 • 5:15 p.m.
Mode Stability in Robust Microcavity Solid-State Dye Laser, *Sergei Popov[1], Rui Zhang[1], Ari T. Friberg[1,2,3], Sergey Sergeyev[4]; [1]Royal Inst. of Technology, Sweden, [2]Helsinki Univ. of Technology, Finland, [3]Univ. of Joensuu, Finland, [4]Waterford Inst. of Technology, Ireland.* Polymeric microcavity dye laser modeled with finite element method demonstrates excellent tolerance against geometrical distortions of the cavity. Mode wavelengths remain stable with two types of potential impairments might occur during the manufacturing process.

FTuBB • HHG and Attosecond Pulses II—Continued

FTuBB4 • 5:15 p.m.
Realization and Characterization of XUV Multilayer Coating for Attosecond Pulses, *Michele Suman[1,2], Maria Guglielmina Pelizzo[1], David L. Windt[3], Gianni Monaco[1,2], Sara Zuccon[1,2], Nicolosi Piergiorgio[1,2]; [1]Information Engineering Dept., Univ. of Padova, Italy, [2]Natl. Res. Council, Natl. Inst. for the Physics of the Matter, LUXOR Lab, Italy, [3]Reflective X-ray Optics LLC, USA.* Multilayer techniques are used to obtain high reflectivity in the XUV spectral region. This work presents the realization of aperiodic multilayer mirrors for attosecond pulse compression and their characterization through reflectivity and photoemission spectroscopy measurements.

Highland J

Highland K — LS

LTuI • Excited State Dynamics in Semiconducting Nanoparticles—Continued

LTuI4 • 5:15 p.m.
Direct Observation and Selection of Acoustic Phonon Quantum Beats in Colloidal CdSe Quantum Dots, *Vanessa Huxter, Shun S. Lo, Anna Lee, Gregory D. Scholes; Univ. of Toronto, Canada.* We use polarization dependent ultrafast third order transient grating measurements to directly observe quantized 10 to 30 wavenumber acoustic phonon modes in CdSe colloidal quantum dots. Simulations of the data will also be presented.

Hyatt Grand Ballroom A/B — META

MTuD • Plasmonic Waveguides—Continued

MTuD5 • 5:15 p.m.
Spectral Analysis of Scattering in Metal-Insulator-Metal Waveguides and Related Equivalent Circuit Models, *Sukru Ekin Kocabas[1], Georgios Veronis[2], David A. B. Miller[1], Shanhui Fan[1]; [1]Stanford Univ., USA, [2]Louisiana State Univ., USA.* We show that the two-dimensional MIM plasmonic waveguide has a discrete and a continuous spectrum, similar to the dielectric slab waveguide. Using this complete spectrum, we calculate the equivalent circuit model for waveguide junctions.

MTuD6 • 5:30 p.m.
Fast Light and Negative Index Modes in Plasmonic Waveguides, *Eyal Feigenbaum, Noam Kaminski, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* When negative slope of the dispersion curve is encountered, the propagating light may be either "fast light" or "backward propagating." We show that the same photonic (plasmonic) system can support both these disjoint solutions.

MTuD7 • 5:45 p.m.
Silicon Plasmonic Waveguides for the Infrared and Terahertz Regions, *Richard Soref[1], Robert E. Peale[2], Walter Buchwald[1], Justin W. Cleary[2]; [1]AFRL/RYHC, USA, [2]Univ. of Central Florida, USA.* Silicon-based plasmonic waveguides are proposed and studied theoretically. A silicon core, silicide underlay, and metal overlay yield propagation losses estimated to be less than 15 cm^{-1} over the 50 μm to 1000 μm wavelength range.

Hyatt Grand Ballroom E/F — OF&T

OTuB • Molded Optics—Continued

OTuB4 • 5:15 p.m.
Precision Molding of Precision Glass Optics, *Shriram Palanthandalam[1], Nam-Ho Kim[1], Yazid Tohme[2]; [1]Univ. of Florida at Gainsville, USA, [2]Moore Nanotechnology Systems LLC, USA.* This paper presents a physics-based computational tool to predict the final shape of a precision optical element after compression molding process. This tool can be used to design the appropriate mold geometry for manufacturing lenses.

OTuB5 • 5:30 p.m. Invited
Recent Trends in Precision Polymer Optics Fabrication, *William S. Beich, Loretta Fendrock, Chris Smock, Nicholas Turner; G-S Plastic Optics, USA.* Precision polymer-optics, manufactured by injection-molding techniques, is a key enabling technology for a range of sophisticated devices. We discuss how companies looking to employ polymer-optical components benefit by working with manufacturers having vertically-integrated manufacturing environments.

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

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

7:00 p.m.–8:30 p.m. OSA Member Reception, *Lilac Ballroom North and South, Rochester Riverside Convention Center*

7:00 p.m.–10:00 p.m. LS Banquet, *Triphammer Grill, 60 Browns Race, Rochester, Phone: 585.262.2700*

8:00 a.m.–10:00 a.m.
FWA • Quantum Telecom I
Colin J. McKinstrie; Bell Labs, Alcatel-Lucent, USA, Presider

FWA1 • 8:00 a.m. Invited
Long-Distance QKD with Superconducting Single-Photon Detectors, *Richard Hughes; Los Alamos Natl. Lab, USA.* Abstract not available.

FWA2 • 8:30 a.m. Tutorial
Devices, Protocols and Architectures for Quantum Communication, *Yoshihisa Yamamoto; Stanford Univ., USA.* Abstract, photo and bio not available.

8:00 a.m.–10:00 a.m.
SWA • Polarized Light: 200 Years since Malus' Discovery I
Taco D. Visser; Vrije Univ., Netherlands, Presider

SWA1 • 8:00 a.m. Invited
Recent Developments in Theory of Polarization of Stochastic Light Beams, *Emil Wolf; Univ. of Rochester, USA.* The considerable progress made in recent years in clarifying basic questions regarding polarization properties of light beams will be reviewed.

SWA2 • 8:30 a.m. Invited
Polarization Effects in High Field Interactions, *Chunlei Guo; Univ. of Rochester, USA.* Polarization effects will be discussed for various phenomena in laser-matter interactions at high intensities.

8:00 a.m.–10:00 a.m.
FWB • Optical Switching and Routing
Zheng Wang; MIT, USA, Presider

FWB1 • 8:00 a.m. Invited
A 130 Gb/s Multiwavelength Transparent TDM-WDM Optical Router, *Ioannis Tomkos[1], J. Leuthold[2], A. Ellis[3], G. Zarris[4], P. Petropoulos[5]; [1]Athens Info. Tech., Greece, [2]Inst. of High-Frequency and Quantum Electronics, Univ. of Karlsruhe, Germany, [3]Photonic Systems Group, Univ. College Cork, Ireland, [4]Univ. of Essex, UK, [5]Optoelectronics Res. Ctr., Univ. of Southampton, UK.* A novel switch concept is presented for transparent optical grooming of 10 and 40 Gb/s traffic in an access network onto a metro core ring network operated at 130 Gb/s traffic.

FWB2 • 8:30 a.m. Invited
Intelligence-Enabled Packet-Centric Metro/Edge Optical Networks, *Song Jiang; Alcatel-Lucent, USA.* This talk focuses on the key enablers for metro/edge optical networks, including new optical technologies for flexible node architectures, integration of optical intelligence software, and service-aware optical monitoring.

8:00 a.m.–10:00 a.m.
FWC • Nonlinear Dynamics and Chaos
Demetrios Christodoulides; College of Optics and Photonics, CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, Presider

FWC1 • 8:00 a.m. Invited
Spatio-Temporal Complexity in Broad-Area Photonics, *William J. Firth; Univ. of Strathclyde, UK.* Cavity solitons are self-localized dissipative structures. In broad area devices, large numbers can coexist. Individual solitons can be stable, or exhibit complex dynamics. Issues of complexity, control, and potential application will be discussed.

FWC2 • 8:30 a.m.
***Ab Initio* Semiclassical Multimode Lasing Theory of Chaotic Cavity Lasers,** *Li Ge[1], Hakan E. Türeci[2], Stefan Rotter[3], Douglas Stone[1]; [1]Dept. of Physics, Yale Univ., USA, [2]Inst. of Quantum Electronics, ETH, Switzerland, [3]Inst. for Theoretical Physics, Vienna Univ. of Technology, Austria.* We apply a novel *ab initio* semiclassical multimode lasing theory to various chaotic dielectric cavity lasers. For the quadrupole the lasing modes, output power and emission pattern depend strongly on the pump profile.

8:00 a.m.–10:00 a.m.
FWD • Microscopy for Diagnostics
Tyler S. Ralston; Univ. of Illinois Urbana-Champaign, USA, Presider

FWD1 • 8:00 a.m. Tutorial
***In vivo* Reflectance Confocal Microscopy,** *James M. Zavislan; Inst. of Optics, Univ. of Rochester, USA.* Reflectance confocal microscopy provides real time, cellular resolution images of *in vivo* and *ex vivo* tissues. I will describe the development of these systems and how the properties of tissue influence the optical and overall system design.

Jim Zavislan received his B.S. with High Honors in optics in 1981 and his Ph.D. in optics in 1988 from the University of Rochester. From 1987 to 1992, he was a Research Staff Member at IBM Almaden Research Center. In 1992 he co-founded Lucid, Inc. where he led the company's research and product development efforts. He directed the design and development of two commercial confocal microscopes (VivaScope 1000 and VivaScope 2000), and initiated and directed USA-wide clinical studies at four sites. In 2002, he joined the Institute of Optics, University of Rochester as an associate professor. He holds additional appointments as associate professor in dermatology, biomedical engineering and ophthalmology, University of Rochester School of Medicine and Dentistry. He is an inventor or co-inventor on 50 US patents, an author or co-author on 20 papers, and a co-editor of a book.

8:00 a.m.–10:00 a.m.
FWE • Optically Probed Dynamics in Condensed Matter Systems
Peter Norreys; Rutherford Appleton Lab, UK, Presider

FWE1 • 8:00 a.m.
Temporal Dynamics of Magnetic Parametric Resonance at Optical Frequencies, *William M. Fisher, Stephen C. Rand; Univ. of Michigan, USA.* Bound electron dynamics are investigated experimentally to show that intense optical magnetism arises through an ultrafast parametric process on sub-picosecond timescales in several transparent, non-magnetic insulators, in agreement with numerical simulations.

FWE2 • 8:15 a.m.
Light Induced 2-Dimensional Laser Array in a Dye-Doped Azo Cholesteric Liquid Crystal, *Boyoung Kang, Hyunhee Choi, Mi-Yun Jeong, Jeong W. Wu; Ewha Womans Univ., Republic of Korea.* Light induced 2-dimensional laser array in a dye-doped azo choelsteric liquid crystal cell using a photo isomerization of azo-nematic liquid crystal is demonstrated. Spatially addressing of lasing emission could be realized.

FWE3 • 8:30 a.m.
Carrier Dynamics and Two Photon Processes in PbS Quantum Dots, *Gero Nootz[1,2], Lazaro A. Padilha[1], Trenton Ensley[1], Scott Webster[1], David J. Hagan[1,2], Eric W. Van Stryland[1,2], Sjoerd Hoogland[3], Edward H. Sargent[3]; [1]CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Physics Dept., Univ. of Central Florida, USA, [3]Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.* Carrier dynamics and two-photon-absorption in PbS-quantum dots are investigated. Evidence of radiative recombination directly from higher excited states is observed. The two-photon-absorption spectrum shows discrete, high contrast absorption features explained by a four band model.

Highland G — FiO

8:00 a.m.–10:00 a.m.
FWF • Photonic Crystal Fibers
Chris Xu; Cornell Univ., USA, Presider

FWF1 • 8:00 a.m. Invited
Nonlinear Optics in Gas-Filled Photonic Band-Gap Fibers, *Alexander Gaeta; Cornell Univ., USA.* Hollow-core band-gap fibers offer an unmatched platform for performing interactions of atoms/molecules with tightly confined light. I will review our recent research efforts on such interactions with rubidium atoms in these fibers.

FWF2 • 8:30 a.m.
All Glass Endless Single Mode Photonic Crystal Fibers, *Liang Dong, Hugh A. McKay, Libin Fu; IMRA America Inc., USA.* All glass endless single-mode PCFs are demonstrated for the first time. The elimination of air holes enables ease of fabrication and the fibers to be spliced and handled as conventional fibers.

Highland H — LS

8:00 a.m.–10:00 a.m.
LWA • Lasers in Space
Frederick J. Raab; LIGO Hanford Observatory, USA, Presider

LWA1 • 8:00 a.m. Invited
Laser Applications on European Space Missions, *Eamonn Murphy; European Space Agency-European Space Res. and Technology Ctr. (ESA-ESTEC), Netherlands.* The European Space Agency has ongoing space mission developments where laser applications are playing a central role. The implementation of lasers for these missions is a key mission driver in terms of performance and reliability.

LWA2 • 8:30 a.m. Invited
Planetary Laser Communications, *Hamid Hemmati; JPL, USA.* Status of planetary high-rate laser communications and precision laser ranging is reviewed. Orders of magnitude improvement over the state-of-the-art is anticipated.

Highland J — LS

8:00 a.m.–10:00 a.m.
LWB • Quantum Optics for Information Processing
Jonathan Home; NIST, USA, Presider

LWB1 • 8:00 a.m. Invited
Quantum Control of Spins and Photons in Diamond, *Mikhail Lukin; Harvard Univ., USA.* We will discuss development of new approaches for quantum control of single spins and single photons in diamond. Novel applications of these techniques to realization of quantum repeaters and nanoscale magnetic sensing will be described.

LWB2 • 8:30 a.m. Invited
Chip-Scale Non-Linear Optics, *Michal Lipson; Cornell Univ., USA.* We demonstrate non-linear effects in high confinement silicon devices including ultra-low-power (<mW) parametric frequency conversion of Gbit/s data and pulse compression using ultra fast cavity modulation.

Highland K — LS

8:00 a.m.–9:45 a.m.
LWC • Transient Spectroscopy in Conjugated Polymers I
Lewis Rothberg; Univ. of Rochester, USA, Presider

LWC1 • 8:00 a.m. Invited
Ultrafast Dynamics of Photoexcitations in pi-Conjugated Polymers and Polymer/Fullerene Blends, *Valy Vardeny; Univ. of Utah, USA.* The ultrafast dynamics of primary photoexcitations in pi-conjugated polymer films and solutions, and polymer/fullerene blends are studied using the transient polarized photomodulation pump-probe technique in a broad spectral range of 0.2-2.7 eV.

LWC2 • 8:30 a.m. Invited
Ultrafast Photonics in Polymers, *Guglielmo Lanzani, Jenny Clark, Tersilla Virgili, Juan Cabanillas-Gonzales; Dept. di Fisica, Politecnico di Milano, Italy.* Conjugated polymers are discussed for their potential role in photonics. Their photophysics is investigated by applying ultrafast spectroscopy. Applications regard amplification, lasing and all optical control in waveguides, plastic optical fibers and lasers.

Hyatt Grand Ballroom A/B — META

8:00 a.m.–10:00 a.m.
MWA • Plasmonics—Devices and Applications I
Junichi Takahara; Osaka Univ., Japan, Presider

MWA1 • 8:00 a.m.
Integrated Photodetectors in Metal Slot Plasmonic Waveguides, *Dany-Sebastien Ly-Gagnon, Sukru Ekin Kocabas, David A. B. Miller; Stanford Univ., USA.* We developed a characteristic impedance model to investigate the transmission properties of plasmonic metal slot waveguides. We used this model to design photodetectors integrated in metal slot plasmonic waveguides.

MWA2 • 8:15 a.m.
Integrated Negative Index Modulator on Optical Fiber, *Pratik Chaturvedi[1], Keng Hsu[1], Hyungjin Ma[1], Shih-Yuan Wang[2], Nicholas Fang[1]; [1]Univ. of Illinois, Urbana-Champaign, USA, [2]Hewlett Packard Labs, USA.* We investigate a novel design of negative index metamaterial modulator integrated on optical fiber. Numerical studies indicate strong modulation of fiber-guided optical signal, when the resonance frequency of the metamaterial is detuned with optical excitation.

MWA3 • 8:30 a.m.
Efficiency Enhancement of Electroluminescence Using Individual or Ordered Array of Metal Nanoparticles, *Jacob B. Khurgin[1], Greg Sun[2]; [1]Johns Hopkins Univ., USA, [2]Univ. of Massachusetts at Boston, USA.* We evaluate the enhancement of electroluminescence efficiency of semiconductor placed in the vicinity of isolated metal nanoparticles and their arrays and show that using randomly assembled particles holds an advantage over the ordered arrays.

Hyatt Grand Ballroom E/F — OF&T

8:00 a.m.–10:00 a.m.
OWA • Metrology Fundamentals
Ulf Griesmann; NIST, USA, Presider

OWA1 • 8:00 a.m. Invited
KEYNOTE: Hartmann and Shack-Hartmann Tests, Applications and Recent Developments, *Daniel Malacara-Hernández, Armando Gómez-Vieyra; Ctr. de Investigaciones en Optica AC, Mexico.* The Hartmann test dates back from 1904 and is still widely used in their original configuration, basically using the same principle. Their most popular applications will be described. Techniques to measure the eye aberrations will be described.

FWA • Quantum Telecom I—Continued

FWA3 • 9:15 a.m. Invited

Superconducting Photon Detectors for Quantum Information and Communication, *Sae Woo Nam; NIST, USA.* There is increasing interest in using superconducting optical photon detectors in a variety of applications in quantum information science and technology. I will describe our work on two types of superconducting detectors.

SWA • Polarized Light: 200 Years since Malus' Discovery I—Continued

SWA3 • 9:00 a.m. Invited

Singularities in the Near Field of a Photonic Crystal, *L. (Kobus) Kuipers; Ctr. for Nanophotonics, FOM Inst. AMOLF, Netherlands.* We will present local measurements of phase- and polarization singularities on the nanoscale in the near field of a photonic crystal.

FWB • Optical Switching and Routing—Continued

FWB3 • 9:00 a.m. Invited

Photonic Integrated Devices for Fast Switching, *Pietro Bernasconi; Bell Labs, Alcatel-Lucent, USA.* Recent examples of monolithically integrated devices and their relevance in optical data networks are reviewed. Fast tunable lasers, high-speed wavelength converters, and arrayed time buffers for fast-switching applications are described.

FWC • Nonlinear Dynamics and Chaos—Continued

FWC3 • 8:45 a.m.

Examination of Chaos-Based Encryption and Retrieval in a Hybrid Acousto-Optic Device, *Monish R. Chatterjee, Mohammed Al-Saedi; Univ. of Dayton, USA.* Using external signal modulation of the diffracted light from a hybrid acousto-optic device under chaos, the resulting encrypted signal is examined via its nonlinear dynamics, and retrieved using parametrically synchronized chaotic demodulation.

FWC4 • 9:00 a.m. Invited

Nonlinear Dynamics in Deformed Microcavity Lasers, *Takahisa Harayama; Dept. of Nonlinear Science, ATR Labs, Japan.* We report a theory and a demonstration of lasing in several deformed microcavities which are known to be chaotic, and discuss their applications to switching and optical sensing devices.

FWD • Microscopy for Diagnostics—Continued

FWD2 • 8:45 a.m.

Intrinsic Nonlinear Optical Signatures of Neuronal Activity, *Henry C. Liu[1], Martin C. Fischer[2], Prathyush Samineni[2], Yasmin Escobedo-Lozoya[3], Ryohei Yasuda[3], Warren S. Warren[4]; [1]Dept. of Electrical Engineering, Princeton Univ., USA, [2]Dept. of Chemistry, Duke Univ., USA, [3]Dept. of Neurobiology, Duke Univ., USA, [4]Dept. of Chemistry, Radiology, and Biomedical Engineering, Duke Univ., USA.* Using novel femtosecond laser pulse shaping techniques and a virtually background-free detection strategy we demonstrate strong self-phase modulation signatures of neuronal activity in hippocampal brain slices without the use of exogenous contrast agents.

FWD3 • 9:00 a.m.

Biochemical and Morphological Assessment of Normal and Pre-Cancerous Engineered Tissue Using Two-Photon Excited Autofluorescence, *Jonathan M. Levitt[1], Martin Hunter[1], Margaret McLaughlin-Drubin[2], Karl Münger[2], Irene Georgakoudi[1]; [1]Dept. of Biomedical Engineering, Tufts Univ., USA, [2]Dept. of Medicine, Brigham and Women's Hospital, USA.* We present a method to non-invasively identify quantitative morphological and biochemical changes between normal and pre-cancerous engineered tissue from depth resolved autofluorescence. Morphology and metabolic activity were assessed using fractal modeling spectral deconvolution.

FWD4 • 9:15 a.m.

Fluorescence Confocal Mosaicing Microscopy of Basal Cell Carcinomas *ex vivo*: Demonstration of Rapid Surgical Pathology with High Sensitivity and Specificity, *Daniel S. Gareau, Julie Karen, Steven Dusza, Kishwer Nehal, Milind Rajadhyaksha, Milind Rajadhyaksha; Sloan-Kettering Cancer Ctr., USA.* Fluorescence confocal mosaicing (FCM) detects basal cell carcinomas in Mohs surgical skin excisions within 5-9 minutes, compared to 20-45 for frozen histology. The sensitivity is 96.6% and specificity is 89.2%. FCM is sensitive and rapid.

FWE • Optically Probed Dynamics in Condensed Matter Systems—Continued

FWE4 • 8:45 a.m.

Photocatalytic Activities of TiO_2 Thin Films with Au Nanoparticles under Ultraviolet and Visible Light Irradiation, *Eisuke Yokoyama, Moriaki Wakaki; Tokai Univ., Japan.* TiO_2 thin films containing Au nanoparticles were prepared using the sol-gel method. Photocatalytic activities were analyzed for degradation of stearic acid. The results of the experiment showed the Au nanoparticles increase photocatalytic activity of TiO_2.

FWE5 • 9:00 a.m.

Directional Absorption and Emission in Hybrid Polymer-Quantum Dot Nanostructures Studied by Scanning Probe and Fluorescence Microscopy, *Kevin T. Early, Kevin D. McCarthy, Michael Y. Odoi, P. K. Sudeep, Todd Emrick, Michael D. Barnes; Univ. of Massachusetts Amherst, USA.* The optical properties of hybrid organic/quantum dot nanostructures, probed at the single molecule limit by scanning probe and fluorescence microscopy, reveal novel and highly directional absorption and emission characteristics, ideal for polarization-based switching applications.

FWE6 • 9:15 a.m.

Spatial Continuous Tuning of Laser Emission in a Dye-Doped Cholesteric Liquid Crystal Wedge Cell, *Mi-Yun Jeong, Hyunhee Choi, Jeong W. Wu; Ewha Womans Univ., Republic of Korea.* Spatial tuning of lasing wavelength in a dye-doped cholesteric liquid crystal wedge cell is demonstrated. Between two dislocation lines, the lasing wavelength is continuously owing to the gradient in the cholesteric helical pitch.

FWF • Photonic Crystal Fibers—Continued

FWF3 • 8:45 a.m.
Broadband Guiding Silica Hollow-Core Fibers for Gas-Phase Nonlinear and Quantum Optics, *Peter J. Roberts[1], Fetah Benabid[2], Francois Couny[2], Philip S. Light[2], Natalie V. Wilding[2]; [1]DTU Fotonik, Dept. of Photonics Engineering, Danish Technical Univ., Denmark, [2]Ctr. for Photonics and Photonic Materials, Dept. of Physics, Univ. of Bath, UK.* Designs for broadband guiding hollow-core fiber, comprising a single solid material component, are compared. Prospects for broadband low-loss propagation, nonlinear optical phenomena such as multiple Raman line generation, and quantum optical processes, are discussed.

FWF4 • 9:00 a.m.
Ultralow-Power Four-Wave Mixing with Rb in a Hollow-Core Photonic Bandgap Fiber, *Vivek Venkataraman, Pablo Londero, Amar Bhagwat, Aaron Slepkov, Alexander Gaeta; Cornell Univ., USA.* We demonstrate extremely efficient four-wave mixing with gain >100 and frequency conversion efficiency as high as 58% at microwatt pump powers in Rb vapor confined to a hollow-core photonic bandgap fiber.

FWF5 • 9:15 a.m.
Sub-33 fs Pulses from an All-Fiber Parabolic Amplifier Employing Hollow-Core Photonic Bandgap Fiber, *Yishan Wang[1,2], JinKang Lim[1], Rodrigo Amezcua-Correa[3], Jonathan C. Knight[3], Brian R. Washburn[1]; [1]Kansas State Univ., USA, [2]State Key Lab of Transient Optics and Photonics, Xi'an Inst. of Optics and Precision Mechanics, China, [3]Ctr. for Photonics and Photonic Materials, Univ. of Bath, UK.* Sub-33 fs, 1 nJ pulses are generated in a Er-doped fiber amplifier composed of a normal dispersion gain fiber, a low dispersion slope photonic crystal fiber, and a highly nonlinear fiber.

LWA • Lasers in Space—Continued

LWA3 • 9:00 a.m. Invited
Developing Lasers for Space Applications: A Practical Guide, *Cheryl Asbury; JPL, USA.* The intention of this talk is to provide some practical tips to use when developing lasers for space that can be used whether starting with a blank drawing board or with a commercial design.

LWB • Quantum Optics for Information Processing—Continued

LWB3 • 9:00 a.m.
A Study of the Absorption Properties of Maximally Path Entangled Number States, *Bill Plick, Christoph F. Wildfeuer, Jonathan P. Dowling; Hearne Inst. for Theoretical Physics, Louisiana State Univ., USA.* We characterize the absorption of realistic maximally path entangled number states. Specifically we investigate the result of down conversion, filters and a beam splitter. Our goal is maximal absorption. Applications include quantum lithography and metrology.

LWB4 • 9:15 a.m.
Optical Bi-Stability and Stationary Entanglement in Two Coupled Quantum Dots in a Cavity, *Arnab Mitra, Reeta Vyas; Univ. of Arkansas, USA.* We study the generation of entanglement between two coupled quantum-dots interacting with a quantized cavity field, preservation of steady-state entanglement in the presence of detuning and decoherence, and optical bi-stability shown by the cavity field.

LWC • Transient Spectroscopy in Conjugated Polymers I—Continued

LWC3 • 9:00 a.m. Invited
Time-Resolved Spectroscopy of Exciton Dynamics and Fission in Organic Molecular Crystalline Materials, *Chris Bardeen, Frank C. Spano, Tai-Sang Ahn, Astrid M. Muller, Yuri S. Avlasevich, Wolfgang W. Schoeller, Klaus Müllen; Univ. of California at Riverside, USA.* Time-resolved spectroscopy is used to determine the structure of initially excited singlet exciton states in polyacene molecular crystals. The role of spatial delocalization plays in exciton fission (multiple exciton generation) in tetracene is investigated.

MWA • Plasmonics—Devices and Applications I—Continued

MWA4 • 8:45 a.m. Invited
Applications of Nanoplasmonics, *Naomi Halas; Rice Univ., USA.* Abstract not available.

MWA5 • 9:15 a.m.
Protein-Membrane Interaction Probed by Single Plasmonic Nanoparticles, *Jan Becker, Cristina Baciu, Andreas Janshoff, Carsten Sönnichsen; Inst. for Physical Chemistry, Univ. of Mainz, Germany.* We present a nanosized plasmonic particle sensor with bio-membrane coverage and monitor binding events of proteins via the introduced spectral shift using the fast single particle spectroscopy (fastSPS) method.

OWA • Metrology Fundamentals—Continued

OWA2 • 8:45 a.m.
Comparison of Transmitted Wavefront Measurements Using Phase Retrieval and Shack-Hartmann Wavefront Sensing, *Gregory R. Brady[1], Stephen K. Mack[2], James R. Fienup[1], Robert Michaels[2], Colleen R. Clar[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Corning Tropel Corp., USA.* Measurements of the transmitted wavefront of a precision lens were made using phase retrieval and Shack-Hartmann sensing. The measurements were performed on-axis at the g-, h-, and i-lines. The measurements agree to nearly λ/100 RMS.

OWA3 • 9:00 a.m.
Calibration Limits for Interferometric Measurements, *Ping Zhou, James Burge; College of Optical Sciences, Univ. of Arizona, USA.* This paper presents how to quantify the measurement noises in optical surface testing. We also discussed how to apply a smoothing filter in map registration and subtraction.

OWA4 • 9:15 a.m.
Robust Estimation of PV for Optical Surface Specification and Testing, *Chris Evans; Zygo Corp., USA.* Peak-to-valley is a characterization of optical figure is biased and noise sensitive. PVr is a proposed robust amplitude parameter which provides automatic filtering, is insensitive to system resolution, and can be related to imaging performance.

Wednesday, October 22

FWA • Quantum Telecom I—Continued

FWA4 • 9:45 a.m.
Fiber Optic Quantum Key Distribution with Single Photons from Quantum Dots, *Martin B. Ward[1], Philip M. Intallura[1,2], Tristan Farrow[1,2], Paola Atkinson[2], Oleg Z. Karimov[1], Zhiliang Yuan[1], Patrick See[1], David A. Ritchie[2], Andrew J. Shields[1]; [1]Toshiba Res. Europe Ltd., UK, [2]Cavendish Lab, Univ. of Cambridge, UK.* Telecom wavelength single photon emission is achieved from InAs/GaAs quantum dots in both optically and electrically excited devices. It has recently been possible to demonstrate quantum key distribution over fiber lengths up to 35 km.

SWA • Polarized Light: 200 Years since Malus' Discovery I—Continued

SWA4 • 9:30 a.m. Invited
Polarization Patterns in the Daylight and Cosmic Skies, *Mark R. Dennis; Physics Dept, Univ. of Bristol, UK.* The study of the polarization pattern of the daylight sky has a long history, with contributions from Arago, Brewster and Chandrasekhar. This pattern shares similar features with the polarization pattern of the cosmic microwave background.

FWB • Optical Switching and Routing—Continued

FWB4 • 9:30 a.m. Invited
Demonstration of All-Optical Deflection Routing for All-Optical Packet-Switched Networks, *Ping Kong A. Wai; Hong Kong Polytechnic Univ., Hong Kong.* We demonstrated all-optical deflection routing of packets for a 2 by 2 node using a Fabry-Perot laser diode for all-optical processing of the packet headers. Both the header and the payload rates are 10 Gb/s.

FWC • Nonlinear Dynamics and Chaos—Continued

FWC5 • 9:30 a.m.
Nonlinear Dynamics of Coupled Lasers: From Weak to Strong Coupling, *Hartmut Erzgräber[1], Sebastian Wieczorek[1], Bernd Krauskopf[2]; [1]Univ. of Exeter, UK, [2]Univ. of Bristol, UK.* We study the dynamics of coupled lasers by means of a composite-cavity mode approach, which is valid for arbitrary coupling. A continuous transition from weak to strong coupling reveals different dynamical mechanisms for laser locking.

FWC6 • 9:45 a.m.
Dynamics of Pulse Propagation in a Four Level Atomic System, *Jon P. Davis, Francesco A. Narducci; Naval Air Systems Command, USA.* We explore theoretically the dynamics of pulse propagation in a four level atomic medium under conditions when the controlling fields are suddenly changed while the pulse is in the medium.

FWD • Microscopy for Diagnostics—Continued

FWD5 • 9:30 a.m.
Differentiation of Unstained Lymphocytes and Granulocytes Using Multi-Wavelength Reflectance Confocal Microscopy, *Zhao Wang[1], James M. Zavislan[1,2]; [1]Dept. of Biomedical Engineering, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* A multiwavelength reflectance confocal microscope using three wavelengths illumination was built to image unstained immune cells. Using wavelength dependence as a contrast source, unstained lymphocytes and granulocytes were differentiated with sensitivity and specificity above 90%.

FWD6 • 9:45 a.m.
Confocal Raman Microscopy of *Streptococcus sanguis* and *mutans,* *Brooke D. Beier[1], Robert G. Quivey[2], Andrew J. Berger[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Ctr. for Oral Biology, Univ. of Rochester, USA.* Confocal Raman microscopy has been used to differentiate the spectra from biofilms of oral bacterial species *Streptococcus sanguis* and *mutans.* Improvements in processing algorithms allow this study to be performed using glass as a substrate.

FWE • Optically Probed Dynamics in Condensed Matter Systems—Continued

FWE7 • 9:30 a.m.
Optical Properties of Semiconductors with Nanotips Structure, *Moriaki Wakaki[1], Yousuke Kanzaki[1], Hideo Miyake[2], Kazumasa Hiramatsu[2]; [1]Tokai Univ., Japan, [2]Mie Univ., Japan.* Nanotips (needle like) structures are constructed on GaN and Si surfaces by reactive ion etching (RIE) using Cl plasma. The optical properties like reflectance spectra were characterized and analyzed using EMA (effective medium approximation).

FWE8 • 9:45 a.m.
Characterizing Dielectric Tensors with Biaxial Ellipsometry, *Paula K. Smith, Stephen C. McClain, Russell A. Chipman; College of Optical Sciences, Univ. of Arizona, USA.* Dielectric tensors of liquid crystal polymer retarder films are determined by measuring the sample with an angle-of-incidence Mueller matrix imaging polarimeter. An optimization routine finds the dielectric tensor that best fits the Mueller matrix data.

10:00 a.m.–10:30 a.m. Coffee Break, *Empire Hall, Rochester Riverside Convention Center*

10:00 a.m.–2:00 p.m. Exhibit Open, *Empire Hall, Rochester Riverside Convention Center*

FWF • Photonic Crystal Fibers—Continued

FWF6 • 9:30 a.m.
Forward-Brillouin Scattering of Light at Acoustic Resonances in SF6 Glass PCF, *Holger Hundertmark, Andre Brenn, Silke Rammler, Philip St. J. Russell; Max-Planck-Res.-Group, Univ. of Erlangen-Nuremberg, Germany.* Using a polarization-spectroscopy technique, we observe spontaneous forward Brillouin scattering of light in birefringent lead-silicate PCF. The higher stress-optical coefficient of the glass means that signals can be detected even in short lengths of fiber.

FWF7 • 9:45 a.m.
Stability of Optical Frequency References Based on Acetylene-Filled Kagome-Structured Hollow Core Fiber, *Andrew M. Jones[1], Kevin Knabe[1], JinKang Lim[1], Rajesh Thapa[1], Karl Tillman[1], Francois Couny[2], Philip S. Light[2], Fetah Benabid[2], Brian R. Washburn[1], Kristan L. Corwin[1]; [1]Kansas State Univ., USA, [2]Ctr. for Photonics and Photonics Materials, Univ. of Bath, UK.* A fiber laser at 1532 nm is stabilized to a sub-Doppler feature in acetylene inside hollow core kagome structured photonic crystal fiber. Short term stability is evaluated by beating against a Cr:forsterite laser-based frequency comb.

LWA • Lasers in Space—Continued

LWA4 • 9:30 a.m. Invited
Coherent Optical Transponder at Femto-Watt Light Levels, *John Dick[1], Meirong Tu[1], Kevin Birnbaum[1], Dmitry Strekalov[1], Ertan Salik[2], Nan Yu[1]; [1]JPL, USA, [2]California State Polytechnic Univ., USA.* We investigated two schemes for coherent optical transponder at extremely low light levels. Optical phase locking at femtowatt levels has been demonstrated and characterized. We also discuss an alternative "injection seeded" approach, and ranging experiments.

LWB • Quantum Optics for Information Processing—Continued

LWB5 • 9:30 a.m.
Demonstration of Basic Geometric Rotations on Rare-Earth Atomic Ensemble, *Mingzhen Tian[1], Ijaz Zafarullah[2], Tiejun Chang[3], Krishna R. Mohan[4], Wm. Randall Babbitt[2,4], [1]Dept. of Physics and Astronomy, George Mason Univ., USA, [2]Dept. of Physics, Montana State Univ., USA, [3]NIST, USA, [4]Spectrum Lab, Montana State Univ., USA.* Two basic Bloch vector rotations on a rare-earth ensemble were demonstrated through geometric paths driven by composite laser pulses, which can be used to compose any single qubit gate. The operation fidelity was evaluated.

LWB6 • 9:45 a.m.
Two-Mode Cavity QED beyond the Weak Field Limit, *James Clemens[1], Perry Rice[1], Luis Orozco[2], Pablo Barberis[2]; [1]Miami Univ., USA, [2]Univ. of Maryland, Joint Quantum Inst., USA.* We consider multilevel atoms in a cavity supporting two orthogonally polarized modes, one driven and one undriven. For weak driving, the system has a quasi steady state, with bistability and interesting dynamics at larger drives.

LWC • Transient Spectroscopy in Conjugated Polymers I—Continued

LWC4 • 9:30 a.m.
Temporal and Spectral Nonlinear Absorption Characterization of a Hybrid Porphyrin-Squaraine-Porphyrin Macromolecule, *Scott Webster[1], Susan A. Odom[2], Davorin Peceli[1], Lazaro A. Padilha[1], Olga V. Przhonska[3], Honghua Hu[1], Gero Nootz[1], A. D. Kachkovski[4], Stephen Barlow[2], H. L. Anderson[5], Seth R. Marder[2], David J. Hagan[1], Eric W. Van Stryland[1]; [1]Univ. of Central Florida, USA, [2]School of Chemistry and Biochemistry and Ctr. for Organic Photonics and Electronics, Georgia Tech, USA, [3]Inst. of Physics, Natl. Acad. of Sciences, Ukraine, [4]Inst. of Organic Chemistry, Natl. Acad. of Sciences, Ukraine, [5]Chemistry, Chemistry Res. Lab, Univ. of Oxford, UK.* The nonlinear absorption mechanisms of a porphyrin-squaraine-porphyrin macromolecule have been studied with femto/pico/nanosecond pulsewidths. Two-photon absorption of the macromolecule is ~10× larger than the constituents and is explained by intra-molecular charge transfer.

MWA • Plasmonics – Devices and Applications I—Continued

MWA6 • 9:30 a.m.
Chemoselective Metal Nanohole Arrays for Compact Multiplexed Chemical Sensors, *Ganapathi Subramania, Jeremy B. Wright, Shawn M. Dirk, Igal Brener; Sandia Natl. Labs, USA.* We have demonstrated submicron periodic metal nanohole array with voltage selective chemical functionalization using compound 4-nitrodiazonium-tetrafluoroborate. The resulting spectral shift of ~70nm indicates the potential for use in high sensitivity chemical detection.

MWA7 • 9:45 a.m.
Development of Localized Surface Plasmon Resonance Sensor Based on Nanoimprinting Technology, *Takeo Nishikawa, Hideyuki Yamashita, Ryosuke Hasui, Rie Masuda, Satoshi Fujita, Yutaro Okuno; OMRON Corp., Japan.* This paper introduces a localized surface plasmon resonance biosensor fabricated by using nanoimprinting technology. The detection of a cancer marker (alpha-fetoprotein) by a desktop proto-model based on this principle is also presented.

OWA • Metrology Fundamentals—Continued

OWA5 • 9:30 a.m. Invited
Absolute Flatness Measurement with Two Plates, *Chen Xu[1], Lei Chen[1], Fei Liu[2], Jianyi Yin[1]; [1]School of Electronic Engineering and Optoelectronic Technology, Nanjing Univ. of Science and Technology, China, [2]Ctr. for Applied Optics, Univ. of Alabama, USA.* We present a novel method of using two optical plates to realize the absolute flatness test. The basic theory is derived. The experimental results are in good agreement with that obtained by Zygo's three-flat application.

10:00 a.m.–10:30 a.m. Coffee Break, *Empire Hall, Rochester Riverside Convention Center*

10:00 a.m.–2:00 p.m. Exhibit Open, *Empire Hall, Rochester Riverside Convention Center*

10:30 a.m.–12:00 p.m. FWG • Beam Combining III

Gregory D. Goodno; Northrop Grumman Space Technology, USA, Presider

FWG1 • 10:30 a.m. Invited

Electronic Beam Combination of Fiber Amplifier Arrays, *Thomas M. Shay[1], J. T. Baker[2], C. A. Robin[1], C. Vergien[1], Clint Zeringue[1], David Gallant[2], T. J. Bronder[1], D. Pilkington[1], Chunte A. Lu[1], Anthony D. Sanchez[1]; [1]AFRL, USA, [2]Boeing LTS Inc., USA.* The first reference beam free phase-locking of a high-power fiber amplifier array is reported. We also present a theoretical model predicting that it is possible to phase over 100 elements using this technique.

FWG2 • 11:00 a.m.

Characterization of Diffraction Gratings for Use in Wavelength Beam Combining at High Average Power, *Steven J. Augst, Ryan C. Lawrence, T. Y. Fan, Daniel V. Murphy, Antonio Sanchez; MIT Lincoln Lab, USA.* Wavelength beam combined architectures typically depend on the use of diffraction gratings. We explore the high average power limitations of commercial gratings using experiments and theoretical modeling.

10:30 a.m.–12:00 p.m. SWB • Polarized Light: 200 Years since Malus' Discovery II

Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA, Presider

SWB1 • 10:30 a.m. Invited

Polarization in Hyper-NA Lithography, *Bruce Smith; Dept. of Microelectronic Engineering, Rochester Inst. of Technology, USA.* Hyper-NA immersion lithography is becoming the dominant technology for semiconductor device fabrication. At the corresponding large angles in the image media, control of polarization becomes necessary. Innovative approaches to polarization control are evolving to provide maximum enhancement from polarization effects.

SWB2 • 11:00 a.m. Invited

Polarization and Coherence Optics: Historical Perspective, Status and Future Directions, *Christian Brosseau; Univ. de Bretagne Occidentale, France.* We describe some of the milestones, of the past three centuries, along the road towards increased understanding of polarization optics. The story is divided into four main steps, from Bartholinus to Wolf.

10:30 a.m.–12:00 p.m. FWH • Coherent Communications

Jonathan Hu; Univ. of Maryland, Baltimore County, USA, Presider

FWH1 • 10:30 a.m. Invited

High-Speed Coherent Optical Receivers Realized in DSP, *Noriaki Kaneda, Andreas Leven, Young-Kai Chen; Alcatel-Lucent, USA.* Digital coherent optical detection has emerged as a promising technology for next generation optical communication. DSP realized in FPGA for coherent optical QPSK receivers has proven its capability in the high-speed optical communication environment.

FWH2 • 11:00 a.m. Invited

High-Speed Transparent Optical Networks, *Sethumadhavan Chandrasekhar; Bell Labs, Alcatel-Lucent, USA.* Recent progresses in long haul transparent optical networks that support high data rates are reviewed. Advanced modulation formats and passband-optimized reconfigurable add/drop multiplexers are some of the key enablers for next generation optical networking.

10:30 a.m.–12:00 p.m. FWI • Systems for Optical Manipulation III

Carlos López-Mariscal; NIST, USA, Presider

FWI1 • 10:30 a.m. Invited

From 3-D Optical Tweezers to 3-D Optical Machines: Volumetric Optical Force Control and Imaging by Holographic Methods, *Yohai Roichman, David G. Grier; New York Univ., USA.* Optical tweezers with complex 3-D force fields were formed by holographic methods. We used accurate 3-D imaging of tracer particles to demonstrate novel optical machines such as equi-intensity traps, bi-directional pumps, and brownian optical engines.

FWI2 • 11:00 a.m.

Phase-Space Analysis of Generalized Sampling and Non-Uniform Sampling Expansions, *Markus E. Testorf[1], Bryan Hennelly[2]; [1]Dartmouth College, USA, [2]Natl. Univ. of Ireland, Maynooth, Ireland.* Based on existing generalizations of Shannon's sampling expansion a new non-uniform sampling expansion is suggested. Applications in the context of digital holography and compressive imaging are considered.

10:30 a.m.–12:00 p.m. FWJ • Targeted Therapy and Molecular Imaging

Enrico Gratton; Univ. of Illinois at Urbana-Champaign, USA, Presider

FWJ1 • 10:30 a.m. Invited

Photoactivated Tissue Repair, *Robert Redmond; Wellman Ctr. for Photomedicine, Harvard Medical School, Massachusetts General Hospital, USA.* This presentation summarizes recent progress made in the development of a new light-driven, sutureless tissue repair method in a variety of tissues including skin, nerve, eye, blood vessel and cartilage.

FWJ2 • 11:00 a.m. Invited

Bioluminescent Probes, *Wafik S. El-Deiry; Univ. of Pennsylvania, USA.* Abstract not available.

10:30 a.m.–12:00 p.m. FWK • Petawatt Lasers and Laser Facilities

Koichi Yamakawa; Japan Atomic Energy Agency, Japan, Presider

FWK1 • 10:30 a.m. Invited

Petawatt Lasers: Status Quo and Perspectives, *Efim A. Khazanov; Inst. of Applied Physics, Russian Acad. of Science, Russian Federation.* We discuss physical and technical aspects of petawatt lasers based on neodymium glass, Ti:sapphire, and optical parametric chirped pulse amplifiers as well as future perspectives including usage of Cr:YAG ceramics and Yb ceramics.

FWK2 • 11:00 a.m. Invited

Energy Deposition Using PW Lasers, *Peter A. Norreys; Rutherford Appleton Lab, UK.* The understanding of energy transport by fast electrons generated in intense laser-plasma interactions is crucial for the successful applications of petawatt-class laser systems. I will describe recent experiments that have investigated these properties in detail.

Highland G — FiO

10:30 a.m.–12:00 p.m.
FWL • Photonic Band Gap Devices
Liang Dong; IMRA America Inc., USA, Presider

FWL1 • 10:30 a.m.
The Effects of Lattice Shape on Photonic Band Gaps, *Arash Mafi, Karl W. Koch; Corning Inc., USA.* We report on the influence of geometry and lattice shape parameter on the bandgaps associated with propagation in the plane and out of the plane of periodicity in photonic crystals.

FWL2 • 10:45 a.m.
Exciton-Polaritons in Double-Quantum-Well Based Resonant Photonic Crystals, *David Goldberg[1], Lev I. Deych[1], Vinod Menon[1], Alexander Lisyansky[1], Vadim Tokranov[2], Mikhail Yakimov[2], Serge Oktyabrsky[2]; [1]Dept. of Physics, Queens College, USA, [2]College of Nanoscale Science and Technology, Univ. at Albany SUNY, USA.* Using angle dependant reflection and luminescence spectroscopy we demonstrate coupling of two exciton resonances in periodic double-well GaAs/AlGaAs based multiple-quantum-well structures to Bragg modes of the background photonic crystal.

FWL3 • 11:00 a.m.
Observation of Slow Light Tunneling in Coupled Periodic Waveguides, *Sangwoo Ha[1], Andrey A. Sukhorukov[1], David A. Powell[1], Ilya V. Shadrivov[1], Andrei V. Lavrinenko[2], Dmitry N. Chigrin[3], Yuri S. Kivshar[1]; [1]Nonlinear Physics Ctr., Res. School of Physical Sciences and Engineering, Australian Natl. Univ., Australia, [2]DTU Fotonik, Dept. of Photonics Engineering, NanoDTU, Technical Univ. of Denmark, Denmark, [3]Physikalisches Inst., Univ. Bonn, Germany.* We report the first observation of slow-light tunneling between coupled periodic waveguides, designed to simultaneously support two slow-light states with different phase velocities in the same frequency range. Numerical simulations agree well with experimental results.

Highland H — LS

10:30 a.m.–11:45 a.m.
LWD • Slow Light in Atomic Systems
Danielle A. Braje; NIST, USA, Presider

LWD1 • 10:30 a.m. Invited
All-Optical Delay of Images Using Slow Light, *J. C. Howell, R. M. Camacho, C. J. Broadbent, P. Vudya Setu; Univ. of Rochester, USA.* Recent developments in slow and stopped images, and precision measurements will be discussed.

LWD2 • 11:00 a.m.
Observation of Lasing without Inversion in a Doppler-Broaden Atomic Medium, *Haibin Wu, Julio Gea-Banacloche, Min Xiao; Dept. of Physics, Univ. of Arkansas, USA.* Lasing without population inversion has been experimentally observed in a system with three-level rubidium atoms inside an optical ring cavity. The gain and lasing peaks can be controlled by the pumping power and atomic density.

Highland J — LS

10:30 a.m.–12:00 p.m.
LWE • Cold Molecules I
Nicholas Bigelow; Univ. of Rochester, USA, Presider

LWE1 • 10:30 a.m. Invited
Cold and Ultracold Polar Molecules, *Jun Ye; JILA, NIST, Univ. of Colorado, USA.* We report two experiments working with cold and ultracold polar molecules. First, magnetically trapped ground-state OH molecules are used for cold collisions. Second, we describe progress towards quantum degenerate gas of ground-state KRb molecules.

LWE2 • 11:00 a.m. Invited
Coherent Control of Ultracold Molecules, *Christiane Koch; Freie Univ. Berlin, Germany.* Based on the example of short-pulse photoassociation, I will discuss how ultracold matter may be merged with coherent control. The concept of "shaping" the photoassociation dynamics yields larger molecule formation rates and better final-state control.

Highland K — LS

10:30 a.m.–12:00 p.m.
LWF • Transient Spectroscopy in Conjugated Polymers II
Chris Bardeen; Univ. of California at Riverside, USA, Presider

LWF1 • 10:30 a.m. Invited
Coherent Aspects of Energy Transfer Dynamics in Conjugated Polymers, *Gregory Scholes, Elisabetta Collini; Univ. of Toronto, USA.* Electronic energy transfer is a fundamental process occurring in conjugated polymers subsequent to exciton formation. We report how structural disorder and electronic coupling among conformational subunits conspire to cause coherent effects in ultrafast energy transfer.

LWF2 • 11:00 a.m. Invited
Essential Optical States in π-Conjugated Polymer Films, *Sumit Mazumdar[1], Zhendong Wang[1], Demetra Psiachos[1], Alok Shukla[2]; [1]Univ. of Arizona, USA, [2]Indian Inst. of Technology, India.* We show that in thin films of conjugated polymers with nonnegligible interchain interactions, photoexcitation leads to both optical excitons and excimers. The excimer plays a strong role in both photoluminescence and photoinduced absorptions.

Hyatt Grand Ballroom A/B — META

10:30 a.m.–12:30 p.m.
MWB • Apertures and Slits in Metal Films
Naomi Halas; Rice Univ., USA, Presider

MWB1 • 10:30 a.m.
Squeezing and Bending an Image through a Subwavelength Hole, *Mario G. Silveirinha[1], Nader Engheta[2]; [1]Univ. of Coimbra, Portugal, [2]Univ. of Pennsylvania, USA.* Exploiting epsilon-near-zero (ENZ)-based tunneling, we show how a complex image may be transported through a tiny subwavelength hole with negligible amplitude and phase distortion. ENZ materials can overcome the effect of diffraction at small apertures.

MWB2 • 10:45 a.m.
Loss Mechanisms in Extraordinary Optical Transmission Gratings, *Troy Ribaudo[1], Karen Freitas[1], Daniel Wasserman[1], Eric Shaner[2], Jeff G. Cederberg[2]; [1]Univ. of Massachusetts at Lowell, USA, [2]Sandia Natl. Labs, USA.* A full angular and spectral investigation of Extraordinary Optical Transmission gratings fabricated on GaAs substrates has been performed. Semiconductor doping effects on the transmission through, and diffraction from, these subwavelength plasmonic structures are presented.

MWB3 • 11:00 a.m.
The Physics of Extraordinary Optical Transmission through Subwavelength Slits and Slit Arrays, *John Weiner[1], Domenico Pacifici[2], Gaëtan Lévêque[3]; [1]Univ. of Sao Paulo, Brazil, [2]Caltech, USA, [3]Tyndall Natl. Inst., Ireland.* Various approaches to the basic physics of optical transmission through subwavelength structures have led to diverse, conflicting interpretations, predictions. We present a series of experimental and analytical studies explaining essential transmission behavior through subwavelength slits.

Hyatt Grand Ballroom E/F — OF&T

10:30 a.m.–12:30 p.m.
OWB • Testing, CGHs and Aspheres
Quandou Wang; NIST, USA, Presider

OWB1 • 10:30 a.m. Invited
On the Calibration of Diffractive Nulls for Transmission Tests of Aspheric Components, *Johannes Schwider, A. Berger, N. Lindlein, K. Maritel, I. Harder; Inst. of Optics, Information and Photonics, Max Planck Res. Group, Germany.* A transmitted light test of aspheric components lacking stigmatic properties is discussed. The interferometric test uses diffractive optical elements as a null element whose errors shall be removed by a procedure using several relative measurements.

OWB2 • 11:00 a.m.
Radius Measurement of Spherical Surfaces With Large Radii-of-Curvature Using Dual-Focus Zone Plates, *Quandou Wang, Guangjun Gao, Ulf Griesmann; NIST, USA.* The measurement of spherical surface radii exceeding few meters presents a challenge, because the familiar radius-bench method requires large part displacements. Dual-focus zone plates can extend the radius-bench method to measurements of large radii.

FWG • Beam Combining III—Continued

FWG3 • 11:15 a.m.
Spectral Beam Combining of Fiber Lasers by Volume Bragg Gratings, *Oleksiy Andrusyak[1], Vadim Smirnov[2], George Venus[1], Leonid Glebov[1]; [1]College of Optics and Photonics, CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]OptiGrate, USA.* Output power of 770 W from a system combining five fiber lasers with 91.7% efficiency is demonstrated with spectral separation between channels of 0.5 nm and no distortions in diffracted beams.

FWG4 • 11:30 a.m. Invited
Nonlinear Beam Cleanup and Coherent Beam Combining of Fiber Lasers, *Arnaud Brignon, Jean Pierre Huignard; Thales Res. and Technology, France.* For energy/power scaling of fiber lasers we demonstrate the following concepts: Nonlinear SBS beam cleanup of a multimode Yb fiber amplifier and coherent phasing of 2-D single mode Er fiber laser arrays.

SWB • Polarized Light: 200 Years since Malus' Discovery II—Continued

SWB3 • 11:30 a.m. Invited
The Evolution of Polarization Calculi, *Russell Chipman; Univ. of Arizona, USA.* The development of the Jones and Mueller calculi will be reviewed along with the evolution of their applications in polarimetry and optical design.

FWH • Coherent Communications—Continued

FWH3 • 11:30 a.m. Invited
Real-Time Measurements of a 40 Gb/s Coherent System, *Han Henry Sun; Nortel Networks, Canada.* Network operators desire ubiquitous connections that traverse their 50GHz wavelength agile networks, without needing any optical compensation. Coherent detection provides several thousand kilometers of reach at 40Gb/s, and allows digital filters to combat dispersion, PMD and PDL.

FWI • Systems for Optical Manipulation III—Continued

FWI3 • 11:15 a.m.
Two-Photon Induced Refractive-Index Modulation in Quantum-Rod-Dispersed Photopolymers, *Xiangping Li, James W. M. Chon, Min Gu; Ctr. for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne Univ. of Technology, Australia.* Quantum rods are incorporated in azo-dye-dispersed polymers to enhance the recording efficiency via a two-photon energy transfer process. Polarization-encoded data storage is also feasible in this material.

FWI4 • 11:30 a.m.
Information Theory of High-Precision Measurements, *Mohammad A. Khan, Karan D. Mohan, A. N. Dharamsi; Old Dominion Univ., USA.* We formulate a broadly applicable theory of high-precision measurements. A quantitative measure of information in signals is given and it is shown that signals with greater structure carry a quantifiably larger amount of information.

FWJ • Targeted Therapy and Molecular Imaging—Continued

FWJ3 • 11:30 a.m. Invited
Molecular Imaging of Tumor Responses to Photodynamic Therapy *in vivo*, *Soumya Mitra, Thomas Foster; Univ. of Rochester, USA.* Photodynamic therapy (PDT) elicits significant molecular and host responses, which are understood to be important to long-term tumor control. We demonstrate the ability to image these responses using confocal fluorescence in superficial tumors *in vivo*.

FWK • Petawatt Lasers and Laser Facilities—Continued

FWK3 • 11:30 a.m. Invited
To Be Announced, *Jean-Claude Kieffer; Inst. Natl. de la Recherche Scientifique (INRS) Energie, Matériaux et Télécommunications, Canada.* Abstract not available.

NOTES

FWL • Photonic Band Gap Devices—Continued

FWL4 • 11:15 a.m.
Three-Dimensional Photonic Crystals for Refractive Index Sensing in Microfluidics, *Jing Wu, Daniel Day, Min Gu; Ctr. for Micro-Photonics, Swinburne Univ. of Technology, Australia.* We present the concept of a refractive index sensor based on the integration of a three-dimensional photonic crystal with a microchannel by femtosecond laser fabrication. The sensor performance was characterized by FTIR spectroscopy.

FWL5 • 11:30 a.m.
Nonlocal Gap Solitons in Infiltrated Photonic Crystal Fibers, *Francis H. Bennet[1], Per D. Rasmussen[1,2], Christian R. Rosberg[1], Andrey A. Sukhorukov[1], Ole Bang[2], Dragomir N. Neshev[1], Wieslaw Krolikowski[1], Yuri S. Kivshar[1]; [1]Nonlinear Physics Ctr. and Laser Physics Ctr., Ctr. for Ultrahigh-Bandwidth Devices for Optical Systems, Australian Natl. Univ., Australia, [2]DTU Photonics, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark.* We report the first observation of nonlocal discrete gap solitons in infiltrated PCFs. We employ thermal defocusing nonlinearity of the liquid to study the soliton properties and the effects of boundaries of the periodic structure.

LWD • Slow Light in Atomic Systems—Continued

LWD3 • 11:15 a.m.
Storing and Manipulating Multimode Transverse Images in Hot Atomic Vapors, *Praveen K. Vudyasetu, David J. Starling, Ryan M. Camacho, John C. Howell; Univ. of Rochester, USA.* We demonstrate storage and retrieval of images carried by optical pulses in hot atomic vapor and demonstrate image correlation operation using this set up.

LWD4 • 11:30 a.m.
Slow-Light-Based Delayed Quantum Coherent Control for All-Optical Information Processing, *Byoung S. Ham; Inha Univ., Republic of Korea.* We have observed delayed nondegenerate four-wave mixing processes based on slow light. The delayed observation has potential to all-optical buffered switches and routers in all-optical information processing.

LWE • Cold Molecules I—Continued

LWE3 • 11:30 a.m. Invited
Cold Heteronuclear Dimers in Electric Fields: Rovibrational Dynamics and Photoassociation, *Rosario Gonzalez Ferez; Univ. of Granada, Spain.* We investigate the effects of a static electric field on the rovibrational spectra of several alkali polar dimers in their electronic ground state, and on their formation via stimulated emission from ultracold ground state atoms.

LWF • Transient Spectroscopy in Conjugated Polymers II—Continued

LWF3 • 11:30 a.m. Invited
Implications of Delayed Luminescence for Conjugated Polymer Photophysics, *E. J. Wesely, A. P. Marchetti, Y. H. Geng, S. H. Chen, Lewis Rothberg; Univ. of Rochester, USA.* We observe unusual decay dynamics of persistent luminescence in a model oligofluorene. Generation of interchain triplet polaron pairs can account for the dynamics but not the reduction of photoluminescence in films relative to dilute solution.

MWB • Apertures and Slits in Metal Films—Continued

MWB4 • 11:15 a.m.
Engineering the Dielectric Function of Subwavelength Aperture Arrays, *Amit K. Agrawal[1], Z. Valy Vardeny[2], Ajay Nahata[1]; [1]Dept. of Electrical and Computer Engineering, Univ. of Utah, USA, [2]Physics Dept., Univ. of Utah, USA.* We experimentally measure the complete complex dielectric response of plasmonic lattices at terahertz frequencies, and demonstrate that it is significantly different from bulk metals. We further demonstrate the ability to arbitrarily engineer this dielectric response.

MWB5 • 11:30 a.m.
Rigorous Vectorial Plasmonic Diffraction and the Double-Slit Experiment, *Eitan Hirshberg, Pavel Ginzburg, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* Rigorous vectorial formulation of surface-plasmon-polariton optics is derived using Green functions, and employed for variety of 2-D plasmonic elements, i.e. the plasmonic double split. Importance for near field plasmonic surface optics will be discussed.

OWB • Testing, CGHs and Aspheres—Continued

OWB3 • 11:15 a.m.
An Innovative Non-Contact Surface Measurement Solution for Asphere, Deep Parabolic, and Ogive Radome Geometries, *Joseph Meisenzahl, Scott Bambrick, Mike Bechtold, Scott DeFisher, Dave Mohring; OptiPro Systems, USA.* OptiPro Systems is developing a non-contact measurement system using state of the art motion control and calibration techniques while integrating a high accuracy non-contact probe to precisely scan surfaces of aspheric, parabolic, and ogive shapes.

OWB4 • 11:30 a.m.
Fabrication and Characterisation of Aspheric Resonator Mirror for High-Power CO_2 Laser, *RamaGopal V. Sarepaka[1], Gufran S. Khan[1], Satish K. Dubey[1], Vinod Mishra[1]; Gangasharan Singh[1], Kashidas Chattopadhyay[1], A. K. Biswas[2], L. M. Kukreja[2]; [1]Central Scientific Instruments Organisation, India, [2]Raja Ramanna Ctr. for Advanced Technology, India.* Aspheric-graded phase mirrors for high-power CO_2 laser are developed with submicron profile error. A study is performed to understand the effects of various machining parameters on surface topography to achieve optimum surface profile.

NOTES

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
FiO					
FWG • Beam Combining III—Continued	**SWB • Polarized Light: 200 Years since Malus' Discovery II—Continued**	**FWH • Coherent Communications—Continued**	**FWI • Systems for Optical Manipulation III—Continued**	**FWJ • Targeted Therapy and Molecular Imaging—Continued**	**FWK • Petawatt Lasers and Laser Facilities—Continued**

FWI5 • 11:45 a.m.
Spectral-Interferometric Characterization of Nonlinear-Dispersive Similariton, *Aram Zeytunyan[1], Garegin Yesayan[1], Levon Mouradian[1], Pascal Kockaert[2], Philippe Emplit[2], Frédéric Louradour[3], Alain Barthélémy[3]; [1]Yerevan State Univ., Armenia, [2]Univ. Libre de Bruxelles, Belgium, [3]XLIM Inst. de Recherche, France.* We experimentally demonstrate the spectronic nature of the similariton generated in a nonlinear-dispersive fiber without gain and its key specificity of spectro-temporal similarity using the spectral-interferometric method of pulse complete characterization.

NOTES

FWL • Photonic Band Gap Devices—Continued

FWL6 • 11:45 a.m.
Polarization Dependence of Inter-Core Coupling in Multi-Core Photonic Crystal Fibers, *Yan Yan[1], Jean Toulouse[1], Iavor Velchev[2], Slava V. Rotkin[1]; [1]Dept. of Physics, Lehigh Univ., USA, [2]Laser Ctr., Fox Chase Cancer Ctr., USA.* We report on a theoretical and experimental study of the polarization dependence of the inter-core coupling in triple-core photonic crystal fibers (PCFs). The ordinary and extraordinary components of the coupling coefficients are determined.

LWE • Cold Molecules I—Continued

LWF • Transient Spectroscopy in Conjugated Polymers II—Continued

MWB • Apertures and Slits in Metal Films—Continued

MWB6 • 11:45 a.m.
Experiment and Simulation on the Continuous Numerical Aperture Proposition of Sub-Wavelength Annular Aperture, *Chun-Chieh Fang, Chu-Yi Wang, Tsung-Dar Cheng, Kuang-Chong Wu, Chih-Kung Lee; Inst. of Applied Mechanics, Natl. Taiwan Univ., Taiwan.* We focused the radial polarized light beam onto a sub-wavelength annular aperture (SAA) and compared the characteristics of SAA and traditional objective lens. We propose that SAA is a continuous numerical aperture optical element.

MWB7 • 12:00 p.m.
ENZ-Inspired Optical Tunneling through Arbitrarily-Shaped Plasmonic Narrow Channels and Sharp Bends, *Andrea Alù, Nader Engheta; Univ. of Pennsylvania, USA.* We suggest an alternative mechanism for optical tunneling, based on subwavelength waveguides at cut-off. Such novel setup for enhanced transmission is only weakly dependent of the channel length and geometry, including arbitrary abruptions and bends.

MWB8 • 12:15 p.m.
Second Harmonic Generation from Metallic Sub-Wavelength Slits and Scatterers, *Marco Centini[1], Alessandro Benedetti[1], Concita Sibilia[1], Mario Bertolotti[1], M. A. Vincenti[2], Michael Scalora[2]; [1]Univ. of Rome, Italy, [2]US Army, USA.* We examine second harmonic generation from metallic sub-wavelength slits and scatterers. In the enhanced transmission regime, we find that the C,oulomb contribution far exceed magnetic contributions to second harmonic generation.

OWB • Testing, CGHs and Aspheres—Continued

OWB5 • 11:45 a.m.
Ray-Tracing Considering Form Errors on the Fabrication Process Using Local Interpolation for Aspheric Lens Surface, *Shin-ya Morita, Yutaka Yamagata, Akitake Makinouchi; Inst. of Physical and Chemical Res. (RIKEN), Japan.* We propose a new ray-tracing method considering form errors on the fabrication process of aspheric lens using a local interpolation technique proposed by Nagata, to obtain nanometer-accurate lens models without increasing the number of patches.

OWB6 • 12:00 p.m.
Scratch Detection on Spherical Lenses Using Specular Reflection and Fourier Descriptors, *Robson Barcellos, Giuseppe A. Cirino, Luiz N. Gonçalves; Dept. of Electrical Engineering, São Paulo Univ., Brazil.* This work presents a methodology for detection of scratches on spherical organic ophthalmic lenses. Fourier descriptors are used to process an ultraviolet image of the lens, obtained using an ordinary CCD video camera.

OWB7 • 12:15 p.m.
A Model for Cavity Induced Errors with Wavefront Slope in High Accuracy Spherical Fizeau Metrology, *Daniel M. Sykora; Zygo Corp., USA.* High accuracy spherical testing demands consideration of induced errors as a function of wavefront slope and cavity geometry. A geometric model is presented that enables characterization of transmission sphere performance over a range of cavities.

12:00 p.m.–1:30 p.m.
JWA • Joint FiO/LS Poster Session II

Optics in Biology and Medicine Posters

JWA1
PbS Quantum Dots for Near-Infrared Fluorescence Imaging, *Jiantang Sun[1], Kun Fu[1], Ming-Qiang Zhu[1,2], Lissett Bickford[1], Eric Post[3], Rebekah Drezek[1]; [1]Rice Univ., USA, [2]Hunan Univ., China, [3]Louisiana Tech Univ., USA.* In this phantom-based study, we assessed the imaging potential of lead sulfide (PbS) near-infrared quantum dots (QDs) as novel contrast agents for deep tissue fluorescence imaging applications.

JWA2
Enhanced Radiation Forces in the Near-Field of a Structured Thin Metallic Film, *Armis R. Zakharian, Andrey Kobyakov, Arash Mafi, Sergey A. Darmanyan; Corning Inc., USA.* We compute optical forces exerted on dielectric nano-spheres in the near-field of a structured metallic film. Large field enhancement induced by the fundamental Bloch surface plasmon mode is shown to result in efficient trapping.

JWA3
Stressed *Daphnia similis*' Ultra-Weak Light Emission, *Natally A. Siqueira[1], Cristiano M. Gallep[2]; [1]Applied Photonics Lab, Ctr. Superior de Educação Tecnológica, Univ. of Campinas, Brazil, [2]DTT, Ctr. Superior de Educação Tecnológica, Univ. of Campinas, Brazil.* The ultra-weak light emission (biophoton) from *Daphnia similis* submitted to different sodium chloride solutions was analyzed, presenting notable alteration in the photon-count behavior of stressed groups when compared with the non-stressed control.

JWA4
In-Cell DNA Detection Probe Fabrication Based on Microgap Structure Sensor, *Yunmiao Wang, Kristie L Cooper, Anbo Wang; Virginia Tech, USA.* This paper presents a potential method to fabricate a robust in-cell DNA detection probe combining the advantages of pulling and etching technologies. A sensor tip with 10μm diameter has been fabricated.

JWA5
Sensor for Detecting Total Protein in Urine Sample, *Xiaoqun Zhou[1], Soon Huat Ng[1], Min Yong Han[2], Tee Hiang Cheng[3], Ai Qun Liu[3], Lian Hui Zhang[4]; [1]Inst. for Infocomm Res., Singapore, [2]Inst. for Material Res. Engineering, Singapore, [3]Nanyang Technological Univ., Singapore, [4]Inst. of Molecular and Cell Biology, Singapore.* A simple sensor is developed to detected total urine protein which is chemically labeled first. The detectable concentration is low to 0.015mg/ml. Since not involving any lens, our sensor is easy to align, integrate and cost-effective.

Optics in Information Science Posters

JWA6
Fourier-Transform Hologram on CD Using DiscT@2, *Yih-Shyang Cheng, Dwen-Jeh Liau, Jeng Wang; Dept. of Optics and Photonics, Natl. Central Univ., Taiwan.* Phase-only Fourier transform hologram is calculated using iterative Fourier transform process and the binarized information is written on CD using DiscT@2 program. A specially designed optical system is used to read out the information.

JWA7
Artifact Reduction Method for Single Chip Polarization Sensor with On-Chip Polarization Filter Mozaic, *Shih-Schön Lin[1], Viktor Gruev[1], Jan Van der Spiegel[1], Edward N. Pugh, Jr.[2], Nader Engheta[1]; [1]Electrical and Systems Engineering Dept., Univ. of Pennsylvania, USA, [2]F. M. Kirby Ctr. for Molecular Ophthalmology and Inst. of Neurological Sciences, Univ. of Pennsylvania, USA.* Putting three differently oriented polarization filter mozaic on a single imager chip in order to recover three Stokes parameters solves synchronization and calibration problems but introduce artifacts. Here we propose methods to minimize the artifacts.

JWA8
Broadband Silicon Electro-Optic Absorption Modulator, *Ali W. Elshaari, Stefan F. Preble, Mustafa A. G. Abushagur; Rochester Inst. of Technology, USA.* Here we propose a design for a broadband electro-optic absorption modulator. The device is simply a 50μm long silicon waveguide with integrated Schottky diodes. It achieves 64% modulation depth up to at least 10 Gb/s.

JWA82
Programmable Two Beam Polarization Self-Interferometer Using a Parallel Aligned Liquid Crystal Display, *Jeffrey A. Davis[1], Ignacio Moreno[2], Felix A. Klein[1], Mark J. Mitry[1]; [1]San Diego State Univ., USA, [2]Univ. Miguel Hernandez, Spain.* We present a common-path polarizing interferometer using a diffraction grating encoded onto a liquid crystal display (LCD). Experimental results include analysis of phase patterns encoded onto the LCD and of external birefringent elements.

Optical Design and Instrumentation Posters

JWA9
Holographic Inscription of Laguerre-Gaussian Wavefronts in a Liquid Crystal Polarization Grating, *Hyunhee Choi, J. H. Woo, Jeong W. Wu; Ewha Womans Univ., Republic of Korea.* A space-varying polarization hologram grating is fabricated in a nematic liquid crystal cell with azo-side-chain polymer alignment layers. The transmission polarization hologram made by the circular orthogonal polarizations exhibits the polarization-controlled Laguerre-Gaussian beam generation.

JWA10
All-Optical Polarization-Selective Reversed-Wavefront Young Interferometry, *Dean Brown[1], Thomas Brown[1], Riccardo Borghi[2], Massimo Santarsiero[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Univ. degli Studi "Roma Tre", Italy.* An experimental setup is proposed for measuring the correlation tensor of electromagnetic beams. It relies on a Reversed-Wave Young interferometer, where polarization control and hole selection are performed via electrically controlled anisotropic optical elements.

JWA11
High-Resolution Measurement of Absorptive Object by Confocal Nonlinear Optical Microscopy, *Atsuo Ito, Satoshi Ota, Chikara Egami; Shizuoka Univ., Japan.* We demonstrate absorptive object imaging with a new confocal nonlinear optical (NL) microscope. The confocal NL microscope, employing degenerate wave mixing geometry, can detect a fine structure of sub-micron objects.

JWA12
Development of High Efficiency Light Source for Color Hologram Using R, G and B LEDs, *Takehisa Shibuya[1], Shunsuke Kitamura[1], Shunsuke Matsuda[1], Junko Baba[2], Hisashi Asakawa[2], Moriaki Wakaki[1]; [1]Tokai Univ., Japan, [2]Marumo Electric Co., Ltd, Japan.* The light source for color holograms has been developed using multiple high brightness R, G and B LEDs. The developed light source showed higher efficiency and lower noise reconstruction compared with a conventional halogen lamp.

JWA13
Sensitivity Comparison of Mx and Frequency Modulated Bell-Bloom Cs Magnetometers in a Micro-Fabricated Cell, *Ricardo Jiménez-Martinez[1,2], Clark Griffith[1], Svenja Knappe[1], John Kitching[1]; [1]Time and Frequency Div., NIST, USA, [2]Univ. of Colorado, USA.* We compare the sensitivity of two optically pumped atomic magnetometers, Mx and frequency-modulated Bell-Bloom magnetometer implemented in a single pump-probe beam configuration and using a micro-fabricated vapor cell filled with ^{133}Cs and N_2 buffer gas.

JWA14
Active Q Control of Tuning-Fork in Near-Field Scanning Optical Microscope, *Kyoung-Duck Park[1], Dae-Chan Kim[1], Won-Soo Ji[2], Dong-Hoon Chang[1], Dae-Seo Park[1], Young-Seok Kim[1], Beom-Hoan O[1], Se-Geun Park[1], El-Hang Lee[1], Seung Gol Lee[1]; [1]Precision Inspection Measurement Ctr., Republic of Korea, [2]Advanced Technology Group, Factory Automation Team, Samsung Electro-Mechanics, Republic of Korea.* In order to optimize the shear force control system used in height control of NSOM probe, the Q-factor of tuning fork is intentionally controlled by changing vibration of the optical fiber attached on tuning fork.

JWA15
Generation of Non-Diffracting Beams Using Holographic Spatial Filtering, *Ma. Graciela Hernández y Orduña[1,2], Gabriel Martínez-Niconoff[2]; [1]Inst. Tecnologico Superior de Misantla, Mexico, [2]INAOE, Mexico.* We describe the generation of invariant optical fields by illuminating a holographic transmittance with different kinds of illumination. With this we can manipulate the diffraction orders, generating changes in the profiles of the optical beams.

JWA16
Modulational Instability in Non Linear Propagation of Coupled Pulses, *Julio C. Quiceno, Juan C. Muñoz, Efraín Solarte; Univ. del Valle, Colombia.* We consider modulational stability/instability for the periodic solutions in a system of two coupled Schrödinger equations modeling the nonlinear pulse propagation in a birefringent Kerr medium.

JWA17
Scattering Transversal Cross-Section for the Study of the Topological Interference, *Miguel Angel Loredo, Gabriel C. Martinez-Niconoff; INAOE, Mexico.* We describe the geometric of the interference fringes between caustics of diffraction fields. The study is analyzed with the scattering model for elastic collisions and digital image statistical processing. Experimental and computational results are show.

Optical Sciences Posters

JWA18
Resummation of Far-Field Asymptotic Series, *Riccardo Borghi[1], Miguel Alonso[2]; [1]Univ. degli Studi "Roma Tre", Italy, [2]Inst. of Optics, Univ. of Rochester, USA.* The use of a resummation scheme, based on nonlinear transformations for dealing factorial diverging series, is here proposed for the evaluation of electromagnetic fields, in the near zone, starting from their asymptotic far-field series representation.

JWA • Joint FiO/LS Poster Session II—Continued

JWA19
A Coherence Theory of Optical Frequency-Modulated Continuous-Wave Interference, *Jesse Zheng; Photontech Instruments, Canada.* A coherence theory of frequency-modulated continuous-wave (FMCW) interference is introduced, which can explain the relationships among the frequency bandwidth, coherence length, coherence time of optical source, and the contrast of the beat signal.

JWA20
All Optical OFDM System for Wireless Channels, *Moustafa H. Aly; Arab Acad. for Science and Technology, Egypt.* All optical orthogonal frequency division multiplexing is used to achieve high bit rate and eliminate intersymbol interference in optical wireless communications. Overall architecture is enlightened and analytical evaluation is presented for direct and diffused environment.

JWA21
Dispersion Properties of Dual Bragg Cladding Waveguides, *Krishna Thyagarajan, Ritwick Das; Dept. of Physics, Indian Inst. of Technology, India.* A design for high index core dual Bragg cladding waveguide is presented that exhibits significant variation in the slope of phase velocity dispersion curve and strong third order dispersion close to the zero GVD point.

JWA22
Adaptive Interferometer with Unequal Path Lengths, *Emma V. García-Ramírez, Juan Castillo-Mixcóatl, Georgina Beltrán-Pérez, Severino Muñoz-Aguirre; Benemérita Univ. Autónoma de Puebla, Mexico.* An adaptive interferometer with 2.5m of optical path difference (OPD) is presented. It was used with a GaAs crystal as adaptive photodetector. Photo-EMF signal is 17mV at 1MHz, approximately 70% smaller than OPD=0m case.

JWA23
The Poynting Vector and Angular Momentum of Airy Beams, *Henry I. Sztul, Robert R. Alfano; Inst. for Ultrafast Spectroscopy and Lasers, USA.* We analyze and describe the evolution of the Poynting vector and angular momentum of the optical Airy beam. A numerical approach is used to show these values explain the acceleration of this beam.

JWA24
Experimental Synthesis of Electromagnetic Schell-Model Planar Sources, *Franco Gori[1], Massimo Santarsiero[1], Victoria Ramirez-Sanchez[2], Riccardo Borghi[1]; [1]Univ. degli Studi Roma Tre, Italy, [2]Univ. Complutense de Madrid, Spain.* An experimental scheme for synthesizing planar electromagnetic Schell-model sources is presented. It is based on the van Cittert-Zernike theorem for electromagnetic sources and on a modal expansion of the polarization matrix of an incoherent source.

JWA25
Evaluation of Scaled and Annular Pupils within the Framework of the Extended Nijboer-Zernike Formalism, *Sven van Haver[1], Augustus J. E. Janssen[2], Joseph J. M. Braat[1], Silvania F. Pereira[1]; [1]Delft Univ. of Technology, Netherlands, [2]Philips Res. Europe, Netherlands.* We present concise formulae for the Zernike coefficients of numerical aperture reduced pupils and show how they can be exploited within the framework of the ENZ-formalism to characterize optical systems with scaled and annular pupils.

JWA26
Optics with Gain: Fresnel Reflection, Lenserf Reflection, and Evanescent Waveguide Gain, *Anthony Siegman; Stanford Univ., USA.* Stop by this poster to learn about Lenserf reflection and argue about whether amplified total internal reflection and evanescent gain really exist (they don't, despite many supportive publications).

Laser Science Posters

JWA27
New Spectroscopic Evidence that H2 Molecules Present in Gaseous Atmospheres of OB Stars Displaying the 2175A "Bump" Are Coherently Photoexcited, *Peter P. Sorokin; IBM Res. (Emeritus), USA.* Archived VUV spectra of OB stars with the 2175A "bump" contain several "extra" narrow absorption bands fully explainable by H2 four-wave mixing, providing new evidence for the H2 nonlinear optics model we recently proposed.

JWA28
Reflectometric Birefringent Fiber FMCW Interferometric Strain Sensor, *Jesse Zheng; Photontech Instruments, Canada.* A novel reflectometric frequency-modulated continuous-wave (FMCW) interferometric birefringent fiber strain sensor is demonstrated. The sensor has the advantages of high resolution, large dynamic range, long gauge length, long and environment-free leading fiber, and easy instrumentation.

JWA29
All-Birefringent-Fiber Differential FMCW Gyroscope, *Jesse Zheng; Photontech Instruments, Canada.* A fiber-optic FMCW gyroscope is demonstrated, which uses the two beat signals from a birefringent fiber coil to detect rotation velocity. The gyroscope can automatically eliminate the non-reciprocal phase drift and make the resolution double.

JWA30
A Factorization Law for Entanglement Decay, *Thomas Konrad[1], Fernando de Melo[2], Markus Tiersch[2], Christian Kasztelan[3], Adriano Aragão[4], Andreas Buchleitner[2]; [1]Quantum Res. Group, School of Physics, Univ. of KwaZulu-Natal, South Africa, [2]Max-Planck-Inst. für Physik komplexer Systeme, Germany, [3]Inst. für Theoretische Physik C, Germany, [4]Inst. de Física, Univ. Federal do Rio de Janeiro, Brazil.* We present a factorization law for by bipartite quantum systems, which describes the time evolution of entanglement upon passage of either component through an arbitrary noisy channel.

JWA31
Tripartite Entanglement in Two-Mode Cavity QED, *Habtom Woldekristos, James Clemens, Perry Rice; Miami Univ., USA.* We analyze a multi-level atom inside a driven optical cavity, with two orthogonally polarized modes. We discuss entanglement between the atom and two modes, in particular when the undriven mode is highly lossy.

JWA32
Adaptive Optics for Improved Mode-Coupling Efficiencies, *Scott Jobling, Kevin T. McCusker, Paul G. Kwiat; Univ. of Illinois at Urbana-Champaign, USA.* We have demonstrated improved free-space to single-mode fiber coupling via wavefront correction based upon an adaptive-optic mirror (AOM). By introducing AOM-correction paired with genetic-algorithm optimization, we have obtained 97.3±0.3% of the Fresnel-reflection-limited mode-coupling efficiency.

JWA33
Quantum Interference in the Incoherent Spectra of Resonance Fluorescence, *Zach Callahan[1], Perry Rice[1], Robert Brecha[2], Leno Pedrotti[2]; [1]Miami Univ., USA, [2]Univ. of Dayton, USA.* The incoherent spectrum of resonance fluorescence is a Lorentzian squared instead of the usual Lorentzian. We explain this as a quantum interference effect using quantum trajectory theory.

JWA34
Entanglement between Optical Modes Characterized by Cross-Correlation Functions, *Jeffrey Hyde, Perry Rice; Miami Univ., USA.* We model a weakly driven optical parametric oscillator to determine how effectively the state $|01>+|10>$ can be created, and discuss whether it is an entangled state or not using cross-correlation.

JWA35
Free-Space Optical Wireless Communications, *Shawn P. Casey, Bruce Fields, Olga Hizkiayhu, Shahida Parvean, Mario Garcia, Josh Gensheimer, Tyrel Parkinson, Albert Hanshaw; DeVry Univ. North Brunswick, USA.* Free-space optical communications technologies promise to provide advantages over contemporary wired and radio frequency communications equipment. A FSO wireless communications student project will be discussed in detail.

JWA36
Modeling of Superconducting Atom Chip Traps, *Valery Dikovsky[1], Vladimir Sokolovsky[1], Bo Zhang[2], Carsten Henkel[2]; [1]Ben Gurion Univ. of the Negev, Israel, [2]Univ. Potsdam, Germany.* Building an atom chip with superconducting wires poses novel challenges due to the spatial distribution of supercurrents. We present self-consistent calculations and summarize the perspectives of electromagnetic noise reduction.

JWA37
Automatization of a Water Flow Laser Sensor Based on Bragg Gratings, *Severino Muñoz-Aguirre, Georgina Beltrán-Pérez, Oscar Méndez-Zepeda, Juan Castillo-Mixcóatl; Benemerita Univ. Autonoma de Puebla, Mexico.* The operation of a water-flow sensor based on two FBG laser was automatized using a PIC16F877 microcontroller. The results for optical power related to water-flow agreed with those for digitalized amounts within a 7.5% error.

JWA38
Improving the Material Quality of Quantum Cascade Lasers Grown by MOCVD Using Pump Probe Reflectivity, *Robinson Kuis, Anthony Johnson, Fow-Sen Choa, Liwei Cheng; Univ. of Maryland, Baltimore County, USA.* To understand and optimize the purging time used in the growth process of QCLs by MOCVD, time resolved pump probe reflectivity and photoluminescence studies were performed on several InAlAs/InGaAs superlattice structures.

Quantum Electronics Posters

JWA39
Space Bound Optical Vortex, *Rijuparna Chakraborty, Ajay Ghosh; Dept. of Applied Optics and Photonics, Univ. of Calcutta, India.* A procedure for the generation of three-dimensional optical vortex -optical black hole- is reported. The mask needed must be three-dimensional and can be achieved using stack of diffractive-optical-elements. It can be used in three-dimensional trapping.

JWA • Joint FiO/LS Poster Session II—Continued

JWA40
Plasmon-Assisted Magnetization-Induced Optical Second-Harmonic Generation in GMR Nanogranular Films, *Oleg Aktsipetrov[1], Tatiana Murzina[1], Anton Maydykovskiy[1], Evgeniya Kim[2], Mitsuteru Inoue[3], Anatoliy Kravets[4]; [1]Moscow State Univ., Russian Federation, [2]GE Global Res. Ctr., USA, [3]Toyohashi Univ. of Technology, Japan, [4]Inst. of Magnetism, Natl. Acad. of Sciences of Ukraine, Ukraine.* Spectroscopy of magnetization-induced second-harmonic generation (MSHG) is studied in magnetic granular films containing Co nanoparticles. A strong resonance of MSHG intensity is observed in the vicinity of the local surface plasmons exited in Co nanogranules.

JWA41
Giant Optical Activity in Spiral-Chiralic Silver Films, *Oleg Aktsipetrov[1], Tatiana Murzina[1], Anton Maydykovskiy[1], Alejandro Silhanek[2], Victor Moshchalkov[2], N. Verellen[2], J. Fritzche[2], Maxim Dokukin[3], A. Khanikaev[3], Aleksandr Barishev[3], Hironaga Uchida[3], Mitsuteru Inoue[3], Alex Bratkovsky[4], Ekaterina Ponizovskaya[4], S. Y. Wang[4], R. S. Williams[4], Vitaliy Metlushko[5], Thierry Verbiest[6], B. Ilic[7]; [1]Moscow State Univ., Russian Federation, [2]Inst. for Nanoscale Physics and Chemistry, Katholieke Univ. Leuven, Belgium, [3]Toyohashi Univ. of Technology, Japan, [4]Quantum Science Res., Hewlett-Packard Labs, USA, [5]Dept. of Electrical and Computer Engineering, Univ. of Illinois, USA, [6]Lab of Chemical and Biological Dynamics, Katholieke Univ. Leuven, Belgium, [7]Cornell Nanofabrication Facility, Cornell Univ., USA.* Giant optical activity in visible range is observed in thin chiralic "wallpaper" Ag films with spiral nano-design. "Greek" ornamented artificial gyrotropic metamaterial rotates light polarization up to 2° at wavelength from 600 to 750 nm.

JWA42
Spherical 3-D Photonic Crystal with a Conducting Nanoparticle Core, *Alvaro Zamudio-Lara[1], Jose Javier Sanchez-Mondragon[2], Jesus Escobedo-Alatorre[1], Miguel Torres-Cisneros[3], Daniel A. May-Arrioja[2], Adalberto Alejo-Molina[2]; [1]Ctr. for Res. in Engineering and Applied Sciences, UAEM, Mexico, [2]INAOE, Mexico, [3]Electronics Dept. and Mechatronics, Univ. of Guanajuato, Mexico.* We present the analysis of the transmission of a conducting nanoparticle at the core of a 3-D dielectric photonic crystal.

JWA43
One-Dimensional Photonic Crystal with a Conducting Nanoparticles Composite, *Jose Javier Sanchez-Mondragon[1], Jesus Escobedo-Alatorre[2], Miguel A. Basurto-Pensado[2], Adalberto Alejo-Molina[1], Alvaro Zamudio-Lara[2]; [1]INAOE, Mexico, [2]Ctr. for Res. in Engineering and Applied Sciences, UAEM, Mexico.* We present near soliton propagation in an optical fiber with a core doped conducting nanoparticles.

JWA44
Bio-Molecule Micro-Contact Printing for Fabricating Patterned Gold Nanoparticles, *Yun-Cin Luo[1], Cher-Kei Chang[1], Pai-Yen Chen[1], Chi-Hong Lin[2]; [1]Natl. Nano Device Labs, Taiwan, [2]Dept. of Biophotonics, Natl. Yam-Ming Univ., Taiwan.* A bio-molecule micro-contact-printing technique is proposed to fabricate periodical Au-nanostructures, which were successfully characterized using atomic force microscope. This technique provides a possibility of massively producing patterned bio-molecule and metallic nanostructures for plasmonic device applications.

JWA45
Complex Dispersion Relation of One-Dimensional Metallo-Dielectric Photonic Crystal, *Adalberto Alejo-Molina[1], Jose Javier Sánchez-Mondragon[1], Daniel A. May-Arrioja[1], David Romero-Antequera[1], Jesus Escobedo-Alatorre[2], Alvaro Zamudio-Lara[2]; [1]INAOE, Mexico, [2]Ctr. for Res. in Engineering and Applied Sciences, UAEM, Mexico.* We discuss the complex dispersion relation of one-dimensional metallo-dielectric photonic crystal, produced by a dielectric photonic crystal with extremely thin metallic insets with the same periodicity. We have carried out the analytical and numerical analysis.

JWA46
On the Unified Theory of Coherence and Polarization of Random Electromagnetic Field, *Andrey S. Ostrovsky[1], Miguel A. Olvera-Santamaria[1,2], Gabriel Martinez-Niconoff[2], Patricia Martinez-Vara[2]; [1]Univ. Autonoma de Puebla, Mexico, [2]INAOE, Mexico.* The critical revision of the unified theory of coherence and polarization of a random electromagnetic field is presented. The new deduction of the degree of coherence and the degree of polarization is given.

JWA47
Quasimode Statistics in Localized Random Media, *Jing Wang, Azriel Z. Genack; Dept. of Physics, Queens College of the City Univ. of New York, USA.* We have measured field spectra on a grid of points on the output surface of a quasi-one-dimensional random sample. The statistics of quasimodes is obtained by decomposing the spectra into sums of Lorentzian lines.

JWA48
Low Frequency Fluctuations in a Multi-Mode Vertical-Cavity Surface-Emitting Laser Subject to Polarized Optical Feedback, *Hong Lin, Zachary J. Lapin, Justin D. HoShue; Bates College, USA.* We have observed feedback-induced low frequency fluctuations in a vertical-cavity surface-emitting laser operating with several transverse modes. Effects of injection current and external cavity length on the low frequency fluctuations are investigated experimentally.

JWA49
Eavesdrop Detection for Chaotic Communication with Mutual Optical Coupling, *Satoshi Ebisawa[1], Haruka Miyazaki[2], Shinichi Komatsu[2]; [1]Gakushuin Univ., Japan, [2]Waseda Univ., Japan.* We numerically study a mutual optical coupling system and the sensitivity of the correlation between each laser with a certain time-lag to parameter, and discuss that an eavesdrop detection for chaotic communication can be applied.

JWA50
Luminescence from a Fibonacci Photonic Crystal, *Vasilios Passias[1], Zhou Shi[1,2], Nikesh Valappil[1], Lev Deych[1,2], Alexander Lisyansky[1,2], Vinod M. Menon[1,2]; [1]Queens College of CUNY, USA, [2]Graduate Ctr. of CUNY, USA.* We report the realization of an active Fibonacci photonic quasi-crystal via spin coating. Alternation of the luminescence properties of rhodhamine dye embedded in the quasi-crystal is presented and compared to theoretical simulations.

JWA51
Dark Photonic Lattices in Nonlinear Liquids, *Edgar Alvarado-Mendez, Omar Emigdio Nieto-Zárate, Monica Trejo-Duran, José A. Andrade-Lucio, Everardo Vargas-Rodríguez, Julián M. Estudillo-Ayala, Roberto Rojas-Laguna, Igor Sukhoivanov; Univ. of Guanajuato, Mexico.* The formation of dark photonic lattices in nonlinear liquid media is presented. The interference patterns are propagated in R6G with acetone medium in 1 cm and the dependence with the power give different dark lattices.

JWA52
Influence of Different Concentrations of Mg on the Photorefractive Gain in $LiNBO_3$, *S. Gonzales-Martinez[1], J. Castillo-Torres[2], J. G. Murillo[1], Rurik Farias[1], J. Hernandez[3], H. Murrieta[3]; [1]Ctr. de Investigacion en Materiales Avanzados S.C., Mexico, [2]Univ. Tecnologica de la Mixteca., Mexico, [3]Univ.. Nacional Autónoma de México, Mexico.* Dependence of photorefractive response on c-axis orientation for $LiNbO_3$ at several magnesium contents has been observed. When c-axis is perpendicular to the incidence plane the optical damage persists even above threshold and diminished below threshold.

JWA53
Nonlinear Pulse Propagation in an Optical Fiber Doped with Conducting Nanoparticles, *Jose Javier Sanchez-Mondragon[1], Miguel Torres-Cisneros[2], Celso Velásquez-Ordoñez[3], Margarita Tecpoyotl-Torres[4], Eduardo Perez-Careta[2], Daniel A. May-Arrioja[1]; [1]INAOE, Mexico, [2]Electronics Dept. and Mechatronics, Univ. of Guanajuato, Mexico, [3]Univ. de Guadalaja, Ctr. Universitario de los Valles, Mexico, [4]Ctr. for Res. in Engineering and Applied Sciences, UAEM, Mexico.* We present near soliton propagation in an optical fiber with a core doped conducting nanoparticles.

JWA54
"Color" Transfer Matrix Method in Nonlinear Medium, *Paweł Szczepański[1,2], Tomasz P. Osuch[1], Zbigniew Jaroszewicz[1,3], Marta Buryk[1]; [1]Natl. Inst. of Telecommunications, Poland, [2]Warsaw Univ. of Technology, Poland, [3]Inst. of Applied Optics, Poland.* Generalization of transfer matrix method is presented which allows for nonlinear effects calculation in periodical and homogenous one-dimensional medium. Simulation results of Raman amplification in isotropic nonlinear photonic crystal and homogenous structure are presented.

JWA55
Z-Scan Technique with White-Light Continuum Generated in a Photonic Crystal Fiber, *Jonathas de Paula Siqueira, Lino Misoguti; Inst. de Física de São Carlos, Univ. de São Paulo, Brazil.* We present a new technique that employs a white-light continuum generated by a photonic crystal fiber, pumped by femtosecond oscillator, in the Z-Scan technique to characterize the spectrum of saturated absorption in the azodye DR-13.

JWA56
Competition Between the Absorption and Refractive Index Gratings on the Beam Coupling in $Bi_{12}TiO_{20}$ Employing a Vector Approach, *Miguel A. González-Trujillo[1], Isabel M. Casar[2], Jose G. Murillo[3], Jose R. Farías[3]; [1]ESCOM-IPN, UPALM, Zacatenco, Mexico, [2]Inst. de Física, Univ. Nacional Autónoma de México, Mexico, [3]Ctr. de Investigacion en Materiales Avanzados S.C., Mexico.* Employing a tensor approach, numerical simulations of beam coupling in the photorefractive recording in $Bi_{12}TiO_{20}$ were made. The competition between the refractive index and the absorption gratings at high modulation depth was studied.

JWA • Joint FiO/LS Poster Session II—Continued

JWA57
Intense Upconversion Emissions in GSO, LSO and LGSO Laser Crystals Co-Doped with Er^{3+} and Yb^{3+}, *Lin Han[1,2], Shuqi Chen[1,2], Feng Song[2], Axel Schülzgen[1], Nasser Peyghambarian[1]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]Photonics Ctr., College of Physics, Nankai Univ., China.* Intense visible upconversions under excitation of 975 nm are presented in Er^{3+}/Yb^{3+} co-doped Gd_2SiO_5, Lu_2SiO_5 and $(Lu_{0.5}Gd_{0.5})_2SiO_5$ laser crystals. Results indicate that these crystals should be promising laser gain mediums for tunable solid-state upconversion lasers.

JWA83
Diffraction of an Electromagnetic Wave at a Metallic Grating with Slits, *Raúl García-Llamas, Ramón Munguía-Arvayo, Jorge Gaspar-Armenta; Univ. de Sonora, Mexico.* A rigorous solution of the diffraction of an electromagnetic wave at a metallic grating with slits is treated. The interference of surface plasmons between subwavelength slits is studied by using the near-field intensity.

Photonics Posters

JWA58
Loss Measurement of Photonic Integrated Waveguides by Scanning Near-field Optical Microscopy, *Boon Ping Ng[1,2], Zhao Gang Dong[1,2], Shaw Wei Kok[1], Ying Zhang[1], Yeng Chai Soh[2]; [1]Singapore Inst. of Manufacturing Technology, Singapore, [2]Nanyang Technological Univ., Singapore.* A method of using scanning near-field optical microscopy to measure the loss of embedded optical waveguides is presented. The method gives accurate measurement of propagation loss and other parameters characterizing the manufacturing quality of waveguides.

JWA59
Optical Fiber Attenuation Coefficient, *Meire C. Fugihara, Armando Nolasco Pinto; Inst. of Telecommunications, Univ. of Aveiro, Portugal.* The exponential approximation for UV absorption could not fit the experimental measurements of the optical fiber attenuation coefficient over a broad spectral range. We show that a Lorentzian function allows a correct fit.

JWA60
Multi-Wavelength Electro-Optic Pulse Characterization, *Limin Ji[1], William R. Donaldson[2], Thomas Hsiang[1]; [1] Depts. of Electrical and Computer Engineering, Univ. of Rochester, USA, [2]Lab for Laser Energetics, Univ. of Rochester, USA.* Fiber-optic-based electro-optic polarization rotators are used to modulate multiple wavelengths simultaneously to facilitate single-shot pulse characterization and enhanced signal to noise ratios with electro-magnetic interference and radiation hardness. Multiple wavelengths create independent samples for averaging.

JWA61
Transient Effects in Pump Reflected Raman Amplifiers, *João M. Ferreira[1,2], Armando N. Pinto[1,3]; [1]Inst. of Telecommunications, Univ. of Aveiro, Portugal, [2]Physics Dept., Univ. of Aveiro, Portugal, [3]Dept. of Electronics, Telecommunication and Informatics, Univ. of Aveiro, Portugal.* We analyze a pump reflected Raman amplifier. Although it presents a better use of pump power, we show that it also presents a worst dynamic behavior, leading to signal degradation in dynamic optical networks.

JWA62
Measurement Noise Tolerance of a Single-Angle Plane-Wave Photonic Crystal Characterization Method, *Gregory R. Kilby[1], Kirk A. Ingold[1], Thomas K. Gaylord[2]; [1]United States Military Acad., USA, [2]Georgia Tech, USA.* A method to measure the single-angle plane-wave transmittance/reflectance of photonic crystal structures has been developed. The method employs an inverse matrix computation susceptible to measurement noise. The noise tolerance of the characterization method is identified.

JWA63
A Semi-Cylindrical Axial Gradient Refractive-Index Lens in Wedge-Shaped Fiber Coupling with InP-Based PLC, *Xu Liu, Xiaohan Sun; Southeast Univ., China.* A scheme with a novel semi-cylindrical axial GRIN lens between wedge-shaped fiber and InP-based PLC yielding higher coupling efficiency than those with one and two radial GRIN lens(es) by 7.816dB and 2.282dB, respectively, is devised.

JWA64
Photonic Devices Using Colloidal Quantum Dot Composites, *Saima Husaini[1,2], Nikesh Valappil[1], Vinod M. Menon[1,2]; [1]Queens College of CUNY, USA, [2]Graduate Ctr. of CUNY, USA.* We report the development of waveguides and microresonators using colloidal CdSe quantum dot composites. Results of steady state and time resolved photoluminescence performed on the dots in various hosts are also presented.

JWA65
Double Slit Diffraction in Self-Defocusing Nonlinear Media with Nonlocal Response, *Can Sun, Jason W. Fleischer; Princeton Univ., USA.* We study experimentally double slit diffraction in a self-defocusing nonlocal medium. By varying slit separation and distance to boundaries, we find a method of beam steering that allows beams to attract and repel from walls.

JWA66
The Optical and Electronic Characteristics of Photonic Crystal Vertical-Cavity Surface-Emitting Lasers, *Kirk A. Ingold, Lisa A. Shay, Gregory R. Kilby; United States Military Acad., USA.* Near- and far-field radiation patterns, optical spectrum measurements, and light/voltage versus current plots are used to characterize photonic crystal vertical-cavity surface-emitting lasers. The experimental apparatus is validated and measurements are reported.

JWA67
Broadband ASE Noise Model for Systems with Raman Amplification, *Nelson J. Muga[1,2], Meire C. Fugihara[1,3], Mário S. F. Ferreira[2], Armando N. Pinto[1,3]; [1]Inst. of Telecommunications, Univ. of Aveiro, Portugal, [2]Dept. of Physics, Univ. of Aveiro, Portugal, [3]Dept. of Electronic Telecommunication and Informatics, Univ. of Aveiro, Portugal.* A new model that accurately describes the amplified spontaneous emission in broadband systems with distributed Raman gain is presented. Extensive simulations are corroborated with experimental results.

JWA68
Four-Wave Mixing in Optical Fibers in a Low Power Regime, *Nuno A. Silva[1,2], Armando N. Pinto[1,3]; [1]Inst. of Telecommunications, Univ. of Aveiro, Portugal, [2]Dept. of Physics, Univ. of Aveiro, Portugal, [3]Dept. of Electronics, Telecommunications and Informatics, Univ. of Aveiro, Portugal.* We analyze the FWM process in optical fibers in a low power regime. We show the importance of the nonlinear contribution to the phase-mismatch and the influence of polarization effects in the FWM process.

JWA69
A New 3-D Time Domain Full-Band Method Using Parallel Processing for Photonics Applications, *Marcos S. Gonçalves, Carlos H. S. Santos, Hugo E. Hernández-Figueroa, Aldário C. Bordonalli; Univ. of Campinas, Brazil.* A parallel time-domain numerical approach for 3-D-vector wave equation solutions is presented. The algorithm uses finite element discretization and parallel processing to describe pulse propagation in optical devices.

JWA70
Serial Hybrid Gain Controlled EDFA: An Approach Based on All-Optical and Electronic Gain Control Schemes, *Julio C. R. F. Oliveira[1], Juliano R. F. Oliveira[1,2], Aldário C. Bordonalli[2], Elnatan C. Ferreira[2]; [1]CPqD Foundation, Brazil, [2]School of Electrical and Computer Engineering, Univ. of Campinas, Brazil.* A new design approach of hybrid gain controlled EDFAs intended for the next generation of optical networks is presented, providing extended dynamic gain range independently of the coupled input power.

JWA71
A Complex-Band Technique Based on the Green's Function for Analysis of Propagation Loss in Photonic Crystal Structures, *Charles M. Reinke[1], Ali Asghar Eftekhar[1], Babak Momeni[1], Ali Adibi[1], Xiaoguang Zhang[2]; [1]Georgia Tech, USA, [2]Oak Ridge Natl. Lab, USA.* We present a numerical complex-band technique based on the Green's function for analyzing propagation loss in photonic crystal waveguides. The method is demonstrated using simulations of two-dimensional photonic crystal waveguides having a single fabrication defect.

JWA72
Parametric Study of FTIR Optical Coupler, *Nathan Huntoon, Marc P. Christensen; Southern Methodist Univ., USA.* A parametric analysis of a 3dB coupler based upon frustrated total internal reflection is presented.

JWA73
Matching Optical Nanoantennas by Nanocircuit Elements, *Andrea Alù, Nader Engheta; Univ. of Pennsylvania, USA.* Concepts of antenna loading and matching are applied to optical nanoantennas and waveguides. We show how radiation properties and matching features of optical nanoradiators may be properly optimized using optical nanocircuit loads and feeding nanowaveguides.

JWA74
A Two-Layer MEMS Micromirror for Optical Scanning and Spatial Light Modulation, *Jorge Varona[1,2], Margarita Tecpoyotl-Torres[1], Anas A. Hamouí[2], Javier Sanchez-Mondragon[3]; [1]State Univ. of Morelos (UAEM), Mexico, [2]McGill Univ., Canada, [3]INAOE, Mexico.* A MEMS micromirror capable of 3-D operation with low insertion loss (~1dB) is presented. The device requires only two masks for fabrication and operates at CMOS voltage levels. The full switching speed is about 10-ms.

JWA75
Effects of Finite Gain Bandwidth on Raman Amplification in Silicon Waveguides, *Samudra Roy, Shyamal K. Bhadra; Fiber Optics Lab, Central Glass and Ceramic Res. Inst., India.* The detrimental effect of gain dispersion on Raman amplification in silicon waveguides is studied by using a variational technique. The influences of finite gain and photogenerated free carriers are analyzed by introducing Rayleigh dissipation function.

JWA76
Design, Fabrication and Characterization of Spatial Mode Selector in Silicon, *Ilya Goykhman, Boris Desiatov, Uriel Levy; Hebrew Univ. of Jerusalem, Israel.* We demonstrate the design, fabrication and experimental characterization of the spatial mode selector that transmits only the second silicon waveguide mode. Nanofabrication results and near field measurements are presented.

JWA77
Silicon-Compatible Optical Elements, *Charles G. Durfee[1], Thomas E. Furtak[1], Russell E. Hollingsworth[2], Ali J. Sabbah[1], P. David Flammer[1], Reuben T. Collins[1]; [1]Colorado School of Mines, USA, [2]ITN Energy Systems, USA.* With a model confirmed by visible-wavelength experiments, we show that a MOS capacitor can support surface plasmon modes. We also present finite-element designs for resonant cavity structures that are a step towards Si-based free-carrier modulators.

JWA • Joint FiO/LS Poster Session II—Continued

JWA78
Effect of Etched Sidewall Tilt on the Reflection Loss of Silicon-on-Insulator (SOI) or III-V Etched Facet Reflector, *Yunan Zheng, Yingyan Huang, Seng-Tiong Ho; Northwestern Univ., USA.* The effect of etching's verticality on the reflection loss of strongly-guiding SOI or weakly-guiding III-V etched facet reflector (EFR) is studied. High tolerance on tilt makes SOI EFR much more resilient to etching deviation.

JWA79
Study on the Polarization Effect in SERS Fiber Sensor with Chessboard Nanostructure, *Shuqi Chen[1,2], Lin Han[1,2], Axel Schülzgen[1], Nasser Peyghambarian[1], Jianguo Tian[2], Feng Song[2]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]Photonics Ctr., College of Physics, Nankai Univ., China.* Surface-enhanced Raman scattering (SERS) fiber sensor with chessboard nanostructure is designed and studied by finite-difference time-domain (FDTD) method. The influences of polarization effect and the enhancement of electric field are researched.

JWA80
Gas Sensor Based on an All Fiber Erbium-Doped Fiber Laser with a Hollow-Core Photonic Bandgap Fiber Cell, *Everardo Vargas-Rodriguez, Julian Estudillo-Ayala, Roberto Rojas-Laguna, Edgar Alvarado-Mendez, Monica Trejo-Duran, Jose A. Andrade-Lucio; Univ. of Guanajuato, Mexico.* In this work a low concentration gas sensor is presented. The sensor is based on a low cost all fiber EDF laser and a photonic bandgap fiber (PBGF) which is used as a gas cell.

JWA81
Sensitivity Enhancement of a SPR Based Fiber Optic Sensor by Using a Tapered Probe, *Banshi D. Gupta, Rajneesh K. Verma, Anuj K. Sharma; Indian Inst. of Technology Delhi, India.* Fiber optic SPR sensor with uniform sensing region sandwiched between two identical tapered regions has been proposed. Theoretical studies show that the sensitivity of the present probe increases with the increase in taper ratio.

JWA82 appears after JWA8.

JWA83 appears after JWA57.

12:00 p.m.–1:30 p.m. MWOSA (Minorities and Women in OSA) Luncheon, *Regency Ballroom, Hyatt Regency Rochester*

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

NOTES

NOTES

1:30 p.m.–3:30 p.m.
SWC • A Tribute to Howard Schlossberg I
Alexander E. Kaplan; Johns Hopkins Univ., USA, Presider

SWC1 • 1:30 p.m. Invited
Ultrafast Spectroscopy of Semiconductors, *Steven Cundiff; JILA, NIST, Univ. of Colorado, USA.* The ultrafast optical response of semiconductors has been the subject of substantial research. The interest has been motivated by unique aspects of the interaction between light and semiconductors that are revealed by ultrafast techniques.

SWC2 • 2:00 p.m. Invited
A New Generation of Ultrafast X-Ray Sources, *Roger W. Falcone[1,2]; [1]Dept. of Physics, Univ. of California at Berkeley, USA, [2]Advanced Light Source, Lawrence Berkeley Natl. Lab, USA.* I will describe new accelerator-based ultrafast x-ray sources, including those based at synchrotrons and free electron lasers, their capabilities, and the science that is being undertaken at these sources.

SWC3 • 2:30 p.m. Invited
Optical Coherence Tomography for Biomedical Imaging, *James Fujimoto; MIT, USA.* Optical coherence tomography (OCT) enables optical biopsy, imaging tissue pathology *in situ* and in real time. Since its development in the early 1990s, OCT is finding increasing clinical applications ranging from ophthalmology to intravascular imaging.

SWC4 • 3:00 p.m. Invited
Proton and Ion Acceleration by an Ultrafast TW CO_2 Laser: Proof-of-Principle Experiments, *Peter Shkolnikov[1], Igor Pogorelsky[2], V. Yakimenko[2], M. Babzien[2], P. McKenna[3], D. Carroll[3], D. Nealy[4], A. Pukhov[5], Z. Najmudin[6], L. Willingdale[6], E. Stolyarova[7], G. Flynn[7]; [1]Stony Brook Univ., USA, [2]Brookhaven Natl. Lab, USA, [3]Univ. of Strathclyde, UK, [4]Rutherford Appleton Lab, UK, [5]Univ. of Darmstadt, Germany, [6]Imperial College London, UK, [7]Columbia Univ., USA.* Results on proton acceleration by an ultrashort TW CO_2 laser interacting with Al foils show proton energy spectra substantially different from those obtained with solid-state lasers, due to the laser's different wavelength and polarization.

See next page for additional sessions 1:30 p.m.–3:30 p.m. ▶

Highland A

FiO

1:30 p.m.–3:30 p.m.
FWM • Quantum Telecom II
Paul Voss; Georgia Tech Lorraine, France, Presider

FWM1 • 1:30 p.m. Invited
Quantum Cryptography in Practical Networks, *Misha Brodsky; AT&T Labs, USA.* Quantum key distribution (QKD), which carries the promise of fundamentally secure communications, has reached a point of relative maturity and first commercial offerings. I will describe the state of the art in its technological implementation.

Highland B

Joint

1:30 p.m.–3:30 p.m.
JWB • Optics for Energy I: Solar Cell Materials and Development
Raymond Kostuk; Univ. of Arizona, USA, Presider

JWB1 • 1:30 p.m. Invited
Plasmonic Scattering Enhancement of Quantum Well Solar Cells, *Edward T. Yu; Univ. of California at San Diego, USA.* Quantum-well solar cells offer a route to photovoltaic power conversion with predicted efficiencies of 45-63%. We discuss methods of improving their performance by engineering photon propagation paths via scattering from metal or dielectric nanoparticles.

Highland C

1:30 p.m.–3:15 p.m.
FWN • Optics and Instrumentation for Next-Generation Sources I
Lahsen Assoufid; Argonne Natl. Lab, USA, Presider

FWN1 • 1:30 p.m. Invited
Optical Metrology Requirements for Coherence-Preserving and Next-Generation X-Ray Mirrors, *Peter Z. Takacs; Brookhaven Natl. Lab, USA.* Nanometer focusing of nanometer wavelength x-rays produced by next-generation accelerator sources will require extraordinary control of wavefront errors introduced by reflective and refractive optics. Achieving this goal will require significant advances in metrology techniques.

Highland D

FiO

1:30 p.m.–3:30 p.m.
FWO • Optical Hydrodynamics and Solitons
Michael Vasilyev; Univ. of Texas at Arlington, USA, Presider

FWO1 • 1:30 p.m.
Snake and Neck Instability of Spatial Bright Optical Solitons in Hyperbolic Systems, *Simon-Pierre Gorza, Philippe Emplit, Marc Haelterman; OPERA-Photonique, Univ. Libre de Bruxelles, Belgium.* The temporal break-up of spatial optical bright solitons of the (2+1)-dimensional hyperbolic nonlinear Schrödinger equation is experimentally studied. It is shown that these solitons are unstable against both snake and neck type modulational instability.

FWO2 • 1:45 p.m.
Rayleigh-Taylor Instability in Nonlinear Optics, *Shu Jia, Andrew Sichel, Jason W. Fleischer; Princeton Univ., USA.* We report the first theoretical consideration and experimental observation of Rayleigh-Taylor instability in nonlinear optics. The perturbation period depends on the intensity (density) difference and acceleration (index gradient) between layers, in agreement with theoretical calculations.

Highland E

1:30 p.m.–3:30 p.m.
FWP • Dynamic Fluorescence Imaging
Thomas Foster; Univ. of Rochester, USA, Presider

FWP1 • 1:30 p.m. Invited
Digital Frequency-Domain FLIM, *Enrico Gratton; Univ. of California at Irvine, USA.* We present a mathematical model and physical implementation for a digital frequency domain FLIM system which provides lifetime resolution comparable to TCSPC methods. We present data on cells and on molecules diffusing in solution.

Highland F

1:30 p.m.–3:30 p.m.
FWQ • Petawatt and Chirped Pulse Laser Technology
John H. Kelly; Lab for Laser Energetics, Univ. of Rochester, USA, Presider

FWQ1 • 1:30 p.m. Invited
Technological Challenge and Activation of 10-kJ PW Laser LFEX for Fast Ignition at ILE, *Noriaki Miyanaga[1], H. Azechi[1], K. A. Tanaka[1], T. Kanabe[2], T. Jitsuno[1], J. Kawanaka[1], Y. Fujimoto[1], R. Kodama[1], H. Shiraga[1], K. Knodo[1], K. Tsubakimoto[1], H. Habara[1], K. Sueda[1], H. Murakami[1], N. Morio[1], S. Matsuo[1], N. Sarukura[1], Y. Izawa[1], K. Mima[1]; [1]Osaka Univ., Japan, [2]Univ. of Fukui, Japan.* This paper reports a design overview of a 10-kJ PW laser (LFEX) and technological developments of 2x2 arrayed amplifier, wavefront correction, 1.3-m Faraday rotator, new scheme of pulse compressor and 91-cm dielectric gratings etc.

Highland G

FiO

1:30 p.m.–3:30 p.m.
FWR • Novel Fiber Devices I
Alexander Gaeta; Cornell Univ., USA, Presider

FWR1 • 1:30 p.m. Invited
Multimode Plastic Fiber for 100G, *Stephen Ralph; Georgia Tech, USA.* Graded index multimode plastic optical fiber is shown to support 40Gbps serial rates over 100m and 4x25Gbps WDM is shown to be supported over 100m. The large alignment tolerance is shown to be retained.

Highland H

FiO

1:30 p.m.–3:30 p.m.
FWS • Lasing in and Scattering from Random Media
Hui Cao; Yale Univ., USA, Presider

FWS1 • 1:30 p.m.
Effect of Nonlinear Mode Interaction in One-Dimensional Disordered Lasers, *Oleg Zaitsev[1], Lev Deych[2], Vladimir Shuvaev[2]; [1]Univ. of Duisburg-Essen, Germany, [2]Queens College of CUNY, USA.* Statistical properties of lasing in a random one-dimensional open system are studied numerically. Mode suppression and hysteresis due to nonlinear coupling between lasing modes are demonstrated within the standard third-order laser theory.

FWS2 • 1:45 p.m.
Theory of Diffusive Random Lasers, *A. Douglas Stone[1], Hakan E. Tureci[2], Li Ge[1], Stefan Rotter[1]; [1]Yale Univ., USA, [2]Inst. for Quantum Electronics, Switzerland.* The stationary nonlinear multimode lasing solutions of the semiclassical laser equations are obtained for a 2-D diffusive random laser (DRL) using a novel time-independent self-consistent method which treats the cavity openness exactly.

Highland J

LS

1:30 p.m.–3:30 p.m.
LWG • Cold Atom Sensors
Francesco A. Narducci; Naval Air Systems Command, USA, Presider

LWG1 • 1:30 p.m. Invited
Quantum Control of Ultracold AMO Systems by Nanomechanical Resonators, *M. Bhattacharya, O. Dutta, S. Singh, Pierre Meystre; Univ. of Arizona, USA.* Laser-cooled nanomechanical oscillators are promising new tools to manipulate and control ultracold atomic and molecular samples. As an illustration, we show how they can be exploited to entangle and squeeze a lattice of dipolar molecules.

Highland K

LS

1:30 p.m.–3:00 p.m.
LWH • Carbon Nanostructure Imaging and Spectroscopy
Tony F. Heinz; Columbia Univ., USA, Presider

LWH1 • 1:30 p.m. Invited
Optical Imaging of Carbon Nanotubes, *Paul Finnie[1,2], Kate Kaminska[1], D. Guy Austing[1], Andrew Li-Pook-Than[1,2], Jacques Lefebvre[1]; [1]Natl. Res. Council Canada, Canada, [2]Dept. of Physics, Univ. of Ottawa, Canada.* The macroscopic lengths of today's nanotubes make them accessible to optical imaging. The use of global Raman imaging and PL imaging for characterization and fundamental study of single nanotubes in air-suspended configurations will be described.

Hyatt Grand Ballroom A/B

META

1:30 p.m.–3:30 p.m.
MWC • Metamaterials II
Evgenii Narimanov; Purdue Univ., USA, Presider

MWC1 • 1:30 p.m.
External Modulation of Terahertz Quantum Cascade Lasers Using Metamaterials, *Igal Brener[1], X. G. Peralta[1], W. J. Padilla[2], E. W. Young[1], A. J. Hoffman[3], M. J. Cich[1], R. D. Averitt[4], M. C. Wanke[1], J. B. Wright[1], H.-T. Chen[5], J. F. O'Hara[5], A. J. Taylor[5], J. Waldman[6], W. D. Goodhue[6], J. Li[6]; [1]Ctr. for Integrated Nanotechnologies and Sandia Natl. Labs, USA, [2]Boston College, USA, [3]Princeton Univ., USA, [4]Boston Univ., USA, [5]MPA-CINT, Los Alamos Natl. Lab, USA, [6]Univ. of Massachusetts at Lowell, USA.* We use active metamaterials as external modulators for a 2.4 THz quantum cascade laser. We present initial optical modulation results with the goal of designing an electrically-driven modulator.

MWC2 • 1:45 p.m.
Optical Hyperspace for Plasmons: Dyakonov States in Metamaterials, *Zubin Jacob, Evgenii Narimanov; Purdue Univ., USA.* We show that the subwavelength imaging behaviour observed in the magnifying superlens experiment [Smolyaninov *et al.,* Science 2006] is due to Dyakonov plasmons. This state, not observed previously, gives rise to subdiffraction plasmon beams on resonance.

Hyatt Grand Ballroom E/F

OF&T

1:30 p.m.–3:30 p.m.
OWC • Micro/Integrated Optics
Christopher Dainty; Natl. Univ. of Ireland, Ireland, Presider

OWC1 • 1:30 p.m. Invited
Progress in Laser-Induced Backside Wet Etching, *Hiroyuki Niino; Photonics Res. Inst., Natl. Inst. of Advanced Industrial Science and Technology, Japan.* One-step method to fabricate surface microstructures on silica-glass plates using LIBWE is reviewed. Well-defined deep microtrenches without crack formations were fabricated with ns-pulsed laser beam of point-focused DPSS UV laser and mask-patterned KrF excimer laser.

FWM • Quantum Telecom II—Continued

FWM2 • 2:00 p.m. Invited
Low-Cost Devices for Quantum Cryptography, *John G. Rarity[1], D. Lowndes[1], M. S. Godfrey[1], J. L. Duligall[1,2], A. M. Lynch[1]; [1]Univ. of Bristol, UK, [2]Hewlett-Packard Labs, UK.* We review our low cost and short range quantum cryptography system designed to exchange keys between a hand-held device and a fixed terminal such as an ATM. Performance metrics and use scenarios will be described.

FWM3 • 2:30 p.m. Invited
Quantum Key Distribution and Optical Networking, *Paul Toliver[1], T. E. Chapuran[1], R. J. Runser[2], N. A. Peters[1], M. S. Goodman[3], J. Jackel[1], S. McNown[2], R. J. Hughes[4], C. G. Peterson[4], K. McCabe[4], J. E. Nordholt[4], K. Tyagi[4], D. Rosenberg[4], N. Dallman[4], [1]Telcordia Technologies, Inc., USA, [2]Lab for Telecommunication Sciences, USA, [3] Defense Advanced Res. Projects Agency (DARPA), USA, [4]Los Alamos Natl. Lab, USA.* Quantum key distribution offers a unique opportunity in securing next-generation optical networks. Recent advances in the integration of QKD within conventional DWDM network environments will be presented along with guidelines for practical system engineering.

JWB • Optics for Energy I: Solar Cell Materials and Development—Continued

JWB2 • 2:00 p.m. Invited
Plasmons and Photovoltaics, *Kylie Catchpole[1,2], F. Beck[2], R. Schropp[3], A. Polman[1]; [1]AMOLF, Netherlands, [2]Australian Natl. Univ., Australia, [3]Univ. of Utrecht, Netherlands.* We review recent progress and report new results on the use of particle plasmons to enhance the efficiency of solar cells. We describe the basic mechanisms at work, and provide an outlook on future prospects.

JWB3 • 2:30 p.m. Invited
Optically Tandem Solar Cells, *Alan Kost; Univ. of Arizona, USA.* Limiting factors for solar cells include poor conversion efficiency for short wavelength solar radiation and transparency to near infrared light. This presentation describes "optically tandem cells" that convert solar radiation to optimal wavelengths.

FWN • Optics and Instrumentation for Next-Generation Sources I—Continued

FWN2 • 2:00 p.m. Invited
Tranverse Coherence Properties of X-Ray Beams in Third-Generation Light Sources, *Gianluca Aldo Geloni, Evgeni Saldin, Evgeni Schneidmiller, Mikhail Yurkov; Deutsches Elektronen-Synchrotron, Germany.* Undulator radiation is modelled as a random process, and described as an incoherent superposition of laser-like beams from single electrons. Coherence properties are quantified in terms of statistical correlation functions of the radiation field.

FWN3 • 2:30 p.m.
Focused X-Ray Beam Characterization by Phase Retrieval with a Moveable Phase-Shifting Structure, *Manuel Guizar-Sicairos, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Characterization of focused x-ray beams by phase retrieval is addressed. We introduce diversity to the phase retrieval problem in a practical way by translating a phase-shifting structure relative to the beam, allowing for superior reconstructions.

FWO • Optical Hydrodynamics and Solitons—Continued

FWO3 • 2:00 p.m. Invited
Optical Hydrodynamics, *Mankei Tsang[1], Demetri Psaltis[2], Jeffrey H. Shapiro[1], Seth Lloyd[1]; [1]MIT, USA, [2]Inst. of Imaging and Applied Optics, Ecole Polytechnique Federale Lausanne, Switzerland.* The propagation of light can be studied in a hydrodynamic picture, which is especially useful in nonlinear optics. Classical and quantum formulations of optical hydrodynamics are discussed.

FWO4 • 2:30 p.m.
Bound States of Dissipative Solitons in Optical Fiber Systems, *Mário F. Ferreira, Sofia C. V. Latas; Dept. of Physics, Univ. of Aveiro, Portugal.* We investigate the interaction between soliton pulse solutions of the complex Ginzburg-Landau equation and the fundamental properties of their bound states. The impact of intrapulse Raman scattering in these bound states is also discussed.

FWP • Dynamic Fluorescence Imaging—Continued

FWP2 • 2:00 p.m. Invited
Fluorescence Lifetime and Spatially Modulated Light for Image-Guided Surgery, *Sylvain Gioux[1,2], Amaan Mazhar[3], David Cuccia[4], Anthony Durkin[3], Bruce J. Tromberg[3], John V. Frangioni[2]; [1]Boston Univ., USA, [2]Beth Israel Deaconess Medical Ctr., USA, [3]Univ. of California at Irvine, USA, [4]Modulated Imaging Inc., USA.* Achieving an adequate signal to background ratio is of paramount importance for targeted diagnostics. We will present recent results in near-infrared time and spatial frequency methods applied to large field-of-view image-guided surgery.

FWP3 • 2:30 p.m.
Fluorescent Tissue Imaging with a Multiplexed Holographic Spectral-Spatial System, *Yuan Luo[1], Paul Gelsinger[1], George Barbastathis[2], Jennifer Barton[1], Raymond Kostuk[1]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]MIT, USA.* A 3-D imaging method with the use of multiplexed holographic gratings to visualize biological structures is presented. We demonstrate the imaging modality to obtain illuminated biological samples with a LED and laser-induced fluorescent tissue structures.

FWQ • Petawatt and Chirped Pulse Laser Technology—Continued

FWQ2 • 2:00 p.m. Invited
The OMEGA EP High-Energy, Short-Pulse Laser System, *Leon Waxer, John H. Kelly, B. E. Kruschwitz, J. Qiao, M. J. Guardalben, I. A. Begishev, J. Bromage, C. Dorrer, J. L. Edwards, L. Folnsbee, S. D. Jacobs, R. Jungquist, T. J. Kessler, R. W. Kidder, S. J. Loucks, J. R. Marciante, D. N. Maywar, R. L. McCrory, D. D. Meyerhofer, S. F. B. Morse, A. V. Okishev, J. B. Oliver, G. Pien, J. Puth, A. L. Rigatti, W. Schmid, M. J. Shoup III, C. Stoeckl, K. A. Thorp, and J. D. Zuegel; Lab for Laser Energetics, Univ. of Rochester, USA.* OMEGA EP (Extended Performance) is a petawatt-class addition to the existing 30-kJ, 60-beam OMEGA Laser Facility at the University of Rochester. Activation of the OMEGA EP Laser is complete and results will be described.

FWQ3 • 2:30 p.m.
Ultra-Broadband Optical Parametric Chirped-Pulse Amplification Using a Cryogenic-Cooled Yb:YLF Pump Laser, *Koichi Yamakawa[1,2], M. Aoyama[1,2], Y. Akahane[1,2], K. Tsuji[1], K. Ogawa[1,2], T. Harimoto[3], J. Kawanaka[4], H. Nishioka[5], M. Fujita[6]; [1]Japan Atomic Energy Agency, Japan, [2]JST CREST, Japan, [3]Univ. of Yamanashi, Japan, [4]Inst. of Laser Engineering, Osaka Univ., Japan, [5]Inst. for Laser Science, Univ. of Electro-Communications, Japan, [6]Inst. for Laser Technology, Japan.* We have demonstrated ultra-broadband optical parametric chirped-pulse amplification of more than 500-nm bandwidth pumped by a diode-pumped, cryogenic-cooled Yb:YLF chirped-pulse amplification laser.

FWR • Novel Fiber Devices I—Continued

FWR2 • 2:00 p.m.
Measurement of the Verdet Constant in a Terbium-Core-Doped Fiber, *Lei Sun[1,2], Shibin Jiang[3], Jonathan Zuegel[2], John Marciante[1,2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Lab for Laser Energetics, Univ. of Rochester, USA, [3]AdValue Photonics Inc., USA.* The effective Verdet constant is measured in a 25-wt%.-terbium-doped phosphate fiber. It is six times larger than a silica fiber, with contributions from the materials in the core and the cladding.

FWR3 • 2:15 p.m.
Beam Profile of Two Simultaneously Propagating Channels of Same Wavelength in Step Index Multimode Fibers, *Syed H. Murshid, Abhijit Chakravarty, Raka Biswas; Florida Inst. of Technology, USA.* Spatially multiplexed channels of exactly the same wavelength can be transmitted simultaneously over a single strand of multimode fiber. Experimental setup, screen projection of output and beam intensity profiles at the exit end is presented.

FWR4 • 2:30 p.m. Invited
Multimaterial Fibers and Integrated Fiber Photonic Devices, *Zheng Wang, Ayman F. Abouraddy, Fabien Sorin, Sylvain Danto, Ofer Shapira, John Joannopoulos, Yoel Fink; MIT, USA.* We demonstrate multimaterial fibers containing dielectric, conducting and semiconducting microstructures with disparate optical and electrical functions. The integrated functionalities, for example, photodetectors and fiber-lasers, are demonstrated at both single-fiber and fiber-fabric levels.

FWS • Lasing in and Scattering from Random Media—Continued

FWS3 • 2:00 p.m. Invited
Making Random Lasers Useful for Practical Applications, *Siu-Fung Yu; Nanyang Univ., Singapore.* This presentation investigates the possibility to design and realize semiconductor random media with lasing performance compatible to that of conventional semiconductor laser diodes so that random lasers can be made for practical applications.

FWS4 • 2:30 p.m.
Disordered Media as Efficient Optical Devices, *Thomas Kohlgraf-Owens, Aristide Dogariu; CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA.* Homogeneous materials are ubiquitous in optical systems. Disordered media are usually considered a nuisance since they cause intricate scattering. However, we show they can act as linear devices and demonstrate their operation as efficient polarimeters.

LWG • Cold Atom Sensors—Continued

LWG2 • 2:00 p.m. Invited
Atom Interferometry with a Weakly Interacting Bose Einstein Condensate, *Marco Fattori[1,2], C. D'Errico[1,2], G. Roati[1,2], M. Zaccanti[1,2], M. Jona Lasinio[1,2], M. Modugno[1,2], G. Modugno[1,2], M. Inguscio[1,2]; [1]Univ. of Florence, Italy, [2]Museo Storico della Fisica, Ctr. Studi e Ricerche Enrico Fermi, Italy.* We demonstrate trapped atom interferometry with a weakly interacting Bose Einstein condensate. Atomic scattering length is tuned almost to zero by means of a broad magnetic Feshbach resonance and interaction induced decoherence results strongly suppressed.

LWG3 • 2:30 p.m.
Achieving High Precision with a Thermal Beam Atom Interferometer, *Christopher J. Erickson, James L. Archibald, Jeremiah Birrell, Landon Goggins, Daniel A. Merrill, Dallin S. Durfee; Brigham Young Univ., USA.* We report on the progress of a thermal calcium-beam Ramsey-Bordé atom interferometer. Our efforts have led to the development of precision electronic and laser systems whose design allows them to be implemented as lab standards.

LWH • Carbon Nanostructure Imaging and Spectroscopy—Continued

LWH2 • 2:00 p.m.
The Lifetime of Optical Phonons in Graphite, *Hugen Yan, Daohua Song, Kin Fai Mak, Ioannis Chatzakis, Janina Maultzsch, Tony F. Heinz; Depts. of Physics and Electrical Engineering, Columbia Univ., USA.* Femtosecond pump-probe Raman spectroscopy has been applied to monitor the decay of non-equilibrium optical phonons in graphite. A lifetime of 2.2 ps is found.

LWH3 • 2:15 p.m.
Raman Spectroscopy of Graphene under Uniaxial Strain, *Hugen Yan, Mingyuan Huang, Daohua Song, Changyao Chen, James Hone, Tony F. Heinz; Ctr. for Nanoscale Science and Engineering, Columbia Univ., USA.* Polarized Raman spectroscopy was performed on single-layer graphene under uniaxial strain. The G- mode softens and splits into two components that exhibit distinct polarization properties related to the orientation of the graphene lattice.

LWH4 • 2:30 p.m.
Dissipation Mechanisms in Free Standing Single and Bi-Layer Graphene, *Bennett Goldberg, Sebastian Rémi, Constanze Metzger, Billy Hubbard, Anna Swan; Boston Univ., USA.* We use micro-Raman scattering to probe the dissipation mechanisms in suspended and supported single and bi-layer graphene as a function of temperature to 4K.

MWC • Metamaterials II—Continued

MWC3 • 2:00 p.m.
How to Design and Characterize Metal-Dielectric Based Metamaterials: Experimental Demonstrations of Metamaterial Applications at the Millimeter-Wave Regime, *Kamil B. Alici, E. Ozbay; Bilkent Univ., Turkey.* In the present work, after detailed explanation of the metamaterials design methods, we demonstrate two different double negative metamaterial media and their properties in terms of radiation and negative refaraction at the millimeter-wave regime.

MWC4 • 2:15 p.m.
Negative Electromagnetic Energy Interpretation of Negative Group Velocities in Metamaterials, *Noam Kaminski, Meir Orenstein; Technion - Isreal Inst. of Technology, Israel.* Negative dispersion can be tailored in metamaterials with gain. Causal pulses in this medium are exhibiting "negative light" that can be interpreted as carrying negative electromagnetic energy, exploiting the stored energy in the gain medium.

MWC5 • 2:30 p.m.
Testing the Controversies of Toroidal Electrodynamics using Metamaterials, *Nikitas Papasimakis[1], Kiril Marinov[1], Vassili A. Fedotov[1], Allan D. Boardman[2], Nikolay I. Zheludev[1]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]Inst. of Materials Res., Ctr. for Theory and Modelling, Univ. of Salford, UK.* Experiments with metamaterials can resolve some intriguing controversies of toroidal electrodynamics. We illustrate this by the study of polarization-sensitive stop-bands and optical activity in toroidal helices.

OWC • Micro/Integrated Optics—Continued

OWC2 • 2:00 p.m.
Micro-Optical Fabrication Based on Laser Smoothing of Etched Structures, *Krystian L. Wlodarczyk[1], Enrique Mendez[1], Howard J. Baker[1], Mohammad Taghizadeh[1], Roy McBride[2], Denis R. Hall[1]; [1]Heriot Watt Univ., UK, [2]PowerPhotonic Ltd., UK.* CO_2 laser smoothing of reactive-ion-etched silica structures is shown to provide controlled relaxation of sharp step features. The process is promising for low light scatter microoptics production using binary or multi-level etched structures as precursors.

OWC3 • 2:15 p.m.
Dual Source Microscope for the Inspection of Micro-Optics, *Robert E. Parks; Optical Perspectives Group, LLC, USA.* A dual light source microscope is described that can measure the first order optical properties of microlenses as well as centering and wavefront quality while simultaneously inspecting the surfaces for beauty defects.

OWC4 • 2:30 p.m.
Low-Cost Fresnel Lens Array with Engineered Point Spread Function for Passive Infrared Motion Sensors, *Giuseppe A. Cirino[1], Allan Berczki[2], Robson Barcellos[1], Spero P. Morato[2], Luiz G. Neto[1]; [1]EESC, Dept. of Electrical Engineering, São Paulo Univ., Brazil, [2]LaserTools Tecnologia Ltda, Brazil.* Cubic-phase distributions are employed as spatial filters in low-cost Fresnel lenses for passive infrared motion sensors. The mould for the fabrication of the lenses in polyethylene was manufactured by laser ablation on hard steel.

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
FiO	Joint	FiO			

FWM • Quantum Telecom II—Continued

FWM4 • 3:00 p.m. Invited

Quantum-Noise Randomized Encryption for Telecommunication Networks, *Gregory Kanter; NuCrypt, USA.* A method of encryption that exploits irreducible quantum noise to enhance the security of traditional encryption algorithms will be described. The method is compatible with telecommunications infrastructure and performs on-par with standard optical communication methods.

JWB • Optics for Energy I: Solar Cell Materials and Development—Continued

JWB4 • 3:00 p.m. Invited

Electroluminescence Refrigeration and Ultrahigh Efficiency Solar Cells: Two Grand Challenges to p-n Junction Devices, *Yong-Hang Zhang; Arizona State Univ., USA.* This talk will discuss the latest progresses in the theoretical and experimental study of p-n junction devices and their application in potential electroluminescence refrigeration and in ultrahigh-efficiency multijunction solar cells.

FWN • Optics and Instrumentation for Next-Generation Sources I—Continued

FWN4 · 2:45 p.m. Invited

Characterization of Focused Soft X-Ray Laser Beams: Comparing their Ablative Imprints with Other Methods, *Libor Juha, Jaromir Chalupsky, Vera Hajkova; Acad. of Sciences of the Czech Republic, Czech Republic.* The surface damage was investigated on suitable material to infer the focused beam characteristics of soft X-ray lasers. The method was tested with the beam of FLASH (Free-Electron LASer in Hamburg).

FWO • Optical Hydrodynamics and Solitons—Continued

FWO5 • 2:45 p.m.

Experimental Observation of Cavity Solitons in a Passive Fiber Optical Resonator, *François Leo, Pascal Kockaert, Philippe Emplit, Marc Haelterman; OPERA-Photonique, Univ. Libre de Bruxelles, Belgium.* Using an optical fiber ring cavity, we demonstrate experimentally the existence of the 1-D Kerr-type cavity soliton. The soliton is generated through cross-phase modulation between the intracavity field and a short external pulse.

FWO6 • 3:00 p.m. Invited

Lattice Surface Solitons, *Demetrios N. Christodoulides, George I. Stegeman; CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA.* We provide an overview of recent experimental and theoretical developments in the area of discrete surface solitons.

FWP • Dynamic Fluorescence Imaging—Continued

FWP4 • 2:45 p.m.

Sensitivity of Fluorescence Lifetime to External Pressure in a Fluorophore-Quencher Labeled Microbubble System, *Baohong Yuan; Catholic Univ. of America, USA.* Sensitivity of fluorescence lifetime of a dye labeled on the surface of a microbubble to external pressure is studied. Results show a fluorophore-labeled microbubble system is an excellent sensor for noninvasive measurement of weak pressure.

FWP5 • 3:00 p.m.

Accuracy of pH Sensing Using Fluorescence Lifetime Imaging Microscopy, *Yuxiang Lin[1], Arthur F. Gmitro[1,2]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]Dept. of Radiology, Univ. of Arizona, USA.* This paper presents the influence of photon noise in pH measurement using the fluorescence lifetime imaging microscopy. The accuracy of measurement with both frequency-domain and time-domain techniques are discussed.

FWP6 • 3:15 p.m.

Two-Photon Autofluorescence Dynamics for Quantitative Cell Pathology and Respiratory State Activities, *Qianru Yu, Andrew Lutes, Ahmed A. Heikal; Pennsylvania State Univ., USA.* Two-photon autofluorescence dynamics imaging of metabolic co-factors, NADH and FAD, will be discussed as natural probes for cell biology. Of particular interest are the redox states and energy metabolism in breast cancer and normal cells.

FWQ • Petawatt and Chirped Pulse Laser Technology—Continued

FWQ4 • 2:45 p.m.

A Modular Approach to Spectral Phase Calculation: Application to Grism Optimization, *Charles G. Durfee[1], Jeff A. Squier[1], Jeff J. Field[1,2], Steve Kane[2]; [1]Colorado School of Mines, USA, [2]Horiba Jobin-Yvon, USA.* By making a superposition of basic tilted window modules we can calculate the spectral phase of a wide variety of refractive/diffractive planar structures (including varieties of grisms) that are important for optimizing ultrafast amplifier designs.

FWQ5 • 3:00 p.m. Invited

Novel Matter and Devices in High Energy Density Science with High Power Lasers, *Ryosuke Kodama; Osaka Univ., Japan.* Presented are high-energy plasma photonic devices for novel radiation sources and a high-energy-density solid, or a novel metallic state of high-pressure-condensed matter using high-power lasers. "Creation and Probe" is proposed with these integrated technologies.

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

Highland G / Highland H — FiO

FWR • Novel Fiber Devices I—Continued

FWR5 • 3:00 p.m.
Low Loss Fusion Splicing of Silica Microfibers, *Parama Pal, Wayne H. Knox; Inst. of Optics, Univ. of Rochester, USA.* We spliced together two tapered, step-index, air-clad silica microfibers using a CO_2 laser with loss < 0.3%. This may be important for realizing practical photonic circuits by eliminating mechanical instabilities related to evanescent coupling.

FWR6 • 3:15 p.m.
Passive Stabilization of Slow Light Delays in SBS-Based System Using a Faraday Rotator Mirror, *Mark Bashkansky[1], David R. Walker[1], Armen Gulian[2], Michael Steiner[1], Fredrik K. Fatemi[1]; [1]NRL, USA, [2]SFA, USA.* SBS in non-polarization maintaining single mode fibers is often used for slow light. Due to polarization sensitivity in fibers the delay may fluctuate. We demonstrate a technique that can be used to stabilize the delay.

FWS • Lasing in and Scattering from Random Media—Continued

FWS5 • 2:45 p.m.
Scattering of Stochastic Fields from Deterministic and Random Collections of Particles, *Serkan Sahin, Olga Korotkova; Univ. of Miami, USA.* We investigate the second-order statistical properties of fields scattered from collections of particles with the help of pair-scattering matrices. Both the incident light and the scatterers may be deterministic or random.

FWS6 • 3:00 p.m.
Coupled Dipole Approximation for Modeling Large Scale Random Media, *Sergey Sukhov, David Haefner, Aristide Dogariu; CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA.* We extend the coupled dipole approximation to model optical properties of large scale slabs of inhomogeneous materials. This method handles various aspects of the structural morphology including composition, spatial distribution, inclusion size, and surface roughness.

FWS7 • 3:15 p.m.
Spatial Intensity Correlations of Light Scattered by a Thick Random Medium, *Zhenyu Wang, Andrew M. Weiner, Kevin J. Webb; Purdue Univ., USA.* Experiments with two beams scattered by a thick random medium show that information about the incident wave vectors can be retrieved from a spatial correlation over source position. This observation should be useful in imaging applications.

Highland J / Highland K — LS

LWG • Cold Atom Sensors—Continued

LWG4 • 2:45 p.m.
Magnetometry with High Sampling Rate Using Cold Atoms in a Movable Dark Optical Trap, *Matthew L. Terraciano, Mark Bashkansky, Fredrik K. Fatemi; NRL, USA.* We use Faraday spectroscopy of atoms confined to a crossed hollow beam trap to measure the magnetic field in a 200-micron-diameter spot with kilohertz sampling rate. Magnetic field maps are acquired by dynamic trap scanning.

LWG5 • 3:00 p.m.
Quantum Limited Postion Measurements of a Dark Matter-Wave Soliton, *Carsten Henkel[1], Antonio Negretti[2], Klaus Moelmer[2]; [1]Univ. Potsdam, Germany, [2]Dept. of Physics and Astronomy, Univ. of Aarhus, Denmark.* We show that the position of a dark matter-wave soliton in a quasi-one-dimensional BEC can be determined with a precision that scales with the atomic density as $n^{(-3/4)}$, without particular squeezing or entanglement.

LWG6 • 3:15 p.m.
OAM Induced BEC Vortices–Detection and Applications , *Sulakshana N. Thanvanthri[1], Kishor T. Kapale[2], Jonathan P. Dowling[1]; [1]Louisiana State Univ., USA, [2]Western Illinois Univ., USA.* We present an overview of theoretical work on atomic vortices created using OAM states. Gyroscopes are an important application of atomic vortex superposition. We use non-destructive detection schemes to compare with sensitivity of current gyroscopes.

LWH • Carbon Nanostructure Imaging and Spectroscopy—Continued

LWH5 • 2:45 p.m.
Scattering of a Focused Shifted Laser Beam by an Elongated Large-Size Spheroidal Particle, *Elsayed Esam M. Khaled[1], Hany L. Ibrahim[2]; [1]Electrical Engineering Dept., Faculty of Engineering, Assiut Univ., Egypt, [2]Telecom Egypt, Egypt.* Scattered and internal intensities of an elongated, large size parameter spheroidal particle illuminated with an arbitrary laser beam are calculated. A combination of the T-matrix and the plane wave spectrum methods is used.

Hyatt Grand Ballroom A/B — META

MWC • Metamaterials II—Continued

MWC6 • 2:45 p.m.
Plasmonic Metamaterial with Coupling Induced Transparency, *Shuang Zhang, Dentcho A. Genov, Yuan Wang, Ming Liu, Xiang Zhang; Univ. of California at Berkeley, USA.* A plasmonic "molecule" consisting of a radiative element coupled with a sub-radiant (dark) element is theoretically investigated. The plasmonic "molecule" shows electromagnetic response that closely resembles the electromagnetically induced transparency (EIT) in an atomic system.

MWC7 • 3:00 p.m.
Metamaterials Using Magnetic Resonance between Periodic Strips and a Metallic Film, *Liping Wang, Bong Jae Lee, Zhuomin Zhang; Georgia Tech, USA.* Metamaterial can be realized by exciting the magnetic resonance between a periodic metallic strip and an opaque metallic film with a dielectric spacer, allowing tuning the absorption/emission of the infrared radiation.

MWC8 • 3:15 p.m.
Plasmonic Metamaterials Band Structure, *Gilad Rosenblatt, Michael Ney, Eyal Feigenbaum, Meir Orenstein; Technion - Isreal Inst. of Technology, Israel.* Tailoring dispersion features of metal-air metamaterials using a MIM and IMI coupling approach allows for low loss propagation, highly squeezed surface-guided modes, negative index modes adjustable cut-offs and induced degeneracy between modes of different symmetries.

Hyatt Grand Ballroom E/F — OF&T

OWC • Micro/Integrated Optics—Continued

OWC5 • 2:45 p.m.
Point-Spread Function of the GRIN Array Including Aberrations and Optical Path Differences, *Xi Chen, Nicholas George; Univ. of Rochester, USA.* Theoretical treatment of the GRIN array to include aberrations that limit the point-spread function in the modern digital copier. Aberrations and optical path differences are included, yielding results for PSF that are in accord with experiment.

OWC6 • 3:00 p.m.
Fabrication of Long-Period Fiber Gratings Using a Low-Pressure Mercury Lamp, *Toru Mizunami, Yutaku Sho, Yoshihito Ishida; Dept. of Electrical Engineering, Kyushu Inst. of Technology, Japan.* Long-period gratings were fabricated using photorefractive index changes of optical fiber by the 254-nm radiation of a low-pressure mercury lamp. An attenuation of 17.9 dB was obtained for a grating period of 460 μm.

OWC7 • 3:15 p.m.
High Channel Count Connector for Optical Interconnect, *Yoichi Taira, Fumiaki Yamada, Akihoro Horibe, Shigeru Nakagawa, Sayuri Kohara, Hidetoshi Numata; IBM, Japan.* We evaluated the precision fabrication of multichannel optical connector for computer communication. Molded ferrules and precision cut polymer films are used to fabricate a high channel count connector in a simple and cost effective manner.

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

4:00 p.m.–5:30 p.m.
SWD • A Tribute to Howard Schlossberg II
Robert L. Byer; Stanford Univ., USA, Presider

SWD1 • 4:00 p.m. Invited
Applications of Molecular Coherence, *Alexei Sokolov; Texas A&M Univ., USA.* Macroscopic molecular coherence allows broadband collinear generation of Raman sidebands, opening possibilities for compression of optical sub-cycle subfemtosecond pulses, and for non-sinusoidal field synthesis; increased coherence also enables improvements in optical detection and sensing applications.

SWD2 • 4:30 p.m. Invited
Nanoscale Stratification of Local Field and Related Effects of Giant Resonances, "Magic Numbers" and Hystereses, *Sergei N. Volkov, Alexander E. Kaplan; Dept. of Electrical and Computer Engineering, Johns Hopkins Univ., USA.* We predict nanoscale local-field patterns in self-interacting 1-D and 2-D lattices of two-level atoms. They result in giant size-related resonances, low-intensity optical bistability, and self-induced cancellation of resonant local-field suppression.

4:00 p.m.–5:30 p.m.
FWT • Diffractive Micro and Nano Structures for Sensing and Information Processing I
Erez Hasman; Technion - Israel Inst. of Technology, Israel, Presider

FWT1 • 4:00 p.m. Invited
Microscopic Model of the Extraordinary Light Transmission, *Philippe Lalanne[1], H. Liu[1,2]; [1]Lab Charles Fabry de l'Inst. d'Optique, Univ. Paris-Sud, France, [2]Key Lab of Opto-Electronic Information Science and Technology, Ministry of Education, Inst. of Modern Optics, Nankai Univ., China.* The electromagnetic interaction between nano-objects on the metal surface is driven by two different waves: the SPP mode and a quasi-cylindrical wave. We discuss the impact of these two waves in the extraordinary transmission.

FWT2 • 4:30 p.m.
Femtosecond Laser Micromachining of Ophthalmologic Hydrogels with Two Photon Absorption Enhancement, *Li Ding[1], Wayne H. Knox[1], Siddhesh Pawar[2], Glen Labenski[2], Thomas Smith[2], Dharmendra Jani[3], Jeffrey Linhardt[3], Jay F. Kunzler[3]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Rochester Inst. of Technology, USA, [3]Bausch & Lomb, USA.* Ophthalmologic hydrogel polymers are doped with fluorescein or coumarin dyes to enhance two photon absorption (TPA) during the femtosecond laser micromachining process. Consequently, micromachining speed can be significantly increased.

4:00 p.m.–5:30 p.m.
JWC • Optics for Energy II: Systems for Energy Efficiency
Alan Kost; Univ. of Arizona, USA, Presider

JWC1 • 4:00 p.m. Invited
Energy Implications of Solid-State Lighting Technology, *E. Fred Schubert, Jong Kyu Kim; Rensselaer Polytechnic Inst., USA.* The efficient yet highly controllable generation of light can be accomplished by light-emitting diodes that can have a 20 times greater efficiency than incandescent light sources. Implications on energy, environment, and finances will be discussed.

JWC2 • 4:30 p.m. Invited
Optically Powered Networks, *Juerg Leuthold[1], W. Freude[1], J. Becker[1], M. Roeger[1], M. Hoh[1], G. Boettger[1], M. Hübner[1], J. Hehmann[2], T. Pfeiffer[2]; [1]Univ. of Karlsruhe (TH), Germany, [2]Alcatel-Lucent, Bell Labs Germany, Germany.* Optically-powered networks are demonstrated. In these networks optically-powered remote sensors and optical transmitters perform communication with the base station. The success of the scheme relays both on power-efficient hardware and a proper network protocol.

4:00 p.m.–5:30 p.m.
FWU • Optics and Instrumentation for Next-Generation Sources II
Regina Soufli; Lawrence Livermore Natl. Lab, USA, Presider

FWU1 • 4:00 p.m. Invited
X-Ray Monochromator Characteristics for a Coherent Energy Recovery Linac Source of Hard X-Rays, *Donald Bilderback, Alexander Kazimirov; Cornell Univ., USA.* Energy Recovery Linacs can produce highly coherent hard X-ray beams. Reflection from a silicon (111) crystal will not do much harm to an ERL 50 fs duration X-ray pulse at 8 keV.

FWU2 • 4:30 p.m.
Integration of the Two-Dimensional Power Spectral Density into Specifications for the X-Ray Domain—Problems and Opportunities, *Wayne R. McKinney, Malcolm R. Howells, Valeriy V. Yashchuk; Lawrence Berkeley Natl. Lab, USA.* An implementation of the two-dimensional statistical scattering theory for the prediction of scattering from x-ray mirrors is presented with a graphical user interface. This development has clarified several problems which are of interest to synchrotrons.

4:00 p.m.–5:45 p.m.
FWV • Coherence I
P. Scott Carney; Univ. of Illinois at Urbana-Champaign, USA, Presider

FWV1 • 4:00 p.m.
Polarization Vortex Illumination: Predicting and Measuring the Correlation Matrix, *Dean P. Brown, Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA.* A reversed-wavefront Young interferometer is used for direct measurement of polarization-dependent and spatially dependent correlation matrices. We show critical illumination systems with polarization vortex mode converters in the pupil produce an improvement in image contrast.

FWV2 • 4:15 p.m.
Intensity Fluctuations and Cross-Polarization in Gaussian Schell-Model Beams, *Asma Al-Qasimi[1], Daniel F. V. James[1], Emil Wolf[2]; [1]Univ. of Toronto, Canada, [2]Univ. of Rochester, USA.* We study intensity fluctuations of two light beams differing only in the degree of cross-polarization. For two model beams with same degree of coherence and same degree of polarization, the intensity fluctuations can be different.

FWV3 • 4:30 p.m.
Polarization Correlation in a Quasi-1-D Random System, *Shaolin Liao, Azriel Z. Genack; Queens College of CUNY, USA.* Statistical correlation of polarization of microwave radiation from randomly positioned spheres inside a circular waveguide is investigated. Cross correlation vanishes in cylindrical coordinates but not in other orthogonal coordinate systems except on the waveguide axis.

4:00 p.m.–5:30 p.m.
FWW • Microscopy Instrument and Software Developments
Mircea Mujat; Physical Sciences, Inc., USA, Presider

FWW1 • 4:00 p.m.
High Performance Self Aligning Miniature Optical Systems for *in vivo* Diagnostics, *Robert T. Kester[1], Todd Christenson[2], Rebecca Richards Kortum[1], Tomasz Tkaczyk[1]; [1]Rice Univ., USA, [2]HT Micro, USA.* Fabrication of high performance low cost miniature optical systems are possible through the use of hybrid glass/plastic optics and DXRL based optomechanics. Self aligning optomechanics maintain tight alignment tolerances eliminating labor intensive assembly.

FWW2 • 4:15 p.m.
Inexpensive and Flexible Slit-Scanning Confocal Imaging Using a Rolling Electronic Aperture, *Matthew S. Muller, Ann E. Elsner, Benno L. Petrig; Indiana Univ., USA.* The temporal synchronization between slit-scanning illumination and line-by-line CMOS detection permits the creation of a flexible electronic confocal aperture. A novel imaging system design is presented, highlighting the advantages and challenges to this technique.

FWW3 • 4:30 p.m.
Estimation of Phase Shifts in Structured Illumination for Optically Sectioned Imaging of Moving Objects, *Sapna A. Shroff, James R. Fienup, David R. Williams; Univ. of Rochester, USA.* Structured illumination has been used to obtain optically sectioned images. We estimate unknown, random phase shifts in the multiple sinusoidally patterned images in post-processing, permitting the application of this technique to translating objects.

Highland F

FiO

4:00 p.m.–5:15 p.m.
FWX • Ultrahigh Fields and Laser Technology
Peter Norreys; Rutherford Appleton Lab, UK, Presider

FWX1 • 4:00 p.m. Tutorial
Frontiers in Ultrahigh Fields—A Tutorial on Recent Advances , *Thomas Cowan; Forschungszentrum Dresden-Rossendorf, Inst. of Radiation Physics, Germany.* Abstract, biography and photo not available.

Highland H

LS

4:00 p.m.–4:45 p.m.
LWI • Novel Elements of Laser Science
John Kitching; NIST, USA, Presider

LWI1 • 4:00 p.m.
Dynamics of Localized Waves, *A. A. Chabanov[1], Z. Q. Zhang[2], S. K. Cheung[2], C. H. Wong[2], A. Z. Genack[3]; [1]Univ. of Texas at San Antonio, USA, [2]Hong Kong Univ. of Science and Technology, Hong Kong, [3]Queens College CUNY, USA.* Dynamic microwave transmission has been measured in quasi-1-D disordered samples with lengths up to three localization lengths and compared to self-consistent localization theory, to 1-D simulations, and to a dynamic single parameter scaling model.

LWI2 • 4:15 p.m.
Trojan Electrons in Symmetric Conic Quantum Dots, *Matt K. Kalinski; Dept. of Chemistry and Biology, Utah State Univ., USA.* Doped quantum dots with attractive conic quantum dot potentials are considered. The stable electron can be in "superconducting" confined configuration executing persistent current in Gaussian state in infinitesimally small CP electric fields.

LWI3 • 4:30 p.m.
Thermal Effects of Volume Bragg Grating as Laser Mirrors Due to Minute Self-Absorption, *Te-yuan Chung[1], Sakoolkan Boonruang[2]; [1]Dept. of Optics and Photonics, Natl. Central Univ., Taiwan, [2]Natl. Electronics and Computer Technology Ctr. (NECTEC), Thailand.* A simulation using T-matrix and finite element analysis confirm the experimental results and suggest VBG laser wavelength and reflectivity change caused by the volume Bragg grating absorption induced thermal effects.

Highland J

LS

4:00 p.m.–5:30 p.m.
LWJ • Cold Molecules II
Jun Ye; JILA, Univ. of Colorado & NIST, USA, Presider

LWJ1 • 4:00 p.m. Invited
Manipulating Polar Molecules: Traps, Synchrotrons and Chips, *Gerard Meijer; Fritz-Haber Inst., Germany.* The motion of polar molecules in a beam can be manipulated with electric fields. Decelerated beams of molecules can be loaded in traps or storage rings, and manipulation of molecules on a chip is demonstrated.

LWJ2 • 4:30 p.m. Invited
Experiments with Trapped Ultracold RbCs Molecules, *Eric Hudson; Yale Univ., USA.* Dense samples of ultracold heteronuclear molecules, produced via atomic photoassociation, have been trapped in an optical lattice. We report on recent measurements of inelastic collision rates for these molecules with both Rb and Cs atoms.

Highland K

LS

4:00 p.m.–5:30 p.m.
LWK • Spectroscopy of Carbon Nanotubes
Gregory Scholes; Univ. of Toronto, USA, Presider

LWK1 • 4:00 p.m. Invited
Optical Spectroscopy of Individual Single-Walled Carbon Nanotubes and Graphene, *Tony Heinz; Columbia Univ., USA.* Linear optical measurements and Raman spectroscopy have been applied to probe electronic excitations and phonons in individual carbon nanotubes and in isolated samples of single-layer graphene.

LWK2 • 4:30 p.m. Invited
Excited States Decay in Carbon Nanotubes, *Vasili Perebeinos; IBM, USA.* We will discuss the decay of radiative and non-radiative decay of the excited states in carbon nanotubes and the role of the environment. The vibrational excitation spectra can be used to characterize the local environment.

Hyatt Grand Ballroom A/B

META

4:00 p.m.–6:00 p.m.
MWD • Nanoplasmonics I
Walter Pfeiffer; Univ. of Bielefeld, Germany, Presider

MWD1 • 4:00 p.m.
Re-Routing Optical Fields in Channels Carved in Epsilon-Near-Zero (ENZ) Nanocircuit Boards, *Nader Engheta, Andrea Alù; Univ. of Pennsylvania, USA.* Optical fields may be manipulated and re-routed in arbitrarily-shaped grooves carved in near-zero-permittivity substrates. These channels act as nanoscale "wires" for optical displacement vectors with almost uniform phase, satisfying Kirchhoff's circuit laws at optical frequencies.

MWD2 • 4:15 p.m.
The Nanoplasmonic Coplanar Family, *Yinon Stav, Nikolai Berkovitch, Meir Orenstein; Technion, Israel.* Coplanar plasmonic waveguides at the nanometric regime are studied both theoretically and experimentally, including their mutual coupling. Edge guiding in these structures enables relatively long plasmon propagation (tens of micrometers).

MWD3 • 4:30 p.m. Invited
Plasmonic Nano-Guides and Circuits, *Sergey I. Bozhevolnyi; Univ. of Southern Denmark, Inst. of Sensors, Signals and Electrotechnics, Denmark.* Surface-plasmon (SP) based waveguiding configurations are considered, and subwavelength photonic components utilizing SP modes propagating along channels cut into and dielectric ridges deposited onto gold films are overviewed demonstrating first examples of ultra-compact plasmonic components.

Hyatt Grand Ballroom E/F

OF&T

4:30 p.m.–5:45 p.m.
OWD • Large Optics
H. Philip Stahl; NASA Marshall Space Flight Ctr., USA, Presider

OWD1 • 4:00 p.m. Invited
Paper Withdrawn

OWD2 • 4:30 p.m.
Fabrication and Testing of Combined Primary and Tertiary Mirrors for the Large Synoptic Survey Telescope, *Buddy Martin, Jim Burge, Randy Lutz, Mike Tuell; Univ. of Arizona, USA.* The Large Synoptic Survey Telescope is a three-mirror system with an 8.4-m primary mirror and a 5.1-m tertiary mirror on a single glass substrate. This mirror is being manufactured at the Steward Observatory Mirror Lab.

SWD • A Tribute to Howard Schlossberg II—Continued

SWD3 • 5:00 p.m. Invited
Nonlinear Optics of Electron Spin Coherences in Semiconductors, *Hailin Wang; Univ. of Oregon, USA.* I will discuss recent experimental studies of nonlinear optical properties of electron spins in semiconductors. Differences and similarities between atomic and semiconductor spin systems as well as effects of manybody Coulomb correlations will be emphasized.

FWT • Diffractive Micro and Nano Structures for Sensing and Information Processing I—Continued

FWT3 • 4:45 p.m.
3-D Localization of Fluorescent Microparticles Using a Rotating Point Spread Function, *Sri Rama Prasanna Pavani, Rafael Piestun; Univ. of Colorado at Boulder, USA.* We demonstrate single-image three-dimensional position localization of fluorescent microspheres embedded in a 3-D volume by engineering the point spread function of a wide-field fluorescent microscope to rotate continuously with defocus.

FWT4 • 5:00 p.m.
A Compact Integrated Chemical/Biological Sensor, *Jonathan S. Maikisch, Thomas K. Gaylord; School of Electrical and Computer Engineering, Georgia Tech, USA.* A compact, integrated silicon-on-insulator optical sensor design based on in-plane diffraction gratings for microfluidic detection of gaseous and liquid analytes is presented and analyzed. Optimization, characterization, and sensitivity analysis are performed with rigorous coupled-wave analysis.

FWT5 • 5:15 p.m.
Direct UV-Written Near-Visible and Visible Planar Bragg Gratings and their Application in Sensors, *Dmytro O. Kundys, James C. Gates, Huw E. Major, Corin B. E. Gawith, Peter G. R. Smith; Optoelectronics Res. Ctr., Univ. of Southampton, UK.* We demonstrate sensor devices based on planar Bragg gratings operated at near-visible and visible wavelengths fabricated by direct UV-writing. Latest nano-scale period Bragg gratings offer new advantages in highly integrated sensors applications.

JWC • Optics for Energy II: Systems for Energy Efficiency—Continued

JWC3 • 5:00 p.m. Invited
Optics for Solar Cells for Portable Power, *Duncan Moore; Inst. of Optics, Univ. of Rochester, USA.* For portable solar power it is necessary to have three ingredients—a few hours of charging without moving the device, very high efficiency and reasonable manufacturing costs. This paper will address the trade-offs of these elements.

FWU • Optics and Instrumentation for Next-Generation Sources II—Continued

FWU3 • 4:45 p.m. Invited
X-Ray Free-Electron-Laser Interaction with Materials, *Stefan Hau-Riege; Lawrence Livermore Natl. Lab, USA.* The high-intensity ultrashort radiation of x-ray free electron lasers allows accessing a new regime of ultrafast x-ray-matter interaction. We discuss this interaction physics and the consequences for optics and diagnostics.

FWU4 • 5:15 p.m.
EUV Spectroscopy of Tin-Doped Laser Plasma Sources, *Reuvani D. Kamtaprasad, Robert T. Bernath, Kazutoshi Takenoshita, Simi George, Martin C. Richardson; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Detailed spectroscopic studies on extreme ultraviolet (EUV) emission from tin-doped droplet laser plasmas were completed using a combination of spectroscopic instruments that allow for quantitative spectroscopy throughout the radiation region of 5-550 nm.

FWV • Coherence I—Continued

FWV4 • 4:45 p.m.
Application of Correlation-Induced Spectral Changes to Inverse Scattering, *Olga Korotkova[1], Daomu Zhao[2], Emil Wolf[3]; [1]Univ. of Miami, USA, [2]Zhejiang Univ., China, [3]Univ. of Rochester, USA.* The phenomenon of correlation-induced spectral changes generated on scattering of a polychromatic plane wave on a spatially homogeneous random medium is used to determine the correlation function of the scattering potential of the medium.

FWV5 • 5:00 p.m.
Statistical Fluctuations: Going Beyond the Ensemble Average, *John Broky, Jeremy Ellis, Kyle Douglass, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Random media with identical averaged properties may differ greatly in their detailed structure. These differences manifest in fluctuations between realizations. We examine fluctuations in path length and polarimetric quantities as a means of structural differentiation.

FWV6 • 5:15 p.m.
Relation Between Channel and Spatial Mesoscopic Correlations in Volume-Disordered Waveguides, *Alexey G. Yamilov; Missouri Univ. of Science and Technology, USA.* We investigate the relationship between channel and spatial mesoscopic correlations in volume disordered waveguides. We demonstrate that only with inclusion of a surface escape function, it is possible to reach consistency between two expressions.

FWW • Microscopy Instrument and Software Developments—Continued

FWW4 • 4:45 p.m.
Gabor Domain Optical Coherence Microscopy, *Panomsak Meemon, Supraja Murali, Kye-sung Lee, Jannick P. Rolland; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We propose a developing technology called Gabor Domain Optical Coherence Microscopy (GD-OCM), whose innovation is two fold: (1) The design of an invariant ~3μm lateral resolution dynamic-focusing probe; (2) A data acquisition and fusion scheme.

FWW5 • 5:00 p.m.
Full-Pupil Line-Scanning Confocal Microscope for Imaging Weakly Scattering Tissues: Comparison to Divided-Pupil, *Daniel S. Gareau, Sanjee Abeytunge, Milind Rajadhyaksha; Sloan-Kettering Cancer Ctr., USA.* Confocal reflectance full-pupil and divided-pupil line-scanning microscopes provide optical sectioning of 1-2μm and image nuclear detail in skin. Line-scanning with linear detectors is a simpler alternative to point-scanning for imaging weakly scattering epithelial tissues.

FWW6 • 5:15 p.m.
Constructing Human Retinal Capillary Maps from Adaptive Optics SLO Imaging, *Stephen A. Burns, Toco Y. P. Chui, Hongxin Song; Indiana Univ., USA.* We present a technique based on the adaptive optics confocal scanning laser ophthalmoscope for generating complete capillary maps of regions of the human retina.

FWX • Ultrahigh Fields and Laser Technology—Continued

FWX2 • 4:45 p.m.
Paper Withdrawn

FWX3 • 5:00 p.m.
1.1 Petawatt Hybrid, OPCPA-Nd:glass Laser Demonstrated, *Erhard W. Gaul, Mikael Martinez, Joel Blakeney, Axel Jochmann, Martin Ringuette, Douglas Hammond, Ramiro Escamilla, Watson Henderson, Skyler Douglas, Todd Ditmire; Univ. of Texas at Austin, USA.* We demonstrated a 1.1 Petawatt Laser (186 J, 167 fs) based on optical parametric chirped pulse amplification (OPCPA) and mixed Nd:glass amplification, which is to our knowledge currently the highest power operating laser.

LWJ • Cold Molecules II—Continued

LWJ3 • 5:00 p.m. Invited
Dynamics of Ultracold Polar Molecules in a Thin Wire Electrostatic Trap (TWIST), *Patrick J. Zabawa, Amy E. Wakim, Jan Kleinert, Christopher Haimberger, Nicholas P. Bigelow; Univ. of Rochester, USA.* Improvement in the lifetime of electrostatically trapped and deeply bound, polar NaCs molecules in the $X^1\Sigma$ state is achieved. Studies of optical and inter-species interactions occurring in the TWIST are presented.

LWK • Spectroscopy of Carbon Nanotubes—Continued

LWK3 • 5:00 p.m. Invited
Magnetophotoluminescence Spectroscopy of Excitons in Individual Carbon Nanotubes, *Ajit Srivastava[1], Han Htoon[2], Victor I. Klimov[2], Junichiro Kono[1]; [1]Rice Univ., USA, [2]Ctr. for Integrated Nanotechnology, Los Alamos Natl. Lab, USA.* We have performed low-temperature micro-photoluminescence studies on individual single-walled carbon nanotubes in magnetic fields up to 5 T and directly measured the dark-bright exciton splitting magnitude through the observation of magnetic brightening.

MWD • Nanoplasmonics I—Continued

MWD4 • 5:00 p.m.
Nano-Scale Focusing of Surface Plasmons in Metallic V-Grooves, *Hyeun-Seok Choi, David F. P. Pile, Sunghyun Nam, Guy Bartal, Xiang Zhang; Univ. of California at Berkeley, USA.* We present an experimental evidence for nanofocusing of SPPs in tapered metallic V-grooves at deep sub-wavelength scale (~λ/40 at wavelength 1.5 micron). We find the power emerging from different V-grooves increases with decreased output width.

MWD5 • 5:15 p.m.
Improving Au Nanoantenna Resonance by Annealing, *Kuo-Ping Chen, Vladimir P. Drachev, Zhengtong Liu, Alexander V. Kildishev, Vladimir M. Shalaev; Purdue Univ., USA.* Nanoantenna plasmonic absorption is enhanced using an annealing technique. The annealed Au nanoantenna array shows sharper resonances and twice the peak absorption versus those in the initially fabricated array before annealing.

OWD • Large Optics—Continued

OWD3 • 4:45 p.m.
Stress Polishing of Aspherical Surfaces for VLT AO Instrumentation , *Emmanuel Hugot[1], Marc Ferrari[1], Gérard Lemaitre[1], Kacem El Hadi[1], Pierre Montiel[1], Jean Francois Carré[2], Denis Fappani[2]; [1]Lab d'Astrophysique. de Marseille, France, [2]SESO, France.* Stress polishing methods are developed for the manufacturing of a large aspherical thin shell for the VLT Deformable Secondary Mirror and for the manufacturing of toric mirrors for the VLT SPHERE instrument.

OWD4 • 5:00 p.m.
Modified Wavefront Sensing and Correction Methodology for Active Segment Mirror of Large Space Telescope, *Heng Mao, Xiao Wang, Dazun Zhao; Beijing Inst. of Technology (BIT), China.* The active segmented primary mirror of space telescope needs realignment and figure correction after deployment. A wavefront sensing and correction methodology, including calculation based correction, is proposed to separate piston error from figure errors at exit-pupil.

OWD5 • 5:15 p.m.
Large Convex Asphere, *Christian du Jeu; Société Européenne de Systèmes Optiques, France.* Discussion on large convex asphere mirror manufacturing is presented with examples. We focused on polishing issues on one side, interferometric measurements set-up and accuracy on other side. The appropriate method to set manufacturing tolerances is defined.

FWV • Coherence I—Continued

FWV7 • 5:30 p.m.
The Hunt for Vortex Knots in 3-D Speckle Fields, *Robert P. King[1], Mark R. Dennis[2], Kevin O'Holleran[3], Miles J. Padgett[3]; [1]Univ. of Southampton, UK, [2]Univ. of Bristol, UK, [3]Univ. of Glasgow, UK.* Random optical speckle patterns in three dimensions contain complex tangles of optical vortices. We investigate the knotting and linking of these lines in computer simulations of optical fields using tools from knot theory.

Hyatt Grand Ballroom D

Joint

6:00 p.m.–7:30 p.m.
JWD • Joint META/OF&T Poster Session

OF&T Posters

JWD1
***In situ* Drag Force Measurements in MRF of Optical Glasses,** *Sivan Adar[1], Henry Romanofsky[2], Shai N. Shafrir[2], Chunlin Miao[2,3], John C. Lambropoulos[2,3], Stephen D. Jacobs[2,3,4]; [1]ORT Braude College of Engineering, Israel, [2]Lab for Laser Energetics, Univ. of Rochester, USA, [3]Dept. of Mechanical Engineering Materials Science Program, Univ. of Rochester, USA, [4]Inst. of Optics, Univ. of Rochester, USA.* A spotting technique using the magnetorheological finishing (MRF) process is applied to measurements of drag force for optical glasses. *In situ* measurement results are reported as a function of substrate surface roughness.

JWD2
Optics Manufacturing Technician Apprenticeship Program, *Rosario Micali, James Winston; Monroe Community College, USA.* The optics manufacturing environment is changing. Small companies are replacing large manufacturers. New workers need to be trained as optics fabricators. A structured career program has been developed to provide manufacturing experience and classroom instruction.

JWD3
Non-Destructive Evaluation of Diamond Tool Materials for Optical Manufacturing Applications, *Yuansun Wu, Paul Funkenbusch; Dept. of Mechanical Engineering, Univ. of Rochester, USA.* A simple, ultrasonic method for non-destructively testing commercial optical grinding tools is demonstrated, with results compared to a material database collected for diamond composite tool materials. The ultrasonic wave-speed strongly correlates with other properties.

JWD4
Modified Formulation of Phase Gradient for Noise-Immune Phase Retrieval in Phase-Shifting Interferometry, *Dae-Seo Park, Yoon-Suk Lee, Dae-Chan Kim, Beom-Hoan O, Se-Geun Park, El-Hang Lee, Seung Gol Lee; Inha Univ., Republic of Korea.* For retrieving phase information from interferograms in phase-shifting interferometry, the method of finding phase gradients is newly proposed, and it was confirmed to have the noise-immune performance superior to those of conventional methods.

JWD5
Characterization of Point Diffraction Interferometer with Aperture Cuasicircular, *Fermin S. Granados-Agustin, Alejandro Cornejo-Rodriguez, Esteban Rueda-Soriano, Rufino Diaz-Uribe; INAOE, Mexico.* The point diffraction interferometer, made with the technique of a drop of mercury on glass plate, does not form circular orifices perfectly. The objective of this work is to measure these effects.

JWD6
Ion Beam Figuring of Strongly Curved Surfaces with a (X, Y, Z) Linear Three-Axes System, *Thomas Haensel, Andreas Nickel, Axel Schindler; Leibniz-Inst. for Surface Modification, Germany.* Ion beam figuring of strongly curved surfaces using small spot beam and a three linear axes motion system and taking the ion incidence etch rate dependence into account in the process modeling has been developed.

MWD • Nanoplasmonics I—Continued

MWD6 • 5:30 p.m.
Enhanced Fluorescence via Optical Nanoantennae, *Reuben M. Bakker[1], Zhengtong Liu[1], Hsiao-Kuan Yuan[1], Rasmus Pedersen[2], Alexandra Boltasseva[2], Alexander V. Kidishev[1], Vladimir P. Drachev[1], Vladimir M. Shalaev[1]; [1]Purdue Univ., USA, [2]Technical Univ. of Denmark, Denmark.* Optical nanoantennae are developed for their field enhancement properties. Dye coating antenna arrays show enhanced fluorescence that varies with antenna geometry. The enhanced fluorescence exhibits a reduced excited state lifetime and a dipolar polarization pattern.

MWD7 • 5:45 p.m.
Loading Babinet Optical Nanoantennas with Nanocircuit Elements, *Andrea Alù, Nader Engheta; Univ. of Pennsylvania, USA.* The concepts of antenna loading are applied to Babinet optical nanoantennas obtained by carving thin plasmonic screens. We show how the radiation properties may be tailored by properly selecting the nanocircuit elements loading the aperture.

OWD • Large Optics—Continued

OWD6 • 5:30 p.m.
Fabrication and Testing of 8.4 m Off-Axis Segments for the Giant Magellan Telescope, *Buddy Martin, Jim Burge, Steve Miller, Steve Warner, Chunyu Zhao; Univ. of Arizona, USA.* The first off-axis segment for the Giant Magellan Telescope is being manufactured at the Steward Observatory Mirror Lab. This project includes development of a manufacturing facility and three independent measurements for the seven segments.

Hyatt Grand Ballroom D

Joint

JWD • Joint META/OF&T Poster Session—Continued

JWD7
Scanning Pentaprism Measurements of Off-Axis Aspherics, *Peng Su, James H. Burge, Brian Cuerden, Jose Sasian, Hubert M. Martin; Univ. of Arizona, USA.* We developed a scanning pentaprism system to measure off-axis paraboloidal mirrors such as the Giant Magellan Telescope primary mirrors. The test was demonstrated on a 1.7-m diameter prototype and proved to have ~50nm rms precision.

JWD8
Measurement of Core Shape in an Embedded Waveguide by Confocal Scanning Optical Microscope, *Dae-Chan Kim[1], Kyoung-Duck Park[1], Dong-Hoon Chang[1], Beom-Hoan O[1,2], Se-Geun Park[2], El-Hang Lee[2], Keum-Soo Jeon[3], Seung-Gol Lee[1,2]; [1]Precision Inspection and Measurement Ctr., Republic of Korea, [2]Optics and Photonics Elite Res. Acad. (OPERA), Republic of Korea, [3]Doosan Technical Ctr., Republic of Korea.* The core shape of an embedded waveguide was determined by a confocal microscope. The SNR of the microscope was reduced, since reflectance from the core-cladding interface is less than 0.02% due to low index difference.

JWD9
Strategies Evaluation on Catadioptric, Refractive with Diffractive Configurations, *Quanxin Ding, Hua Liu; Key Lab of Natl. Defense Science and Technology on Fire Control Technology, China.* Advanced optimizations are studied systematically in great level. System designs are contrastively studied. Strategies evaluation, which achieves remarkable on MTF, RMS, PSF, utilized cost, test plate, system efficiency and fabrication etc. New concept and algorithm is developed.

JWD10
Specific Polarization-Coding Device with Photoelastic Modulator, *Hsiu-Ming Tsai, Hsin-Jung Yang, Yu-Faye Chao; Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan.* We propose to accomplish a polarization-coding device by using photoelastic modulator (PEM). After calibrating the initial phase of PEM, we can generate specific polarized light in 20μs without any moving part.

JWD11
Ultra-Fast Self-Corrected PEM Ellipsometry, *Hsiu-Ming Tsai, Leng-Chun Chen, Yu-Faye Chao; Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan.* A self-corrected method is proposed for PEM ellipsometry. This algorithm can eliminate errors caused by the temporal deviation (x) and achieve $\delta\psi$~0.14° and $\delta\Delta$~0.25° in 20μs, respectively.

JWD12
Optimization of 4-Point Phase-Lock PEM Ellipsometry, *Tsung-Han Tsai, Hsiu-Ming Tsai, Yu-Faye Chao; Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan.* Only 4-temporal phases are utilized in a photoelastic modulated polarimetry. Based on singular value decomposition, this temporal phase lock PEM ellipsometry can improve the S/N ratio of the polarimetric measurement.

JWD • Joint META/OF&T Poster Session—Continued

JWD13
Analytical Calculi of Wear Profiles Produced with Different Tools over a Stationary Glass, *Irce Leal-Cabrera; Benemérita Univ. Autonoma de Puebla, Mexico.* Analytical equations to calculate the wear produced with different shape tools, that oscillate in one direction and displace in another perpendicular, are obtained. Wear profiles were reproduced and analyzed using these useful equations.

JWD14
Measuring Negative Group Delay Dispersion Chirped Femtosecond Mirrors For a Modelocked Cr:LiSAF Laser, *Allison S. Goodspeed, Matthew J. Bohn; Air Force Inst. of Technology, USA.* Chirped mirrors with negative GDD were measured using a new approach, then used with a saturable absorber mirror to modelock a Cr:LiSAF laser. 1 mW pulsed power was generated from 40 mW of CW output.

META Posters

JWD15
Tunneling-Induced Temporary Light Trapping in Metamaterial-Slab Waveguide, *Kyoung-Youm Kim; Dept. of Optical Engineering, Sejong Univ., Republic of Korea.* Proposed is a waveguide structure in which guided light waves can be trapped via tunneling through thin metamaterial clad layers. This trap is temporary since the trapped light tunnels out completely after a short time.

JWD16
Plasmonic Superfocusing Modes in Metallic Wedge and V-Groove Obtained by Quasi-Separation of Variables, *Kazuyoshi Kurihara[1], Kazuhiro Yamamoto[1], Junichi Takahara[2], Akira Otomo[1]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]Osaka Univ., Japan.* Analytic solutions to the plasmonic superfocusing modes in two wedge-shaped structures are theoretically studied by solving the Helmholtz wave equation for the magnetic field using quasi-separation of variables in combination with perturbation methods.

JWD17
Analysis of Light Propagation through Y-Splitter Double-Chain of Coupled Silver Nanowires with Funnel Feeding, *Hong-Son Chu[1], Kang Chen[2], Wei-Bin Ewe[1], Er-Ping Li[1]; [1]Inst. of High Performance Computing, Singapore, [2]School of Electrical and Electronic Engineering, Nanyang Technical Univ., Singapore.* The optimal structure of the splitter double-chain of coupled silver nanowires waveguide for efficiently guiding and splitting the light at the wavelength of 600 nm is discussed in detail for different geometrical parameters.

JWD18
Light Transmission through a Metallic/Dielectric Concentric Ring Structure, *Hyungduk Ko, Hyun Chul Kim, Mosong Cheng; Texas A&M Univ., USA.* We analyze transmission of a normally incident plane wave through a Ag/dielectric layered concentric ring structure.The focusing beyond diffraction limit is found at the focal length comparable to the distance of 7λ from exit plane.

JWD19
High Efficient Optical Focusing of a Plasmonic Zone Plate with Metal/Dielectric Nanostructured Multilayers, *Hyun Chul Kim, Hyungduk Ko, Mosong Cheng; Dept. of Electrical and Computer Engineering, Texas A&M Univ., USA.* By modulating the nanostructured multilayer of plasmonic zone plate, we demonstrate numerically that the enhancement of optical transmission originates not only from SPs but also from the coupling of SPs in the metal/dielectric multilayer.

JWD20
Coherent Plasmon-Polariton-Phonon Emission from Ultra-High Mobility Carriers, *Spilios Riyopoulos; SAIC, USA.* Interaction between streaming carrier plasmons and lattice vibrations in ultra-high mobility materials leads to unstable excitation of novel, hybrid plasmon-polariton-phonon modes. Spontaneous growth from noise and THz lasing from nano-stuctures is investigated.

JWD21
Plasmonic Photonic Crystals with Complete Bandgap for Surface Plasmon Polariton Waves, *Liang Feng, Vitaliy Lomakin, Yeshaiahu Fainman; Univ. of California at San Diego, USA.* A Si based plasmonic photonic crystal has been constructed on an Al surface to modulate the propagation of in-plane surface plasmon polariton waves. A complete 2-D bandgap has been observed both experimentally and in simulation.

JWD22
The Phase Sensation of Near-Field Optical Enhancement in a Metal Nanoparticle, *Hsing-Ying Lin[1], Chih-Han Chang[1], Chen-Han Huang[2], Cheng-Hsiang Lin[3], Hsiang-Chen Chui[2]; [1]Inst. of Biomedical Engineering, Natl. Cheng Kung Univ., Taiwan, [2]Inst. of Electro-Optical Science and Engineering, Natl. Cheng Kung Univ., Taiwan, [3]Dept. of Engineering Science, Natl. Cheng Kung Univ., Taiwan.* Interferences between photon excitation and plasmon mediated re-radiation are revealed on a nanoparticle basis through NSOM. Results manifest the correlation of phase-response and size-dependent optical enhancement to control surface plasmon modes by means of nanostructures.

JWD23
Enhanced Terahertz Transmission through Subwavelength Aperture Arrays Exhibiting Short Range Order, *Amit K. Agrawal[1], Tatsunosuke Matsui[2], Z. Valy Vardeny[3], Ajay Nahata[1]; [1]Dept. of Electrical and Computer Engineering, Univ. of Utah, USA, [2]Dept. of Electrical and Electronic Engineering, Mie Univ., Japan, [3]Physics Dept., Univ. of Utah, USA.* We measure the THz transmission properties of subwavelength aperture arrays that possess short-range order (SRO), but lack long-range order (LRO). We demonstrate that transmission enhancement still occurs through these structures despite the absence of LRO.

JWD24
Light Transmission through Nanohole Arrays of Periodic and Quasi-Periodic Geometries, *Alexander Minovich[1], Haroldo T. Hattori[1,2], Ian McKerracher[1], Hark Hoe Tan[1], Dragomir N. Neshev[1], Chennupati Jagadish[1], Yuri S. Kivshar[1]; [1]Australian Natl. Univ., Australia, [2]Univ. of New South Wales, Australia.* We study experimentally light transmission through square nanoholes in a gold film and observe enhancement of transmission for specific wavelengths. We demonstrate possibilities for tailoring of the transmitted spectrum by quasi-periodicity and hole-size-chirping.

JWD25
Nonlinear Propagation and Slow Light of Surface Plasmon Polaritons due to Ponderomotive Forces, *Pavel Ginzburg, Alex Hayat, Nikolai Berkovitch, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* Nonlinear dispersion equation of SPP propagating on a metal film is derived. High-power SPP exhibits "slow light" properties before its cutoff point due to ponderomotive repulsion of conduction electrons from the high-intensity regions.

JWD26
Slow-Wave Resonance with "Quasi-Static" Particles, *Eyal Feigenbaum, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* Ultra-small modal volume of $\sim 10^{-4}\lambda^3$ with relatively enhanced Q-factors is obtained when a particle-plasmon is modified to accumulate retardation effects, although the field propagation length is only a few tens of a nanometer.

JWD27
Negative Refraction in 3-D-Chiral Metamaterial, *E. Plum[1], J. Zhou[2,3], J. Dong[3,4], V. A. Fedotov[1], T. Koschny[3,5], C. M. Soukoulis[3,5], Nikolay Zheludev[1]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]Dept. of Electrical and Computer Engineering and Microelectronics Res. Ctr., Iowa State Univ., USA, [3]Ames Lab and Dept. of Physics and Astronomy, Iowa State Univ., USA, [4]Inst. of Optical Fiber Communications and Network Technology, Ningbo Univ., China, [5]Inst. of Electronic Structure and Laser - Foundation for Res. and Technology Hellas (FORTH), and Dept. of Materials Science, Univ. of Crete, Greece.* We demonstrate that artificial chiral meta-material with electromagnetic coupling shows negative index of refraction linked to exceptionally strong circular birefringence.

JWD28
Plasmonic Focusing with Coaxial Illuminated by Radially Polarized Light, *Avner Yanai, Uriel Levy; Hebrew Univ. of Jerusalem, Israel.* We propose and analyze a plasmonic lens consisting of a circular coaxial aperture illuminated by radially polarized light with the same symmetry as the structure. Focusing is enhanced by using Bragg grating eliminating off-focus SPP propagation.

JWD29
Near-Field Scattering and Localization in Deterministic Aperiodic Palsmonic Structures, *Bennett Goldberg[1], Bradley Deutsch[2], Marc McGuigan[1], Ashwin Gopinath[1], Svetlana Boriskina[1], Lukas Novotny[2], Luca Dal Negro[1]; [1]Boston Univ., USA, [2]Inst. of Optics, Univ. of Rochester, USA.* Scattering-type near-field optical microscopy studies of deterministic aperiodic plasmonic structures demonstrates that quasi-static, near-field electromagnetic coupling in deterministic aperiodic arrays can be greatly enhanced with respect to perfectly correlated periodic systems.

JWD30
Discrete Diffraction of Surface Plasmon Polaritons in Parallel Silver Waveguide Arrays at 1550 nm Wavelength, *Michelle Y. C. Xu, James S. Aitchison; Univ. of Toronto, Canada.* We find through theoretical modeling and experimental measurements that the coupling coefficients of silver SPP parallel waveguide arrays having dimensions 4μm×20nm, 5μm×20nm, and 6μm×20nm are 1457.3, 1033.7, and 658.72 m^{-1} respectively at 1550 nm wavelength.

JWD31
Nonresonant High-Order Nonlinearity Properties of Silver Colloidal Nanoparticles in the Femtosecond Regime, *Diego Jose Rativa[1], Renato Evangelista de Araujo[2], Anderson Stevens Leonidas Gomes[1]; [1]Dept. de Física, Univ. Federal de Pernambuco, Brazil, [2]Dept. of Electronics and Systems, Biomedical Engineering, Univ. Federal de Pernambuco, Brazil.* Nonlinear optical properties of silver colloidal nanoparticles in water in a nonresonant femtosecond excitation regime were performed. Values for the third-, fifth- and seventh-order susceptibilities, and their dependence with the nanoparticles concentration were measured.

JWD32
Sensitivity-Enhanced Plasmonic Detection of DNA Hybridization Using Periodic Nanowires, *Seyoung Moon[1], Soon Joon Yoon[1], Dong Jun Kim[2], Donghyun Kim[1,2], Hosub Lee[3], Kangtaek Lee[1,3]; [1]Program for Nanomedical Science and Technology, Yonsei Univ., Republic of Korea, [2]School of Electrical and Electronic Engineering, Yonsei Univ., Republic of Korea, [3]Dept. of Chemical Engineering, Yonsei Univ., Republic of Korea.* Surface plasmon resonance (SPR) has provided sensitive and label-free solution to detecting molecular interactions. We investigated the sensitivity enhancement of SPR based on plasmonic coupling in metallic nanostructures and nano-particles to detect DNA hybridization.

JWD • Joint META/OF&T Poster Session—Continued

JWD33
Planar Plasmonic Terahertz Guided-Wave Devices, *Wenqi Zhu, Amit Agrawal, Ajay Nahata; Univ. of Utah, USA.* We describe the realization of planar plasmonic THz guided-wave devices, including straight waveguides, Y-splitters and 3dB-couplers, using periodically perforated metal films. These perforated films behave as effective media whose dielectric function can be broadly engineered.

JWD34
Dielectric Metamaterials Based on Electric and Magnetic Resonances of Silicon Carbide Particles, *Jon A. Schuller[1], Rashid Zia[2], Thomas Taubner[1], Mark Brongersma[1]; [1]Stanford Univ., USA, [2]Brown Univ., USA.* Conventionally, negative index metamaterials comprise arrays of optically resonant metallic structures. Here, experiments and theory show that Mie resonances of subwavelength dielectric particles can be exploited to construct a new class of negative index metamaterials.

JWD35
Metamaterial Coatings for Asymmetric Mirrors, *Aiqing Chen, Miriam Deutsch; Univ. of Oregon, USA.* We realized dispersion-engineered, broadband asymmetric mirrors using disordered metallodielectric films on glass substrates. The addition of vacuum-deposited silver films renders the asymmetry and its dispersion tunable over a large range of film parameters.

JWD36
Novel, Real-Time Measurement of Plasmon Resonance: Tailoring Nanoparticle Geometry Optically, *Pae C. Wu[1], Maria Losurdo[2], Tong-Ho Kim[1], Giovanni Bruno[2], April S. Brown[1], Henry O. Everitt[1]; [1]Duke Univ., USA, [2]Inst. for Inorganic Methodologies and Plasmas, CNR, Italy.* We demonstrate novel use of *in situ* spectroscopic ellipsometry to probe in real-time metal nanoparticle deposition. Real-time monitoring of NP assembly plasmon resonance enables control of NP size via the plasmon resonance and vice versa.

JWD37
A Study of the Long Propagation Range Bessel Beam Generated by a Subwavelength Annular Aperture Structure, *Yuh-Yan Yu, Ding-Zheng Lin, Long-Sun Huang, Chih-Kung Lee; Natl. Taiwan Univ., Taiwan.* The subwavelength annular apertures (SAA) made on metallic layers by electron beam lithography with metal lift-off processes have been demonstrated. We have experimentally enhanced the Bessel beam distance through the SAA structure with large diameters.

JWD38
Local Barrier Modes and Complete Tunneling through Metamaterial Layers, *Kyoung-Youm Kim[1], Junghyun Park[2], Byoungho Lee[2]; [1]Dept. of Optical Engineering, Sejong Univ., Republic of Korea, [2]School of Electrical Engineering, Seoul Natl. Univ., Republic of Korea.* We investigate the conditions and physical origin of complete tunneling of light through a composite barrier made of multiple metamaterial layers, especially focusing on the roles played by the local modes formed in barrier layers.

JWD39
Nano-Grating-Based Plasmon Enhancement in Total Internal Reflection Fluorescence Microscopy, *Kyujung Kim, Dong Jun Kim, Eun-Jin Cho, Yong-Min Huh, Jin-Suck Seo, Donghyun Kim; Yonsei Univ., Republic of Korea.* This paper presents based on nano-grating based field enhancement in total internal reflection fluorescence microscopy. A sample of silver grating/film on a glass substrate was used for imaging microbeads and confirmed the field enhancement.

JWD40
From Small to Large Silver Nanoparticles Induced by UV Continuous Wave Irradiation in Silver-Exchanged Soda-Lime Glasses, *François Goutaland, Emmanuel Marin, Henri Gagnaire, Jean Yves Michalon, Aziz Boukenter; Lab Hubert Curien, France.* UV continuous wave laser exposure of Ag-exchanged glasses induces silver nanoparticles, whose diameter varies between 10 nm and 1 µm. Various applications, such as SERS effect, are possible due to this wide range of diameter.

JWD41
Localization of Near-Field Resonances in Bowtie Antennae, *Xiaojin Jiao[1], Jeremy Goeckeritz[1], Steve Blair[1], Mark Oldham[2]; [1]Dept. of Electrical and Computer Engineering, Univ. of Utah, USA, [2]Applied Biosystems, Applera Corp., USA.* Influence of adhesion layers on gold bowtie antennae are numerical considered, which depends on refractive-index and absorption of adhesion material and whether it is continuous or etched. A simple near-field optimization method is also demonstrated.

JWD42
A Simple Sensitivity Model for Multiply Interrogated and Interferometric Surface Plasmon Sensors, *Brad Tiffany, James Leger; Univ. of Minnesota, USA.* Metal-film losses intrinsically limit the sensitivity of surface plasmon sensors. Interferometric and multiplexed systems can replace thermal noise limits with shot noise ones and fine-tune optimal operating conditions but cannot overcome this limit.

JWD43
Optical Trapping in the Metal-Insulator-Metal Surface Plasmon Polariton Waveguide, *Junghyun Park[1], Il-Min Lee[1], Kyoung-Youm Kim[2], Minsu Kang[1], Byoungho Lee[1]; [1]Seoul Natl. Univ., Republic of Korea, [2]Sejong Univ., Republic of Korea.* We present the optical trapping based on the metal-insulator-metal surface plasmon polariton waveguide. It is shown that there exists the degenerate mode in the symmetric mode, which corresponds to the optical trapping.

JWD44
Multiple-Scattering of Surface Waves Generated by Nano-Objects on Metallic Surfaces, *Philippe Lalanne[1], Jean Paul Hugonin[1], Haitao Liu[1,2]; [1]Inst.d'Optique, France, [2]Nankai Univ., China.* Many optical plasmonic phenomena, which are observed with metallic nanostructures at visible frequencies, can be reproduced in the THz and microwave domains by scaling the geometrical parameters. We discuss why.

7:00 p.m–8:30 p.m. FiO Postdeadline Paper Sessions, *Locations are listed in Postdeadline Papers Book in registration bag*

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
Joint	FiO				

8:00 a.m.–9:30 a.m. JThA • Optics for Energy III: Solar Energy Design and Development

Erik L. Novak; Veeco Instruments Inc., USA, Presider

JThA1 • 8:00 a.m. Invited

Concentrator Photovoltaics Solar Simulator, *César Domínguez, Ignacio Antón, Gabriel Sala; Inst. de Energía Solar, Univ. Politécnica de Madrid, Spain.* This paper presents the description and characterization of a solar simulator able to measure indoors the performance of concentrator photovoltaic (CPV) systems. Optical fundamentals of the solution proposed for the simulator are explained.

JThA2 • 8:30 a.m. Invited

Optics for Photon Recycling PV Concentrators and Wireless Power Transmission with Lasers, *Ugur Ortabasi; United Innovations, Inc., USA.* The paper explores: a) potential of photon recycling in photovoltaic cavity converters (PVCC) for extreme conversion efficiency, and b) application of PVCC to wireless power transmission by lasers over large distances in space and on earth.

8:00 a.m.–10:00 a.m. FThA • Optical Models of the Eye I

Melanie C. Campbell; Univ. of Waterloo, Canada, Presider

FThA1 • 8:00 a.m. Tutorial

Optical Models of the Eye, *Larry N. Thibos; Indiana Univ., USA.* Model eyes are schematic descriptions of an eye's optical system. Some models emphasize anatomical fidelity, others seek to mimic the eye's functional properties. The balance between anatomical fidelity and mechanistic simplicity is driven by applications.

Larry N. Thibos was educated at the University of Michigan, where he earned B.S. (1970) and M.S. (1972) degrees in electrical engineering, and at the University of California, Berkeley, where he received the Ph.D. in physiological optics (1975) for research on the neurophysiological mechanisms of sensitivity control in the vertebrate retina. During the period 1975-1983 he was a Research Fellow at the John Curtin School of Medical Research at the Australian National University in Canberra, Australia, where he investigated the neurophysiology of retinal information processing. In 1983 he joined the Visual Sciences faculty of the School of Optometry at Indiana University and is currently Professor of Optometry and Visual Sciences. His research interests include the effects of optical aberrations of the eye on visual performance, the limits to spatial vision imposed by retinal architecture, and the characterization of vision in the peripheral field.

8:00 a.m.–10:00 a.m. FThB • Pulse Measurement

Rick Trebino; Georgia Tech, USA, Presider

FThB1 • 8:00 a.m.

Measuring the Spatiotemporal Electric Field of Tightly Focused Ultrashort Pulses, *Pamela Bowlan[1], Ulrike Fuchs[2], Pablo Gabolde[1], Rick Trebino[1], Uwe Zeitner[2]; [1]School of Physics, Georgia Tech, USA, [2]Fraunhofer-Inst. fuer Angewandte Optik und Feinmechanik, Germany.* We demonstrate a spectral interferometer with NSOM probes for measuring focusing ultrashort pulses with high spatial and spectral resolution. We measure a 0.4 NA focus and, for the first time, we observe the forerunner pulse.

FThB2 • 8:15 a.m.

Simply Measuring the Electric Field of Very Long, Complex Pulses, *Jacob A. Cohen, Pamela Bowlan, Rick Trebino; Georgia Tech, USA.* We introduce a simple spectral-interferometric technique for measuring (in time) the intensity and phase of arbitrary complex pulses >1-ns long with <100-fs substructure. It uses a low-resolution spectrometer and multiple replicas of a reference pulse.

FThB3 • 8:30 a.m.

The Effect of an Ultrashort Pulse's Spatial Profile on the Single-Shot Measurement of its Temporal Profile, *Dongjoo Lee[1], Ziyang Wang[2], Xun Gu[2], Rick Trebino[1]; [1]Swamp Optics, USA, [2]Georgia Tech, USA.* A non-uniform spatial profile could distort single-shot pulse measurements. But, surprisingly, we show that these effects are significantly reduced by several fortuitous aspects of the GRENOUILLE technique and so usually have little effect in practice.

8:00 a.m.–10:00 a.m. SThA · Best of Topicals I

Michael Duncan; Naval Res Lab, USA, Presider

SThA1 • 8:00 a.m.

Coherence Holography and Spatial Frequency Comb for 3-D Coherence Imaging and Coherence Vortex Generation, *Mitsuo Takeda[1], Wei Wang[2], Zhihui Duan[1], Yoko Miyamoto[1], Joseph Rosen[3]; [1]Univ. of Electro-Communications, Japan, [2]Heriot-Watt Univ., UK, [3]Ben-Gurion Univ. of the Negev, Israel.* The principle and the applications of a recently proposed unconventional holography technique, coherence holography, applied for coherence vortex generation, and a related technique for dispersion-free 3-D coherence imaging based on a spatial frequency comb will be reviewed. (Digital Holography and Three-Dimensional Imaging, 2008)

SThA2 • 8:30 a.m.

Factorisation of Numbers, Schrödinger Cats and the Riemann Hypothesis, *Wolfgang Schleich, Dept. of Quantum Physics, Univ. of Ulm, Germany.* In this talk we connect the three different topics of factorisation of numbers, Schrödinger cats and the Riemann hypothesis. The bridge between these areas is the concept of a Gauss sum. (Quantum Entanglement and Decoherence: 3rd International Conference on Quantum Information, 2008)

8:00 a.m.–10:00 a.m. FThC • Nonlinear Optics in Novel Media

William J. Firth; Univ. of Strathclyde, UK, Presider

FThC1 • 8:00 a.m. Invited

Subwavelength Discrete Solitons in Nonlinear Metallic Waveguide Arrays, *Xiang Zhang, Guy Bartal, Yongmin Liu, Dentcho A. Genov; Univ. of California at Berkeley, USA.* We present the first theoretical prediction of sub-wavelength discrete solitons in nonlinear periodic metamaterials. These solitons result from the three-fold interplay between periodicity, nonlinearity, and surface plasmons tunneling in nano-scaled nonlinear metallic waveguide array.

FThC2 • 8:30 a.m.

Surface Second-Harmonic Generation from Scattering of Surface Plasmon Polaritons from Circularly Symmetric Metallic Nanostructures, *Lina Cao[1], Nicolae C. Panoiu[2], Richard M. Osgood[1]; [1]Columbia Univ., USA, [2]Univ. College London, UK.* A theoretical model for the calculation of surface second-harmonic generation (SHG) for far-field, near-field distribution from the scattering of surface plasmon polaritons is presented for computational simulations of Gaussian, hemispherical, and cylindrical shapes.

8:00 a.m.–10:00 a.m. FThD • Light Waves in Lattices

Roberto Morandotti; INRS-EMT, Canada, Presider

FThD1 • 8:00 a.m. Tutorial

Nonlinear Waves in Lattices, *Mordechai Segev; Technion - Israel Inst. of Technology, Israel.* The recent progress on waves in nonlinear photonic lattices will be reviewed, with an emphasis on universal ideas that apply to all nonlinear periodic systems in which waves propagate.

Moti Segev is the Trudy and Norman Louis Professor of Physics, at the Technion, Israel. He received his B.Sc. and D.Sc. from the Technion in 1985 and 1990, and spent three years as a postdoc at Caltech. In 1994, he became a professor at Princeton, yet several years ago he went back to his home country and joined the Technion. Moti's research interests are mainly in nonlinear optics, solitons, and quantum electronics. He has more than 230 publications in refereed journals and has given close to 100 invited, keynote, and plenary presentations at conferences. Among his contributions are the discoveries of photorefractive solitons, incoherent solitons, first observation of 2-D lattice solitons, and first observation of Anderson localization in any periodic system containing disorder. Moti is a Fellow of OSA and APS. He has won several awards, among them the 2007 Quantum Electronics Prize of the European Physics Society. However, above all his personal achievements, Moti takes pride in the success of the graduate students and postdocs that have worked with him over the years.

Highland G

Highland H

Highland J

FiO

8:00 a.m.–10:00 a.m.
FThE • Novel Fiber Devices II
Steve Ralph; Georgia Tech, USA, Presider

FThE1 • 8:00 a.m. Invited
Numerical Simulation of Light Transmission through Optical Fibers: Linear and Nonlinear, *G. Ronald Hadley; Sandia Natl. Labs, USA.* We have produced a variety of triangular-mesh finite difference codes for studying the light propagation properties of complex optical fibers in both the linear and nonlinear regimes.

FThE2 • 8:30 a.m.
Chemical Sensing Attributes of CO_2-Laser-Induced Long-Period Fiber Gratings, *Michael R. Hutsel, Reeve Ingle, Thomas K. Gaylord; Georgia Tech, USA.* CO_2-laser-induced long-period fiber gratings are fabricated and characterized for use as chemical sensors. The effects of changing the surrounding refractive index are characterized. End-of-fiber gratings are described, fabricated, and experimentally evaluated.

8:00 a.m.–10:00 a.m.
FThF • Silicon and III-V Based Optoelectronics for Optical Interconnects I
Benjamin G. Lee; Columbia Univ., USA, Presider

FThF1 • 8:00 a.m. Invited
Optical Interconnects in Supercomputers and High Performance Servers, *Jeffrey Kash; IBM Res., USA.* Optical interconnects will help drive continued performance improvements in supercomputers and high performance servers. Prospects, requirements and future technologies will be reviewed, focusing on the substantial improvements required in bitrate, packaging density and cost.

FThF2 • 8:30 a.m.
Ultra-Long Fiber Laser for Secure Optical Key Generation, *Avi Zadok[1], Jacob Scheuer[2], Jacob Sendowski[1], Dan Segal[2], Amnon Yariv[1]; [1]Caltech, USA, [2]Tel Aviv Univ., Israel.* Ultra-long fiber laser system for secure key generation is demonstrated, using standard components only. 1000 bits are shared between users 25km apart, with 0.5% errors. Time and frequency domain attacks could not extract the key.

8:00 a.m.–10:00 a.m.
SThB • Quantum Optics and Quantum Engineering for Undergraduates Symposium I
Svetlana G. Lukishova; Univ. of Rochester, USA, Presider

SThB1 • 8:00 a.m. Invited
Writing a Successful Education Proposal to the NSF, *Warren W. Hein[1,2], Duncan E. McBride[1]; [1]Natl. Science Foundation, USA, [2]American Assn. of Physics Teachers, USA.* Successful education proposals to DUE, like all proposals to NSF, are evaluated on two criteria: Intellectual Merit and Broader Impacts. However, education related proposals present some unique challenges, especially on how to address Intellectual Merit.

SThB2 • 8:30 a.m. Invited
The Challenges of Quantum Physics as Pedagogical Tools, *Arthur G. Zajonc; Amherst College, USA.* Recent developments in quantum optics have made the thought experiments of past the undergraduate lab experiments of today. The teacher has a rich array of observations to illustrate the most challenging concepts of quantum theory.

Highland K

LS

8:00 a.m.–10:00 a.m.
LThA • Spectroscopy of Biomolecular Processes
Vadim Backman; Northwestern Univ., USA, Presider

LThA1 • 8:00 a.m. Invited
Studying Single Cells Using Integrated Raman and Angular-Scattering Microscopy, *Andrew J. Berger, Zachary J. Smith; Inst. of Optics, Univ. of Rochester, USA.* Angularly-resolved elastic scattering and spectrally-resolved Raman scattering can be recorded simultaneously from a single cell. Using the resulting morphological and chemical information, one can classify individual cells or monitor one cell's response to a stimulus.

LThA2 • 8:30 a.m.
Surface-Enhanced Raman Spectroscopy Analysis of Cell Components, *Elina A. Vitol[1], Zulfiya Orynbayeva[2], Michael J. Bouchard[2], Jane Azizkhan-Clifford[2], Gennady Friedman[1], Yury Gogotsi[3]; [1]Dept. of Electrical and Computer Engineering, Drexel Univ., USA, [2]Dept. of Biochemistry and Molecular Biology, Drexel Univ. College of Medicine, USA, [3]Dept. of Materials Science and Engineering, Drexel Univ., USA.* Surface-enhanced Raman spectroscopy signatures of living intact HeLa cervical cancerous cells and a mixture of HeLa cellular organelles are compared. Preliminary data demonstrate that distinct differences between intact cells and mixtures of organelles can be detected.

Hyatt Grand Ballroom A/B

META

8:15 a.m.–10:00 a.m.
MThA • Nanoplasmonics II
Hrvoje Petek; Univ. of Pittsburgh, USA, Presider

MThA1 • 8:00 a.m.
Paper Withdrawn

MThA2 • 8:15 a.m.
Near Field Distribution of Localized SP Coupling in Isolated and Collective Metal Nanoparticle Arrays, *Chen-Han Huang[1], Hsing-Ying Lin[2], Cheng-Hsiang Lin[3], Hsiang-Chen Chui[1]; [1]Inst. of Electro-Optical Science and Engineering, Natl. Cheng Kung Univ., Taiwan, [2]Inst. of Biomedical Engineering, Natl. Cheng Kung Univ., Taiwan, [3]Dept. of Engineering Science, Natl. Cheng Kung Univ., Taiwan.* Near-field optical properties in the vicinity of 2-D Au-nanoparticle arrays were investigated by fiber-collection mode NSOM. Experimental results demonstrate that localized SP coupling depends on the inter-particle gap and photon-plasmonic resonance.

MThA3 • 8:30 a.m.
Cooperative Emission of Light by an Ensemble of Dipoles near a Metal Nanoparticle Mediated by Surface Plasmon, *Tigran V. Shahbazyan, Vitaliy N. Pustovit; Jackson State Univ., USA.* A new mechanism for cooperative emission of light by an ensemble of dipoles near a metal nanoparticle is suggested. The emission is dominated by plasmonic super-radiant states formed due to surface plasmon exchange beetwen dipoles.

Hyatt Grand Ballroom E/F

OF&T

8:15 a.m.–9:45 a.m.
OThA • Optical Materials
Peter Blake; NASA Goddard Space Flight Ctr., USA, Presider

OThA1 • 8:00 a.m. Invited
KEYNOTE: Development of Hot-Pressed and Chemical-Vapor-Deposited Zinc Sulfide and Zinc Selenide in the United States for Optical Windows, *Daniel Harris; Naval Air Systems Command, USA.* This talk traces the development of zinc sulfide and zinc selenide as infrared windows. The path leads from hot pressed Kodak material to Raytheon's chemical vapor deposition to commercialization at CVD, Inc. and II-VI, Inc.

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
Joint	FiO				

JThA • Optics for Energy III: Solar Energy Design and Development—Continued

JThA3 • 9:00 a.m. Invited
Holographic Concepts and Applications for Solar Energy Systems, *Raymond Kostuk; Univ. of Arizona, USA.* In this paper the unique aspects of holographic optical elements are reviewed and put in context for application to photovoltaic and thermal solar energy systems. A holographic planar concentrator and spectral splitting element are evaluated.

FThA • Optical Models of the Eye I —Continued

FThA2 • 8:45 a.m. Invited
The Eye as an Aplantic Design, *Pablo Artal; Univ. of Murcia, Spain.* Some of the recent results that revealed that the human eye behaves as an aplanatic system (well corrected for spherical aberration and coma) will be revised.

FThA3 • 9:15 a.m.
Analysis of the Optical Field at the Human Retina from Wavefront Aberration Data, *Sergio Barbero[1,2], Susana Marcos[1]; [1]Inst. de Optica, Consejo Superior de Investigaciones Cientificas, Spain, [2]Ctr. de Domótica Integral, Univ. Politécnica de Madrid, Spain.* Using Kirchhoff's diffraction theory, we have derived a diffraction integral to compute the optical field at the retina from the wave aberration data. We have implemented a numerical algorithm to compute such integral efficiently.

FThB • Pulse Measurement—Continued

FThB4 • 8:45 a.m.
Ultra-Short Laser Pulse Propagation through the Linear and Nonlinear Media under Conditions of Resonant Absorption, *Alexey V. Gulyaev, Olga V. Tikhonova; Dept. of Physics, Moscow State Univ., Russian Federation.* We investigate the ultra-short pulse propagation in different gas media by direct solution of the inhomogeneous wave equation. The pulse envelope modification according to the propagation is studied. Peculiarities of few-cycle pulse propagation are discussed.

FThB5 • 9:00 a.m.
Far-Field Method for the Characterization of Three-Dimensional Fields, *Oscar Rodríguez, David Lara, Chris Dainty; Applied Optics, Natl. Univ. of Ireland, Galway, Ireland.* We introduce a polarimetry-based far-field method for the study of the interaction between a three-dimensional focused field and a sub-resolution scatterer in the focal region of a high numerical aperture lens.

FThB6 • 9:15 a.m.
Cross-Spectral Density Matrix of Blackbody Radiation, *Mayukh Lahiri[1], Emil Wolf[1,2]; [1]Dept. of Physics and Astronomy, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* Important concept in theory of stochastic light beams is cross-spectral density matrix. We derive explicit expression for the cross-spectral density matrix in the far zone of a beam generated by blackbody source.

SThA:Best of Topicals I—Continued

SThA3 • 9:00 a.m.
Multidimensional Functional Optical Imaging of the Brain, *Elizabeth M. Hillman[1], Brenda Chen[1], Sean A. Burgess[1], Andrew J. Radosevich[1], Matthew B. Bouchard[1], Amir K. Iranmahboob[1], Aniruddha Das[2], Bruno Cauli[3], [1]Columbia Univ., USA, [2]Ctr. for Neurobiology and Behavior, Columbia Presbyterian Medical Ctr., USA, [3]Univ. Pierre et Marie Curie, France.* Optical brain imaging in rodents allows investigation of normal physiology and the effects of disease. Multi-scale imaging and delineation of multiple sources of contrast can reveal contributions of individual cells and processes to ensemble activity. (Biomedical Optics, 2008)

FThC • Nonlinear Optics in Novel Media—Continued

FThC3 • 8:45 a.m.
Nonlinear-Optical Studies of Magneto-Plasmonic Nanosandwiches, *Irina A. Kolmychek[1], Tatyana V. Murzina[1], Oleg A. Aktsipetrov[1], Alfonso Cebollada[2], Gaspar Armelles[2]; [1]Moscow State Univ., Russian Federation, [2]Inst. de Microelectrónica de Madrid, Spain.* Second harmonic generation is applied to study nonlinear-optical and magneto-optical properties of Au/Co/Au nanosandwiches in the spectral vicinity of the plasmon resonance. Comparison with reference homogeneous structure reveals plasmon-assisted modifications of magneto-optical response of nanosandwiches.

FThC4 • 9:00 a.m. Invited
Nonlinear Optics of Structured Photonic Materials, *Robert W. Boyd, Ksenia Dolgaleva, Giovanni Piredda, Aaron Schweinsberg; Inst. of Optics, Univ. of Rochester, USA.* Approaches to the development of new materials for use in nonlinear optics and laser science based on the concept of nano-structuring are described. Past successes and ideas for future work are presented.

FThD • Light Waves in Lattices—Continued

Among those are currently 10 professors in the United States, Germany, Taiwan, Croatia, Italy and Israel.

FThD2 • 8:45 a.m.
Supersolid Behavior of Light, *Albert Ferrando[1], Miguel-Ángel García-March[2], Mario Zacarés[2]; [1]Univ. de València, Spain, [2]Univ. Politécnica de Valencia, Spain.* We will show how light can form stationary structures on dielectric periodic media such that their dynamics present simultaneous features of spatial long range order and superfluidity. This phenomenon is normally referred to as supersolidity.

FThD3 • 9:00 a.m.
Bandgap Guidance of High-Order Modes in a Two-Dimensional Induced Defect, *Daniel Shuldman[1], Xiaosheng Wang[1], Zhigang Chen[1], Jiandong Wang[2], Jianke Yang[2]; [1]San Francisco State Univ., USA, [2]Dept. of Mathematics and Statistics, Univ. of Vermont, USA.* We demonstrate high-order defect modes in an optically induced two-dimensional photonic lattice with a negative (low-index) defect. Experimental results are corroborated by numerical simulations.

FThD4 • 9:15 a.m.
Nonlinear Wave Scattering by Small Barrier Potentials, *Wenjie Wan, Assaf Avidan, Jason W. Fleischer; Princeton Univ., USA.* We consider the nonlinear scattering of a plane wave by a small barrier potential (cylindrical anti-waveguide). We experimentally demonstrate that self-defocusing nonlinearity can greatly enhance transmission, suppress scatter, and generate phase singularities.

Highland G

FThE • Novel Fiber Devices II—Continued

FThE3 • 8:45 a.m.
Active Optical Waveguides with Suppressed Mode Competition, *Dmitry V. Vysotsky, Nikolay N. Elkin, Anatoly P. Napartovich, Vera N. Troshchieva; SRC RF Troitsk Inst. for Innovation and Fusion Res., Russian Federation.* Novel active fiber design strategy is proposed, which separates index and gain profiling. Several fiber amplifier constructions were simulated numerically and stable suppression of higher-order-modes was demonstrated when gain is saturated by the fundamental mode.

FThE4 • 9:00 a.m. Invited
Designs and Applications of Large Mode Area Optical Fibers, *Liang Dong, Jun Li, Hugh A. McKay, Brian K. Thomas, Libin Fu; IMRA America Inc., USA.* Large-mode-area fibers are an essential element for peak power scaling in fiber lasers. We will focus on recent development of leakage channel fibers and demonstration of single-mode operation in cores up to 170μm.

Highland H

FThF • Silicon and III-V Based Optoelectronics for Optical Interconnects I—Continued

FThF3 • 8:45 a.m.
Design of an Optical Kerr Shutter Using Silicon Waveguides, *Lianghong Yin[1], Jidong Zhang[2], Philippe M. Fauchet[1,2], Govind P. Agrawal[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Electrical and Computer Engineering, Univ. of Rochester, USA.* We study the nonlinear polarization rotation induced by a pump pulse on a probe through cross-phase modulation inside a silicon waveguide and show that this phenomenon can be used to realize a fast Kerr shutter.

FThF4 • 9:00 a.m.
Multi-Channel Optical Switch in Photonic Crystal, *Sean P. Anderson, Ashutosh R. Shroff, Philippe M. Fauchet; Univ. of Rochester, USA.* Using coupled cavities it is possible to create a multi-channel slow-light waveguide. We show that this platform can also be the basis for an ultra-compact, multi-channel optical modulator that is ideal for on-chip applications.

FThF5 • 9:15 a.m.
Measurement of Two-Photon Absorption in Porous Silicon Waveguides at 1550 nm, *Paveen Apiratikul[1], Andrea M. Rossi[1,2], Thomas E. Murphy[1]; [1]Univ. of Maryland, USA, [2]Inst. Nazionale di Ricerca Metrologica, Italy.* We report a measurement of the two-photon absorption coefficient in a nanoporous silicon optical waveguide at 1550 nm. Although the waveguide is approximately 70% porous, it exhibits nonlinear absorption comparable to that of silicon waveguides.

Highland J

SThB • Quantum Optics and Quantum Engineering for Undergraduates Symposium I—Continued

SThB3 • 9:00 a.m. Invited
Undergraduate Quantum Optics: The Challenge and the Excitement, *Mark Fox; Univ. of Sheffield, UK.* Undergraduate quantum optics challenges a lecturer to explain exciting experiments without recourse to advanced theoretical techniques. I describe here how I have approached this issue in my text, *Quantum Optics: An Introduction* (Oxford, 2006).

Highland K

LThA • Spectroscopy of Biomolecular Processes—Continued

LThA3 • 8:45 a.m. Invited
Confocal Light Absorption and Scattering Spectroscopic Microscopy, *Lev Perelman; Harvard Medical School, USA.* We have developed a novel optical method, called confocal light absorption and scattering spectroscopic microscopy, for observing submicrometer intracellular structures in living cells. It combines confocal microscopy, a well-established high-resolution microscopic technique, with light-scattering spectroscopy.

LThA4 • 9:15 a.m.
Single Molecule Studies of Protein-DNA Interactions inside Porous Nanocontainers, *Ibrahim Cisse[1], Burak Okumus[2], Chirlmin Joo[1], Taekjip Ha[1,2,3]; [1]Dept. of Physics, Univ. of Illinois at Urbana-Champaign, USA, [2]Ctr. for Biophysics and Computational Biology, Univ. of Illinois at Urbana-Champaign, USA, [3]Howard Hughes Medical Inst., USA.* We adapted porous vesicle encapsulation to single-molecule fluorescence microscopy. Our results provide unique insights in the importance of compartmentation in the origin of life.

Hyatt Grand Ballroom A/B

MThA • Nanoplasmonics II—Continued

MThA4 • 8:45 a.m.
Anisotropic Route to Optical Circuits, *Huikan Liu, Shivanand Shivanand, Kevin J. Webb; School of Electrical and Computer Engineering, Purdue Univ., USA.* The theory for inductors and capacitors achieved with anisotropic slabs is developed. These elements are shown to have low sensitivity to angle of incidence, rendering the performance of filters and antireflection coatings more effective.

MThA5 • 9:00 a.m.
Holographic Detection of the Optical Field Generated by Off-Axis Plasmonic Beaming of Light, *Yongjun Lim, Joonku Hahn, Seyoon Kim, Byoungho Lee; Seoul Natl. Univ., Republic of Korea.* We experimentally realize the off-axis plasmonic beaming of light and measure the generated optical field using holographic microscopy. After fabricating the off-axis beaming structure, we computationally reconstruct the corresponding optical field detected by holographic microscopy.

MThA6 • 9:15 a.m.
Interplay of Surface Plasmon Enhancement, Absorption and Emission in Au/Silica/Dye Nanoparticles, *A. M. Belgrave[1], G. Zhu[1], N. Noginova[1], V. I. Gavrilenko[1], E. Herz[2], U. Wiesner[2], R. Bakker[3], V. P. Drachev[3], V. M. Shalaev[3], V. A. Podolskiy[4], M. A. Noginov[1]; [1]Norfolk State Univ., USA, [2]Cornell Univ., USA, [3]Purdue Univ., USA, [4]Oregon State Univ., USA.* We have synthesized and studied hybrid Au/silica/dye nanoparticles. We have demonstrated that the reduction of the thickness of silica shell separating gold and dye causes the reduction of nanoparticles' absorption and strong enhancement of emission intensity.

Hyatt Grand Ballroom E/F

OF&T • Optical Materials—Continued

OThA2 • 8:45 a.m. Invited
Challenges in Optical Finishing of Reaction Bonded Silicon Carbide, *Joseph Robichaud; L-3 Communication Systems, USA.* Optical finishing of RB SiC is a challenge, due to its two-phased microstructure. Here we summarize the techniques which have been applied to resolve this issue, and provide a summary of the current state of the art.

OThA3 • 9:15 a.m. Invited
Manufacturing High-Precision Optics for the Lawrence Livermore National Ignition Facility and Other International Laser Fusion Facilities, *Roman Hachkowski; Zygo Corp., USA.* Zygo has developed the necessary optical manufacturing processes for the National Ignition Facility program to deliver optics that enable laser fusion research and capability.

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
Joint	FiO				

FThA • Optical Models of the Eye I —Continued

FThA4 • 9:30 a.m.
Wavefront-Based Eye Models for the Study of Developmental Changes, *Melanie C. W. Campbell[1,2], Jennifer J. Hunter[3], Marsha L. Kisilak[1], Elizabeth L. Irving[1]; [1]Univ. of Waterloo, Canada, [2]Guelph Waterloo Physics Inst., Canada, [3]Univ. of Rochester, USA.* Wavefront-based eye models are created with constant linear retinal blur. Several mechanisms for this constancy with growth are considered. Human growth is well modeled but linear retinal blur in chick and monkey decreases with age.

FThA5 • 9:45 a.m.
Modeling the Eye's Optical System Using Ocular Wavefront Tomography, *Xin Wei, Larry Thibos; School of Optometry, Indiana Univ., USA.* We present an ocular wavefront tomography method to reconstruct a customized schematic eye from off-axis aberrations of the tested eyes. From experiment, the reconstructed eyes are anatomically similar and functionally equivalent to the test cases.

FThB • Pulse Measurement—Continued

FThB7 • 9:30 a.m.
Analysis of the Influence of the Spherical Aberration and Defocus in a Young Type Interferogram, *Angela M. Pérez, Aura I. González, Yobani Mejía; Univ. Nacional de Colombia, Colombia.* We propose an interference equation to account for the influence of spherical aberration and defocus on the irradiance distribution of interferograms typically obtained in Young type experiments. This result becomes particularly relevant to coherence measurement.

FThB8 • 9:45 a.m.
Designed Phase Plate for TW Femtosecond Pulses in Air: Spatial Splitting and Increased Intensity, *Xusheng Zhou, Jifeng Zu; Shanghai Inst. of Optics and Fine Mechanics, China.* We examine the propagation of filament after the femtosecond laser pulses pass Random-phase plates and Stair-phase plates. The intensity and numbers of the filament increase sharply due to the interactions of filaments.

SThA:Best of Topicals I—Continued

SThA4 • 9:30 a.m.
Volume Bragg Gratings in PTR Glass—New Optical Elements for Laser Design, *Leonid B. Glebov, CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* This is a survey of achievements in semiconductor, solid state and fiber lasers enabled by the use of new optical elements which are volume Bragg gratings recorded in a photo-thermo-refractive (PTR) glass. (Advanced Solid-State Photonics, 2008)

FThC • Nonlinear Optics in Novel Media—Continued

FThC5 • 9:30 a.m.
Nonlinear Effects in Adiabatic Optical Structures, *Yoav Lahini[1], Francesca Pozzi[2], Marc Sorel[2], Roberto Morandotti[2], Demetrios N. Christodoulides[4], Yaron Silberberg[1]; [1]Weizmann Inst. of Science, Israel, [2]Univ. of Glasgow, UK, [3]Inst. Natl. de la Recherche Scientifique, Canada, [4]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We study experimentally the role of nonlinearity in adiabatic photonic structures. We realize a three-core structure exhibiting an adiabatic passage of light, and find that nonlinearity has a strong effect on the dynamics.

FThC6 • 9:45 a.m.
The Sign Change of Nonlinear Absorption for Low and High Fill-Fraction Gold-Dielectric Composites, *Giovanni Piredda[1], David D. Smith[2], Bettina Wendling[3], Robert W. Boyd[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Spacecraft Vehicle Systems Dept., USA, [3]Inst. of Optics, Robert Bosch GmbH, Germany.* We present data on nonlinear absorption in low and high fill-fraction gold-dielectric composites and discuss the physical reason of the sign change.

FThD • Light Waves in Lattices—Continued

FThD5 • 9:30 a.m.
Nonlinear Dipole Rotation/Oscillation in Anisotropic Lattices, *Xiaosheng Wang[1], Laura Daniel[1], Zhigang Chen[1,2], Jiandong Wang[3], Jianke Yang[3]; [1]San Francisco State Univ., USA, [2]TEDA Applied Physics School, Nankai Univ., China, [3]Dept. of Mathematics and Statistics, Univ. of Vermont, USA.* We demonstrate forced rotation/oscillation of 2nd-band dipole gap solitons by an asymmetrically positioned square lattice. Emergence of vortex with topological charges seems to accompany the dynamical dipole evolution.

FThD6 • 9:45 a.m.
Nonlinear Light Propagation in Rotating Waveguide Arrays, *Shu Jia, Jason W. Fleischer; Princeton Univ., USA.* We experimentally and theoretically study nonlinear light propagation in a rotating waveguide array. We show that non-inertial effects can lead to mode conversion, enhanced transport, and vector (gap) soliton formation.

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

NOTES

Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
FiO			LS	META	OF&T

FThE • Novel Fiber Devices II—Continued

FThE5 • 9:30 a.m.
Extraction of Individual Soliton from a Set by Using a Nonlinear Optical Loop Mirror, *Miguel Bello-Jiménez[1], Eugene A. Kuzin[1], Baldemar Ibarra-Escamilla[1], Ariel Flores-Rosas[1], Manuel Durán-Sánchez[1], Oliver Pottiez[2]; [1]INAOE, Mexico, [2]Ctr. de Investigaciones en Optica (CIO), Mexico.* The technique utilizes the pulse breakup effect to generate a set of solitons from which one highest soliton is extracted by the NOLM. High contrast at the NOLM output can be achieved.

FThE6 • 9:45 a.m.
Multiplexing of Optical Channels as a Function of Orbital Angular Momentum of Photons, *Syed H. Murshid, Azhar Khayrattee; Florida Inst. of Technology, USA.* Presence of orbital angular momentum is experimentally verified in channels of spatially multiplexed fiber optic systems. A novel multiplexing scheme based on orbital angular momentum of photons is also presented.

FThF • Silicon and III-V Based Optoelectronics for Optical Interconnects I—Continued

FThF6 • 9:30 a.m.
The Role of Various Space Variant Polarization Geometries for Tight Focusing Applications, *Uriel Levy, Gilad Lerman; Hebrew Univ. of Jerusalem, Israel.* We demonstrate subwavelength form birefringent optical elements for the realization of novel space variant polarizations and study their tight focusing properties.

FThF7 • 9:45 a.m.
Quantitative Performance Metrics with Long Wave Infrared Multiple Aperture Cameras, *Andrew D. Portnoy, David J. Brady; Duke Univ., USA.* We characterize a long wave infrared multiple aperture imaging system by experimentally measuring its noise equivalent temperature difference and modulation transfer function. These results are compared with a conventional system.

SThB • Quantum Optics and Quantum Engineering for Undergraduates Symposium I—Continued

SThB4 • 9:30 a.m.
Quantum Optics Round-Table Teaching, *Sean J. Bentley; Adelphi Univ., USA.* An advanced undergraduate quantum mechanics course used topics of contemporary quantum optics to stimulate student interest. Half the class meetings were literal round-table discussions on experiments and theories in quantum optics.

SThB5 • 9:45 a.m.
Quantum Trajectory Theory for Research and Teaching with Undergraduates, *James Clemens, Perry Rice; Miami Univ., USA.* We review research and teaching experiences with undergraduates using quantum trajectory theory instead of density matrices for open systems. This approach builds on preliminary work in the curriculum on quantum mechanics using wave functions.

LThA • Spectroscopy of Biomolecular Processes—Continued

LThA5 • 9:30 a.m.
LIBS and LA-ICP-MS Complementary Study of Elemental Distributions in Biominerals, *Karel Novotny[1], Marketa Hola[1], Michaela Galiova[1], Viktor Kanicky[1], Jozef Kaiser[2]; [1]Masaryk Univ., Czech Republic, [2]Univ. of Technology, Czech Republic.* Paper demonstrates the applicability of the two complementary "laser assisted" techniques (laser induced breakdown spectroscopy and laser ablation coupled with ICP MS) for spatial distribution monitoring of different elements in mineralized tissues and bio-mineral structures.

LThA6 • 9:45 a.m.
A New Pulsed 404 nm Laser Source for Biomedical Applications, *Jesper H. Lundeman[1], Ole B. Jensen[1], Peter E. Andersen[1], Stefan Andersson-Engels[2], Christian Pedersen[1], Paul M. Petersen[1]; [1]DTU Fotonik, Technical Univ. of Denmark, Denmark, [2]Physics Dept., Lund Inst. of Technology, Sweden.* We report frequency doubling in a new external cavity configuration with pulsed output up to 720 mW using an 808 nm tapered diode laser as pump source. The laser is used for fluorescence diagnostics applications.

MThA • Nanoplasmonics II—Continued

MThA7 • 9:30 a.m. Invited
Nonlinear Excitation of Surface Plasmons, *Lukas Novotny, Stefano Palomba; Inst. of Optics, Univ. of Rochester, USA.* We demonstrate the nonlinear excitation of surface plasmons by optical four-wave mixing (4WM) in the Kretschmann configuration. We observe characteristic plasmon dips, which we explain in terms of destructive interference between plasmon fields.

OThA • Optical Materials—Continued

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

NOTES

Highland A

Joint

10:30 a.m.–11:45 a.m.
JThB • Optics for Energy IV: Water in Energy Production
Gregory R. Kilby; United States Military Acad., USA, Presider

JThB1 • 10:30 a.m. Invited
The Solar Production of Hydrogen, *Craig Grimes; Penn State Univ., USA.* We will consider some of the design issues underlying a successful (efficient, cost-effective) water photoelectrolysis system for conversion of sunlight to hydrogen, a portable chemical fuel, using earth-crust plentiful materials.

Highland B

FiO

10:30 a.m.–12:00 p.m.
FThG • Optical Models of the Eye II
Melanie C. Campbell; Univ. of Waterloo, Canada, Presider

FThG1 • 10:30 a.m. Invited
Measuring and Modeling the Refractive Index Gradients in Animal Crystalline Lenses, *Ronald H. H. Kröger; Lund Univ., Sweden.* Recent progress in measuring and modeling the refractive index gradients in animal crystalline lenses, the predictions of a model on lens growth, and newly discovered signaling pathways involving the lens will be presented.

Highland C

10:30 a.m.–11:45 a.m.
FThH • Harmonic Generation and Phase Matching
Arash Mafi; Univ. of Wisconsin-Milwaukee, USA, Presider

FThH1 • 10:30 a.m. Invited
Optically-Induced Quasi-Phase Matching in High-Harmonic Generation, *Oren Cohen[1,2], Amy L. Lytle[1], Xiaoshi Zhang[1], Henry C. Kapteyn[1], Margaret M. Murnane[1]; [1]JILA, Univ. of Colorado, USA, [2]Technion - Israel Inst. of Technology, Israel.* Weak counter-propagating pulse trains or multiple quasi-cw waves can induce complex amplitude and phase modulated structures in the high-harmonic field. These "photonic" structures can be used for quasi-phase-matching the high-harmonic generation process.

Highland D

10:30 a.m.–12:00 p.m.
SThC· Best of Topicals II
Michael Duncan; Naval Res Lab, USA, Presider

SThC1 • 10:30 a.m.
Holographic Bragg Reflectors and Other Planar Waveguide Devices Enabled by Deep UV Photolithographic Patterning, *Thomas Mossberg, Christoph Greiner, Dmitri Iazikov, LightSmyth Technologies, Inc., USA.* Precise control over individual diffractive elements ("lines") comprising a Bragg grating allows for advanced spectral programming and, for slab waveguides, incorporation of spatial beamshaping/routing. We discuss application of photolithographic patterning tools enabling line-by-line grating fabrication. (Bragg Gratings, Photosensitivity and Poling in Glass Waveguides, 2007)

Highland E

10:30 a.m.–12:00 p.m.
FThI • Slow Light and Signal Processing
Yannick Keith Lize; ITF Labs, Canada, Presider

FThI1 • 10:30 a.m.
Active Photonic Lattices: Natural Media for Slow Light Propagation, *Spilios Riyopoulos; SAIC, USA.* Modulations of the cavity radiation envelope propagate laterally over a coupled micro-laser array at speeds five orders of magnitude below light speed. Thus active photonic lattices naturally support slow light waves.

FThI2 • 10:45 a.m.
Nonlinear Information Processing with Thin-Film Organic Photorefractive Material, *Jed Khoury[1], Bahareh Haji-saeed[2], Charles L. Woods[1], John Kierstead[2], Nasser Peyghambarian[3]; [1]AFRL/RYHC, USA, [2]Solid State Scientific Corp., USA, [3]College of Optical Sciences, Univ. of Arizona, USA.* Nonlinear information processing via two-beam coupling using thin-film organic photorefractive material is demonstrated. The organic material is found to possess superior response time and resolution compared to photorefractive bulk material.

Highland F

10:30 a.m.–12:00 p.m.
FThJ • Light Localization
Zhigang Chen; San Francisco State Univ., USA, Presider

FThJ1 • 10:30 a.m. Tutorial
Photon Localization: Wave Interference and Modes in Random Media, *Azriel Z. Genack[1], Sheng Zhang[1], Jing Wang[1], Andrey A. Chabanov[2], Patrick Sebbah[3], Zhao-Qing Zhang[4], Valentin Freilikher[5]; [1]Queens College of CUNY, USA, [2]Univ. of Texas at San Antonio, USA, [3]CNRS, Univ. de Nice-Sophia Antipolis, France, [4]Hong Kong Univ. of Science and Technology, Hong Kong, [5]Bar-Ilan Univ., Israel.* The wave interference and mode pictures of wave transport in random media are related and used to understand the spatial, spectral, and temporal statistics of diffusive and localized waves.

Azriel Genack is Distinguished Professor of Physics at Queens College of CUNY. He received his B.A. and Ph.D. degrees from Columbia University. Azi served as a post-doc at the City College of CUNY and at the IBM Research Laboratory in San Jose. He joined the staff of the Exxon Research and Engineering Company in 1977 and worked there until coming to Queens College in 1984. Azi cofounded Chiral Photonics, Inc. in 1999 and has advised the company since its founding. He has published in the areas of microwave and optical propagation, localization and lasing in random and periodic media, band-edge lasing and photonics of planar and fiber chiral

Highland G

10:30 a.m.–11:45 a.m.
FThK • Silicon Photonics III
Thomas Krauss; Univ. of St. Andrews, UK, Presider

FThK1 • 10:30 a.m.
Large Longitudinal-Electric-Fields in Single-Mode Silicon Wire Waveguides, *Jeffrey B. Driscoll, Xiaoping Liu, I-Wei Hsieh, Jerry I. Dadap, Richard M. Osgood, Jr.; Columbia Univ., USA.* We show the presence of exceptionally strong longitudinal electric fields in a single-mode silicon waveguide. This field can be engineered through waveguide geometry and enhanced to exhibit amplitudes 98% of the dominant transverse field.

FThK2 • 10:45 a.m.
Optical Multi-Level Logic on a Silicon Chip, *Karthik Narayanan, Stefan F. Preble, Zhaolin Lu, M. A. G. Abushagur; Rochester Inst. of Technology, USA.* We demonstrate all-optical multi-level logic using a system of symmetric ring resonators in parallel. The device can form the basis of an on-chip optical digital to analog converter (ODAC).

Highland H

10:30 a.m.–12:00 p.m.
FThL • Silicon and III-V Based Optoelectronics for Optical Interconnects II
John E. Cunningham; Sun Microsystems, USA, Presider

FThL1 • 10:30 a.m. Invited
Building Blocks for Intrachip Optical Networks, *J. Michel[1], K. Balakrishnan[1], M. Beals[1], J. Eastep[1], J. Miller[1], T. Konstantakopoulus[1], J. Liu[1], J. Psota[1], M. R. Watts[2], A. Agarwal[1], L. C. Kimerling[1]; [1]MIT, USA, [2]Sandia Natl. Labs, USA.* CMOS compatible photonic devices are at the point where integration with electronics is feasible. We will show how our ultra low power photonic devices can be utilized in an intrachip optical network, supporting multicore processing.

Highland J

10:30 a.m.–12:00 p.m.
SThD • Quantum Optics and Quantum Engineering for Undergraduates Symposium II
Carlos R. Stroud, Jr.; Inst. of Optics, Univ. of Rochester, USA, Presider

SThD1 • 10:30 a.m. Invited
A Quantum Optics Laboratory for Teaching Quantum Mechanics, *Enrique J. Galvez; Colgate Univ., USA.* We have implemented quantum optics experiments with correlated-photons as labs for an undergraduate course on quantum mechanics. The experiments can be explained with the quantum mechanical algebra of a single quantum of light.

Highland K

10:30 a.m.–11:45 a.m.
LThB • THz Spectroscopy in Biomaterials
Andrea Markelz; Univ. at Buffalo, USA, Presider

LThB1 • 10:30 a.m. Invited
Origin of Terahertz Sensitivity to Heme Oxidation State, *Jing Yin Chen, J. R. Knab, Andrea Markelz; Univ. at Buffalo, USA.* Previously we reported the sensitivity of terahertz dielectric responses to the heme oxidation state for cytochrome c. Here we discuss measurements and calculations determining how correlated and diffusive motions give rise to this contrast.

Hyatt Grand Ballroom A/B

10:30 a.m.–12:30 p.m.
MThB • Nanoplasmonics III
Nikolay Zheludev; Univ. of Southampton, UK, Presider

MThB1 • 10:30 a.m. Invited
Ultrafast Photoemission Electron Microscopy: Imaging Light with Electrons on the Femto-Nano Scale, *Hrvoje Petek[1,2], Atsushi Kubo[1,3,4]; [1]Univ. of Pittsburgh, USA, [2]Donostia Intl. Physics Ctr., Spain, [3]Precursory Res. for Embryonic Science and Technology (PRESTO), Japan Science and Technology Agency, Japan, [4]Graduate School of Pure and Applied Sciences, Univ. of Tsukuba, Japan.* Attosecond movies (330-as/frame) of surface plasmon polaritons at lithographically defined nanostructures at the silver/vacuum interface are recorded with a photoelectron emission microscope excited with phase-locked 10-fs pulse pairs. Simple surface plasmon optical elements are studied.

Hyatt Grand Ballroom E/F

10:30 a.m.–12:30 p.m.
OThB • Subaperture Polishing
Kevin J. Moeggenborg; Cabot Microelectronics Corp., USA, Presider

OThB1 • 10:30 a.m. Invited
Characteristics of Random Path Sub-Aperture Polishing, *David D. Walker[1,2], Christina R. Dunn[3], Anthony Beaucamp[3], Richard Freeman[2]; [1]Natl. Facility for Ultra Precision Surfaces, UK, [2]Zeeko Ltd., UK, [3]Zeeko Technologies LLC., USA.* We present a random tool path generation algorithm for sub-aperture polishing. This algorithm produces random tool paths that never cross, can fill any continuous surface, and are different every time the algorithm is run.

NOTES

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
Joint	FiO				

JThB • Optics for Energy IV: Water in Energy Production—Continued

JThB2 • 11:00 a.m.
Tomographic Detection of Water in Fuel Cell Systems, *Laura Waller, Jungik Kim, Yang Shao-Horn, George Barbastathis; MIT, USA.* We present method and results for *in situ* characterization of water diffusion and other degradation mechanisms in fuel cell membranes using interferometric phase tomography.

JThB3 • 11:15 a.m. Invited
Optical Properties of Microalgae for Enhanced Biofuels Production, *Anatasios Melis; Univ. of California at Berkeley, USA.* Research seeks to alter the optical properties of microalgae in order to improve solar-to-biofuels energy conversion efficiency in mass culture under bright sunlight conditions. This requires a genetic tailoring of the chlorophyll arrays of photosynthesis.

FThG • Optical Models of the Eye II—Continued

FThG2 • 11:00 a.m.
Chromatic Wide-Field Eye Models with a GRIN Lens, *Alexander V. Goncharov, Chris Dainty; Natl. Univ. of Ireland Galway, Ireland.* We propose a chromatic eye model featuring a gradient index (GRIN) lens that shows intrinsic chromaticity. The model is optimized to be consistent with the ocular refractive error known from extensive experimental data.

FThG3 • 11:15 a.m. Invited
Eye Models for the Design and Performance Assessment of New-Technology Intraocular Lenses, *Patricia Piers[1], Henk Weeber[1], Pablo Artal[2]; [1]AMO Groningen BV, Netherlands, [2]Ctr. de Investigacion en Optica y Nanofisica, Univ. de Murcia, Spain.* This paper discusses the development of computer-based eye models derived from measurements of the physical characteristics of pseudophakic eyes. These models are capable of predicting the clinically measured quality of new-technology intraocular lenses.

FThH • Harmonic Generation and Phase Matching—Continued

FThH2 • 11:00 a.m.
Modeling Laser-Pulse Evolution during Production of High-Harmonics in a Semi-Infinite Gas Cell, *Matthew Turner, Nicole Brimhall, Michael Ware, Justin Peatross; Brigham Young Univ., USA.* We numerically simulate the propagation of high-intensity laser pulses in helium during high-harmonic generation. Results explain an experimentally observed double focus and illuminate the roles of geometric and nonlinear effects in high-harmonic phase matching.

FThH3 • 11:15 a.m. Invited
Mapping of Attosecond Ionization Dynamics by Recollision-Free Higher-Order Harmonic Generation, *A. J. Verhoef[1], A. Mitrofanov[1], E. E. Serebryannik[2], D. Kartashov[1], A. M. Zheltikov[2], Andrius Baltuška[1]; [1]Vienna Univ. of Technology, Austria, [2]Physics Dept., Intl. Laser Ctr., M.V. Lomonosov Moscow State Univ., Russian Federation.* We demonstrate an all-optical technique for mapping sub-cycle tunnel ionization in gas based on a cross-correlation measurement of Brunel-type harmonics detected in the direction of a weak probe pulse to separate them from recollision-driven harmonics.

SThC: Best of Topicals II—Continued

SThC2 • 11:00 a.m.
Kilohertz-Rate, Collision-Free, Gas-Phase Thermometry with Femtosecond CARS, *James R. Gord[1], Daniel R. Richardson[2], Robert P. Lucht[2], Sukesh Roy[1]; [1]AFRL, USA, [2]Dept. of Mechanical Engineering, Purdue Univ., USA.* Fs-laser-based time-resolved coherent anti-Stokes Raman scattering (CARS) spectroscopy of nitrogen is used to measure temperature at 1 kHz. The first few ps of the time-resolved CARS signal are free of collisions for pressures up to 20 bar. (Laser Applications to Chemical, Security and Environmental Analysis, 2008)

FThI • Slow Light and Signal Processing—Continued

FThI3 • 11:00 a.m.
Observations of Single Pulse Slow Light in a Persistent Spectral Hole-Burning Crystal, *J. S. Han, Byoung S. Ham; Inha Univ., Republic of Korea.* We investigate a self induced ultraslow group delay as long as 40 μs in a persistent spectral hole-burning crystal. The ultraslow light has potential application to on-demand all-optical information processing such as on-demand buffer memory.

FThI4 • 11:15 a.m.
Controllable Delay of Light Pulses in Erbium-Doped Optical Fibers with Saturable Absorption, *Serguei Stepanov, Eliseo Hernández Hernández; CICESE, Mexico.* We report a controllable delay of the probe light pulse sequence by a master, saturating pulses of significantly different wavelength (at 1526 and 1568 nm respectively) observed in erbium-doped single-mode fiber with saturable absorption.

FThJ • Light Localization—Continued

FThJ2 • 11:15 a.m.
Observation of a Localization Transition in Quasi-Periodic Photonic Lattices, *Yoav Lahini[1], Rami Pugatch[1], Francesca Pozzi[2], Marc Sorel[2], Roberto Morandotti[3], Nir Davidson[1], Yaron Silberberg[1]; [1]Weizmann Inst. of Science, Israel, [2]Univ. of Glasgow, UK, [3]Inst. Natl. de la Recherche Scientifique, Canada.* We observe the signature of a localization phase transition in one-dimensional quasi-periodic photonic lattices. In addition we compare experimentally the effect of nonlinearity before and after the transition.

Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
FiO			LS	META	OF&T

FThK • Silicon Photonics III—Continued

FThK3 • 11:00 a.m.
Cross Talk Reduction by Photonic Crystal Cavities, *Rami A. Wahsheh, Zhaolin Lu, Stefan F. Preble, Mustafa A. G. Abushagur; Rochester Inst. of Technology, USA.* Using a square lattice to reduce the cross talk between two photonic crystal structures composed of silicon pillars in air and air holes in silicon shows a reduction of -90.60 dB and -30 dB, respectively.

FThK4 • 11:15 a.m.
Modeling of Thermal Properties of Silicon-on-Insulator Traveling-Wave Resonators, *Amir H. Atabaki, Mohammad Soltani, Qing Li, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* Self-heating and external heat injection in silicon-on-insulator traveling-wave resonators are modeled using finite-element-method by considering the thermal properties of thin silicon slab. Thermal properties of resonators are further optimized for nonlinear and active-tuning applications.

FThL • Silicon and III-V Based Optoelectronics for Optical Interconnects II—Continued

FThL2 • 11:00 a.m.
Influence of the Frequency Dispersion of the Nonlinearity of Si Wires on Dynamics of Ultra-Short Optical Pulses, *Nicolae C. Panoiu[1], Xiaoping Liu[2], Richard M. Osgood[2]; [1]Univ. College London, UK, [2]Columbia Univ., USA.* We present the first full theoretical and numerical analysis of the influence of the frequency dispersion of the effective optical nonlinearity of Si photonic wire waveguides on the dynamics of ultra-short optical pulse propagation.

FThL3 • 11:15 a.m.
Nonlinear Self-Filtering via Dynamical Stochastic Resonance, *Dmitry V. Dylov, Jason W. Fleischer; Princeton Univ., USA.* We experimentally demonstrate nonlinear self-filtering and amplification of low-light-level images hidden in noise. The observed effect strongly depends on the nonlinear coupling strength and properties of the noise, indicative of a dynamical stochastic resonance.

SThD • Quantum Optics and Quantum Engineering for Undergraduates Symposium—Continued

SThD2 • 11:00 a.m. Invited
Teaching Quantum Mechanics with Photon Counting Instrumentation, *Carlos R. Stroud, Jr., Svetlana G. Lukishova; Inst. of Optics, Univ. of Rochester, USA.* We will describe our strategy for combining lecture courses on quantum mechanics and modern physics with laboratory experiments. Funded by the NSF, four quantum optics and quantum information teaching experiments have been implemented.

LThB • THz Spectroscopy in Biomaterials—Continued

LThB2 • 11:00 a.m. Invited
Terahertz Spectroscopy of Illicit Drugs: Experiment and Theory, *Damian G. Allis, Patrick M. Hakey, Timothy Korter; Syracuse Univ., USA.* This presentation will discuss recent efforts in the complete first-principles modeling of the terahertz spectra of a variety of different solid-state materials, with a focus on illicit drugs.

MThB • Nanoplasmonics III—Continued

MThB2 • 11:00 a.m.
New Propagation Effects in Semiconductors in the UV Range: Inhibition of Absorption, Negative Refraction, Anomalous Momentum States and Sub-Wavelength Imaging, *Michael Scalora[1], Vito Roppo[1,2], John Foreman[1,3], Marco Centini[4], Maria A. Vincenti[1,5], Nest Akozbek[1], Mark Bloemer[1]; [1]Charles M. Bowden Res. Ctr., Redstone Arsenal, USA, [2]Dept. de Fisica i Enginyeria Nuclear, Univ. Politecnica de Catalunya, Spain, [3]Dept. of Physics, Duke Univ., USA, [4]Dept. di Energetica, Univ. of Rome La Sapienza, Italy, [5]Dept. di Elettrotecnica e Elettronica, Politecnico di Bari, Italy.* We discuss propagation effects that occur in semiconductors at frequencies above the absorption edge, including inhibition of linear absorption using phase-locked harmonic pulses, negative refraction, anomalous momentum states predicted in negative-index materials, and sub-wavelength imaging.

MThB3 • 11:15 a.m.
Linear and Nonlinear Effective Medium Properties of Metallodielectric Composites of Interacting Spheres and Isolated Spheroids, *Dana C. Kohlgraf-Owens[1], Pieter G. Kik[1,2]; [1]CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Dept. of Physics, Univ. of Central Florida, USA.* We compute the effective medium properties for Kerr-type metallodielectric composites of interacting spheres and isolated spheroids. We show the nonlinear index enhancement increases significantly faster than the linear absorption as particles interact or become elongated.

OThB • Subaperture Polishing—Continued

OThB2 • 11:00 a.m.
Finishing Infrared Materials with MRF® and SSI®, *Bob Hallock, Aric Shorey, Alex Pisarski, Sergei Gorodkin, Robert James, Richard Jenkins; QED Technologies, USA.* Optical fabrication and, specifically, the metrology and final finishing of components for infrared (IR) systems have been a challenge for a number of key material types. Recent developments, examples and supporting data will be presented.

OThB3 • 11:15 a.m.
A Feasibility Study on ELID Ground Optical Material for Computer Controlled Polishing, *Fathima P. Kader Mohideen, Markus Schinhaerl, Andreas Geiss, Rolf Rascher, Peter Sperber; Univ. of Applied Sciences Deggendorf, Germany.* The ELID-MRF hybrid processes might be used efficiently for finishing precision optical components with complex geometry and stringent specifications. The ELID ground samples were studied in order to know the feasibility to finish with MRF.

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
Joint	FiO				

JThB • Optics for Energy IV: Water in Energy Production—Continued

FThG • Optical Models of the Eye II—Continued

FThG4 • 11:45 a.m.
Tunable Fluidic Intraocular Lens in Human Eye Model, *Wen Qiao[1], Frank S. Tsai[1], Sung H. Cho[1], Huimin Yan[2], Yu-Hwa Lo[1]; [1]Univ. of California at San Diego, USA, [2]Zhejiang Univ., China.* Tunable fluidic lenses with deformable surfaces were tested in human eye models as intraocular lenses (IOLs). Fluidic IOL shows superior performance because of its wide accommodation range and similar working principle to the crystalline lens.

FThH • Harmonic Generation and Phase Matching—Continued

SThC: Best of Topicals II—Continued

SThC3 • 11:30 a.m.
3-D Micro-Optic Circuits in Holographic Photopolymers, *Amy C. Sullivan[1,2], Robert R. McLeod[1], Matthew S. Kirchner[1]; [1]Univ. of Colorado, USA, [2]Agnes Scott College, USA.* Three-dimensional direct-write lithography into diffusion-mediated photopolymers developed for holography is shown to create 10 micron single-mode waveguides. We demonstrate low-loss waveguides, 90 degree bends off of encapsulated mirrors and fabrication of waveguides to embedded fibers. (Controlling Light with Light: Photorefractive Effects, Photosensitivity, Fiber Gratings, Photonic Materials and More 2007)

FThI • Slow Light and Signal Processing—Continued

FThI5 • 11:30 a.m.
Theory and Experiment of Chirped-Pulse THz Fast and Slow Light in Semiconductor Optical Amplifiers, *Bala Pesala, Forrest G. Sedgwick, Alexander V. Uskov, Connie J. Chang-Hasnain; Univ. of California at Berkeley, USA.* We present excellent agreement of theoretical simulation and experimental results of THz fast and slow light using a novel chirped-pulse technique. A large timeshift of 8.7 pulses is demonstrated with minimum broadening and distortion.

FThI6 • 11:45 a.m.
Room-Temperature Spectral Hole Burning via SBS, *Daniel Gauthier[1], Adrian A. Juarez[1], Ramon Vilaseca[2], Zhaoming Zhu[1]; [1]Duke Univ., USA, [2]Univ. Politecnica de Catalunya, Spain.* We observe spectral hole burning in a room-temperature optical fiber due to saturation of the stimulated Brillouin scattering process. The spectral hole is ~10,000 times narrower than the width of the resonance.

FThJ • Light Localization—Continued

FThJ3 • 11:30 a.m.
On Criterion for Light Localization in Random Amplifying Media, *Ben Payne[1], Alexey G. Yamilov[1], Jonathan Andreasen[2], Hui Cao[2]; [1]Missouri Univ. of Science and Technology, USA, [2]Yale Univ., USA.* Conventional criteria for Anderson localization of light in random media are not directly applicable in presence of gain. We study a ratio of [transmission coefficient] / [energy stored in system] as a possible alternative criterion.

FThJ4 • 11:45 a.m.
Delocalization Transition in Dimensional Crossover in Layered Media, *Jongchul Park[1], Sheng Zhang[1], Valery Milner[2], Azriel Genack[1]; [1]Queens College of CUNY, USA, [2]Univ. of British Columbia, Canada.* A crossover between localized and diffusive wave propagation is observed in transmission through random layered media with transverse disorder. The crossover occurs at the point at which the beam spread equals the transverse coherence length.

12:00 p.m.–1:30 p.m. FThM • Vision and Color Poster Session *(see page 128)*

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

NOTES

Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom A/B	Hyatt Grand Ballroom E/F
FiO			LS	META	OF&T

FThK • Silicon Photonics III—Continued

FThK5 • 11:30 a.m.
Optically-Driven MEMS Deformable Mirrors via an Array of Photodetectors, *Jed Khoury[1], Kenneth Vaccaro[1], Charles L. Woods[1], Bahareh Haji-saeed[2], Brian Krejca[2], Andrew Davis[2], John Kierstead[2], William D. Goodhue[3]; [1]AFRL/RYHC, USA, [2]Solid State Scientific Corp., USA, [3]Dept. of Physics, Univ. of Massachusetts, USA.* We are in the process of developing an all optically driven, deformable mirror device through the integration of an array of photodetectors with an array of MEMS deformable mirror devices.

FThL • Silicon and III-V Based Optoelectronics for Optical Interconnects II—Continued

FThL4 • 11:30 a.m.
Nanophotodetector Array for Near-Field Imaging, *Boyang Liu, Ki Young Kim, Yingyan Huang, Seng-Tiong Ho; Dept. of Electrical Engineering and Computer Science, Northwestern Univ., USA.* A novel near-field nano-imager based on channelized nanoscale-pixel photodetector (NPD) array is presented. Simulation shows λ/10 resolutions could be obtained by NPD array. Initially realized channelized NPD devices have the smallest pixel size of 50nm.

FThL5 • 11:45 a.m.
Characterization of Scattering from Nanoparticles Using Far-Field Interferometric Microscopy, *Brynmor J. Davis, P. Scott Carney; Univ. of Illinois at Urbana-Champaign, USA.* Analysis and simulations show that coherent confocal microscopy techniques, such as optical coherence microscopy, can be used to estimate the polarizability tensor of an imaged nanoparticle. The estimation process is robust to noise and defocus.

SThD • Quantum Optics and Quantum Engineering for Undergraduates Symposium—Continued

SThD3 • 11:30 a.m.
Teaching Experiments on Photon Quantum Mechanics, *Svetlana G. Lukishova, Carlos R. Stroud, Jr., Luke Bissell, Brandon Zimmerman, Wayne H. Knox; Inst. of Optics, Univ. of Rochester, USA.* We will describe four teaching experiments on photon quantum mechanics for undergraduates: (1) entanglement and Bell's inequalities, (2) single-photon interference, (3) confocal microscope imaging of single-emitter fluorescence, (4) Hanbury Brown and Twiss setup. Fluorescence antibunching.

SThD4 • 11:45 a.m.
Spin Half—Software for Simulating Core Quantum Concepts, *Daniel Styer[1], Mario Belloni[2], Wolfgang Christian[2]; [1]Oberlin College, USA, [2]Davidson College, USA.* The computer program *Spin Half* enables students to design and execute simulated experiments concerning measurement, interference, and entanglement with spin-1/2 atoms—but one facet of a new quantum mechanics curriculum that begins with spin-1/2 systems.

LThB • THz Spectroscopy in Biomaterials—Continued

LThB3 • 11:30 a.m.
Spectroscopy of the Polymorphs of D-Mannitol Using a Quasi Near-Field Terahertz Generation and Detection Setup, *Reshmi Chakkittakandy[1], Jos A. W. M. Corver[2], Paul C. M. Planken[1]; [1]Delft Univ. of Technology, Netherlands, [2]IMA Edwards Pharmaceutical Systems, Netherlands.* We describe a quasi near-field terahertz generation and detection setup having a high bandwidth of 7.5 THz, which we apply to the study of two different polymorphs of D-mannitol, frequently used excipient in pharmaceutical industry.

MThB • Nanoplasmonics III—Continued

MThB4 • 11:30 a.m.
Plasmonic "Petals" Structure that Gives Strong Magnetic Response in the Optical Domain, *Jingjing Li, Shih-Yuan Wang, R. Stanley Williams; Hewlett-Packard Res. Lab, USA.* We show a "petals" structure composed of interweaving dielectric and plasmonic slabs that gives strong magnetic response in optical domain. The structure is of great interests in optical metamaterial design.

MThB5 • 11:45 a.m.
Turbulent Propagation Explaining Forward Slow Light and Negative Index in Plasmonic Waveguides, *Gilad Rosenblatt, Eyal Feigenbaum, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* Pulses launched over metal-dielectric interfaces exhibit a turbulent bi-directional power flow dynamics with vertical imaginary coupling underlying the slow wave nature of propagation in plasmonic waveguides and enabling both slow forward and backward plasmonic waves.

OThB • Subaperture Polishing—Continued

OThB4 • 11:30 a.m.
Frictional Investigation for Magnetorheological Finishing (MRF) of Optical Ceramics and Hard Metals, *Chunlin Miao, Shai N. Shafrir, Henry Romanofsky, Joni Mici, John C. Lambropoulos, Stephen D. Jacobs; Univ. of Rochester, USA.* Drag force and normal force are measured in real time for spots taken on optical glasses and hard ceramics using the magnetorheological finishing (MRF) process. Removal rates increase nonlinearly with shear stress for these materials.

OThB5 • 11:45 a.m.
Improving Surface PSD Using a Random Tool Path, *Christina R. Dunn[1], David D. Walker[2], Anthony Beaucamp[3], John Kelchner[1], Richard Freeman[3]; [4]Zeeko Technologies, USA, [2]Natl. Facility for Ultra Precision Surfaces, UK, [3]Zeeko LLC, UK.* We present a random unicursal tool path for subaperture polishing and compare polishing with the random and raster tool paths. This new complex tool path is useful for reducing mid-spatial frequencies in polished surfaces.

12:00 p.m.–1:30 p.m. FThM • Vision and Color Poster Session *(see page 128)*

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

12:00 p.m.–1:30 p.m.
FThM • Vision and Color Poster Session

FThM1
Study on Wavefront Aberration Compensation between Cornea and Crystalline Lens Based on Diffraction Propagation Theory, *Zhaoqi Wang, Ming Liu; Inst. of Modern Optics, Nankai Univ., China.* Individual eye structures are established with measured cornea data, eyeball depth and wave-front aberrations. Mutual aberration compensation between elements is achieved based on diffraction theory.

FThM2
Phase Reconstruction Using Zernike Orthogonal Slope Polynomials, *Jayoung Nam[1], Larry N. Thibos[1], D. Robert Iskander[2]; [1]Indiana Univ., USA, [2]Queensland Univ. of Technology, Australia.* We develop Zernike radial slope polynomials for phase reconstruction from wavefront slope data. These new polynomials form an orthonormal set for gradient data and thus avoid problems encountered when using spatial-derivatives of ordinary Zernike polynomials.

FThM3
Studies on the Images of Truncated Periodic Targets Formed by a Human Eye in the Presence of SCE-I, *Sumit Ghosh, Pronab Mondal; Indian Student Chapter of Optical Society of America (ISCOSA), India.* The intensity distribution in the diffraction images of truncated, one-dimensional periodic incoherent objects formed by a human eye in the presence of SCE-I are obtained. Image modulations and average irradiance have been determined.

FThM4
Theoretical Computation of Wide Field Projection onto the Retina via Wide Angle Schematic Eye, *Xin Wei, Arthur Bradley, Larry Thibos; School of Optometry, Indiana Univ., USA.* We present a theoretical framework with the implementation in Matlab to simulate the retinal projection of far field scene across a large anisoplanatic visual field in object space via wide angle schematic eyes monochromatically.

FThM5
Estimation of the Effects of High Order Aberration on Human Contrast Sensitivity, *Tao Liu, Zhaoqi Wang; Inst. of Modern Optics, Nankai Univ., China.* By calculating aerial image modulation and MTF of desired high order wavefront aberration, contrast sensitivity function has been simulated, and the effects of high order aberration on contrast sensitivity can be shown without complex system.

FThM6
Paper Withdrawn

FThM7
Analysis of Reaction Time in Visual Attention for Objects with Different Contrast, *Archana Bora, Tarun Aggarwal, Vasudevan Lakshminarayanan; Univ. of Waterloo, Canada.* Two healthy-eyed 6/6 Snellen's acuity individuals were included. Target was presented in CRS-VSG in central and peripheral field in combinations of size, contrast and Gabor patches in random trials and analyzed.

FThM8
Development of an Analytic Schematic Elliptical Gradient Index Model for the Eye of a Rat, *Dafna Sussman[1,2], Mark Bird[1,2,3], Melanie Campbell[1,2]; [1]Univ. of Waterloo, Canada, [2]Guelph Waterloo Physics Inst., Canada, [3]Advanced Medical Optics BV, Netherlands.* Anatomical elliptical and spherical GRIN models of the rat eye are constructed in Zemax. The elliptical model agrees better with experimental measurements of spherical aberration and HO-RMS 20deg. off-axis than the spherical model.

FThM9
Human Factors Effects of Interaction and Display Devices in Virtual Reality (VR) Medical Rehabilitation, *Shih-Ching Yeh, Alexander A. Sawchuk, Belinda Lange, A. A. Rizzo; Univ. of Southern California, USA.* We describe experimental effects of 3-D magnetic and optical interaction devices (both perform well) and displays (shutter glasses better for some tasks compared to autostereoscopic) on visual-motor rehabilitation tasks for stroke and brain injury patients.

FThM10
Measurement of the Accommodation Response in Viewing Stereoscopic Images, *Youngmin Kim, Keehoon Hong, Jae-Hyun Jung, Jong-Mo Seo, Byoungho Lee; School of Electrical Engineering, Seoul Natl. Univ., Republic of Korea.* We perform the measurement of accommodation response in viewing stereoscopic images. The results indicate the possibility that the viewer gazes between the convergence point of images and the display device.

FThM11
Speckle Interferometric System for Measuring Ocular Microtremor, *James P. Ryle[1], Mohammed Al-Kalbani[2], Niamh Collins[2], Unnikrishnan Gopinathan[1,3], Gerard Boyle[2], Davis Coakley[2], John T. Sheridan[1]; [1]Univ. College Dublin, Ireland, [2]St. James Hospital, Ireland, [3]Inst. für Technische Optik, Univ. Stuttgart, Germany.* A compact optical system has been developed capable of measuring minute movements of the eye. Eye movement is simulated through the application an electrical signal to a piezoelectric material which acts as the eye's surface.

FThM12
3-D Mobile Virtual Reality Simulations and Animations Using Common Modern Displays, *Dan Curticapean, Markus Feisst, Andreas Christ; Univ. of Applied Sciences, Germany.* We present an architecture to bring the 3-D experience of powerful personal computer systems to users with mobile displays. An additional feature is to provide this virtual reality information as a 3-D stereoscopic presentation.

FThM13
Human Face Tracking with a WEB-Cam and Color Segmentation Image, *G. Domínguez-Guzmán, Juan Castillo-Mixcóatl, G. Beltrán-Pérez, S. Muñoz-Aguirre; Benemérita Univ. Autónoma de Puebla, Mexico.* A simple human face tracking system using a WEB-cam is presented. WEB-cam is controlled by two servo-motors driven by a microcontroller. Color segmentation image is used to track human face.

FThM14
Wide-Field Steerable Adaptive Optics SLO with Dual Deformable Mirrors: Optical Design, *Zhangyi Zhong[1], Cong Deng[2], Stephen Burns[1]; [1]School of Optometry, Indiana Univ., USA, [2]Ctr. for Automation Technologies and Systems, Rensselaer Polytechnic Inst., USA.* We present the optical design of an all-reflective adaptive optics SLO which provides dual deformable mirror aberration correction and high resolution imaging steerable across a large field of view (over 30 degrees).

FThM15
Effect of Diffraction on Human Scotopic Vision, *V. Vijayakumar, C. Eswaran; Multimedia Univ., Malaysia.* When the pupil radius is large as in scotopic conditions, the intensity changes in the diffracted light for various wavelengths appear to converge to similar values resulting in reduced color discrimination in the human eye.

NOTES

Hyatt Grand Ballroom A/B

META

MThB • Nanoplasmonics III—Continued

MThB6 • 12:00 p.m.
Efficient 3-D Nanofocusing Based on Surface Plasmon Polaritons, *Ruoxi Yang, Zhaolin Lu; Rochester Inst. of Technology, USA.* We present a nanotaper for coupling light from a dielectric waveguide into a nanoscale plasmonic waveguide. Numerical simulation shows that light can be focused into a 21nm-by-24nm spot with efficiency over 60%.

MThB7 • 12:15 p.m.
Larger Near-Field Probes with Better Resolution, *Misha Sumetsky; OFS Labs, USA.* Conventionally, super-resolution is achieved with extremely small near-field nanoprobes. However, larger probes enriched with high spatial frequencies generated by randomly distributed nanoparticles can provide better resolution even in the presence of substantial measurement noise.

Hyatt Grand Ballroom E/F

OF&T

OThB • Subaperture Polishing—Continued

OThB6 • 12:00 p.m.
Surface Texture in Material Removal with MRF on Optical Ceramics and Hard Metals, *Shai N. Shafrir[1], Chunlin Miao[1,2], Henry Romanofsky[1], John C. Lambropoulos[1,2], Stephen D. Jacobs[1,2,3]; [1]Lab for Laser Energetics, Univ. of Rochester, USA, [2]Dept. of Mechanical Engineering Materials Science Program, Univ. of Rochester, USA, [3]Inst. of Optics, Univ. of Rochester, USA.* We use orthogonal 1-D power spectral density (PSD) to study surface texture in MRF spots for optical ceramics and tungsten carbide hard metals. Results reveal how particles in the MR fluid remove material.

OThB7 • 12:15 p.m.
Polishing a Corrective Optic for a Cylindrical Lens Used in X-Ray Mandrel Testing, *Fei Liu, Joseph Geary, Patrick Reardon, Cris Underwood, Ted Rogers, Tim Blackwell; Univ. of Alabama in Huntsville, USA.* A method using a COTS cylindrical lens for acquiring interferometric surface figure data on an X-ray mandrel is discussed. This paper demonstrates a corrector plate fabrication process to nullify the aberration brought by this lens.

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

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

FiO

1:30 p.m.–3:30 p.m.
FThN • Virtual Displays and Natural Tasks
Mary M. Hayhoe; Univ. of Texas at Austin, USA, Presider

FThN1 • 1:30 p.m. Invited
Investigating the Visual Functions of Fixational Eye Movements, *Michele Rucci; Boston Univ., USA.* Precise control of the retinal stimulus is necessary to elucidate the visual function of the instability of natural fixation. This talk will review a real-time system for gaze-contingent display which was designed for this purpose.

1:30 p.m.–3:30 p.m.
FThO • Imaging and Sensing
Glenn D. Boreman; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, Presider

FThO1 • 1:30 p.m.
Interpolation Strategies to Reduce IFOV Error in Stokes Vector Microgrid Polarimeter Imagery, *Bradley M. Ratliff, J. Scott Tyo; College of Optical Sciences, Univ. of Arizona, USA.* Microgrid imaging polarimeters inherently suffer from instantaneous field-of-view error (IFOV) that degrades estimated polarimetric imagery. We develop interpolation strategies to reduce the effects of IFOV error and test them on actual infrared microgrid polarimeter data.

FThO2 • 1:45 p.m.
Measuring the Orbital Angular Momentum of a Photon Using the Diffraction Reciprocal Lattice of a Triangular Slit, *Willamys C. Soares[1], I. Vidal[1], Dilson P. Caetano[1], Eduardo J. S. Fonseca[1], Sabino Chávez-Cerda[2], Jandir M. Hickmann[1]; [1]Optics and Materials Group, OPTMA, Inst. de Fisica, Univ. Federal de Alagoas, Brazil, [2]INAOE, Mexico.* We demonstrate that the reciprocal lattice in the Fraunhofer diffraction pattern of single photons with orbital angular momentum passing through an equilateral triangular slit provides quantitative information of the total amount of orbital angular momentum.

1:30 p.m.–3:30 p.m.
FThP • Coherence II and General Quantum Electronics
Alberto Marino; NIST, USA, Presider

FThP1 • 1:30 p.m.
Complementarity, Source Coherence, and Joint Uncertainty, *Sean J. Bentley; Adelphi Univ., USA.* The relationship between spatial coherence and joint uncertainty of position-momentum entangled photons is the basis for the reinforcement of complementarity in an experiment combining quantum imaging with double-slit interference.

FThP2 • 1:45 p.m.
Unidirectional Laser Emission from Limacon Shaped Microdisk, *Qinghai Song[1], Hui Cao[1], Boyang Liu[2], Seng-Tiong Ho[2], Wei Fang[3], Glenn Solomon[3]; [1]Yale Univ., USA, [2]Northwestern Univ., USA, [3]NIST, USA.* We fabricated a new shape of microdisk which not only gives unidirectional output but also has high quality. All the lasing modes in such a cavity have the same output directionality.

1:30 p.m.–3:30 p.m.
FThQ • Imaging and Detection
Mircea Mujat; Physical Sciences Inc., USA, Presider

FThQ1 • 1:30 p.m.
Integrated Coded Aperture Imaging in Optical Region, *Wanli Chi, Nicholas George; Inst. of Optics, Univ. of Rochester, USA.* A novel coded aperture imaging system working in optical spectrum region is described. Excellent simulation results are presented. The camera is also shown to be capable of multi-wavelength imaging with a single monochromatic detector array.

FThQ2 • 1:45 p.m.
Extended Depth of Field through Unbalanced OPD, *Kaiqin Chu, Nicholas George, Wanli Chi; Inst. of Optics, Univ. of Rochester, USA.* The depth of field of a conventional camera is extended simply by inserting an annular glass ring in front of the lens. The operating principle is explained and experimental results are shown.

1:30 p.m.–3:30 p.m.
FThR • Diffractive Micro and Nano Structures for Sensing and Information Processing II
Luiz G. Neto; Univ. of Sao Paulo, Brazil, Presider

FThR1 • 1:30 p.m. Invited
Ultrafast Signal Processing Using All-Fiber Grating Technologies, *Jose Azana; Inst. Natl. de la Recherche Scientifique, Canada.* We review our recent work on the realization of a variety of fundamental ultrafast signal processing functionalities, including photonic temporal differentiation and photonic temporal integration, using customized optical fiber grating devices.

NOTES

Highland G

Highland H

FiO

1:30 p.m.–3:30 p.m.
FThS • Silicon and III-V Based Optoelectronics for Optical Interconnects III
Jurgen Michel; MIT, USA, Presider

FThS1 • 1:30 p.m. Invited
Silicon Nano-Photonic Interconnection Networks in Multicore Processor Systems, *Benjamin G. Lee, Keren Bergman; Columbia Univ., USA.* We explore how recent advances in nanoscale silicon photonic technologies can be exploited for developing on-chip optical interconnection networks that address the bandwidth and power challenges presented for the communications infrastructure in multicore processors.

Highland J

LS

1:30 p.m.–3:30 p.m.
LThC • Quantum Information with Atoms
Ray Beausoleil; Hewlett-Packard Labs, USA, Presider

LThC1 • 1:30 p.m. Invited
From Phase Diagrams to Quantum Simulations with Neutral Atoms, *Carl J. Williams; NIST, USA.* Optical lattice based neutral atoms systems can engineer or simulate various iconic condensed matter Hamiltonians. I will review recent progress on the phase diagrams of one and two component mixtures in optical lattices.

Highland K

1:30 p.m.–3:30 p.m.
LThD • Cellular Imaging Techniques
Andrew J. Berger; Inst. of Optics, Univ. of Rochester, USA, Presider

LThD1 • 1:30 p.m. Invited
Analyzing Light Scattering from Aspherical Nuclei for Cell Biology and Clinical Applications, *Adam Wax; Dept. of Biomedical Engineering, Duke Univ., USA.* We discuss new models of light scattering by aspherical cell nuclei and relate them to studies of cell mechanics and early cancer detection based on angle-resolve low coherence interferometry, an inverse light scattering method.

Hyatt Grand Ballroom A/B

META

1:30 p.m.–3:30 p.m.
MThC • Surface Plasmons
Harald Giessen; Univ. Stuttgart, Germany, Presider

MThC1 • 1:30 p.m.
Tunable Surface-Plasmon Resonances in Stongly Coupled Metallo-Dielectric Multiple Layers, *John T. Henson, Anirban Bhattacharyya, Theodore D. Moustakas, Roberto Paiella; Boston Univ., USA.* The coupling between semiconductor electron-hole pairs and surface plasmons in metallo-dielectric stacks is investigated experimentally and theoretically, showing that these heterostructures can be used to introduce geometrically tunable resonances in the photonic density of modes.

MThC2 • 1:45 p.m.
Surface-Plasmons on Structured Metallic Surfaces: Theoretical Analysis, Applications to Mid-Infrared Quantum Cascade Lasers and a-SNOM Survey, *Adel Bousseksou[1], Yannick Chassagneux[1], Raffaele Colombelli[1], Arthur Babuty[2], Yannick De Wilde[2], Gille Patriarche[3], G. Beaudoin[3], Isabelle Sagnes[3]; [1]Inst. d'Electronique Fondamentale, France, [2]ESPCI, France, [3]CNRS/LPN, Lab de Photonique et de Nanostructures, France.* We show that periodically structuring the metal-cladding in surface-plasmon asymmetric waveguides for semiconductor lasers introduces new modes which exhibit low losses. We apply these theoretical findings to surface-plasmon quantum-cascade lasers emitting at 7.5 micron wavelength.

Hyatt Grand Ballroom E/F

OF&T

1:30 p.m.–3:30 p.m.
OThC • Materials/ Processing/Coatings
Markus Schinhärl; Univ. of Applied Sciences Deggendorf, Germany, Presider

OThC1 • 1:30 p.m. Invited
LIGO: At the Forefront of Optics Materials Research, *Stephen McGuire; Southern Univ. and A&M College, USA.* Abstract not available.

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

FiO

FThN • Virtual Displays and Natural Tasks—Continued

FThN2 • 2:00 p.m. Invited

Incorrect Focus Cues in Stereo Displays: Effects on Visual Performance and Viewer Fatigue, *Martin Banks; Univ. of California at Berkeley, USA.* Stereoscopic displays yield distortions in 3-D percepts and cause viewer fatigue. Recently developed volumetric displays minimize these problems by decreasing the conflict between depicted depth and focus cues (blur and accommodation).

FThO • Imaging and Sensing—Continued

FThO3 • 2:00 p.m.

Characterization of Nonlinear Molecular Dynamics Using The Double Pump Probe Technique, *Davorin Peceli[1], Claudiu Cirloganu[1], Scott Webster[1], Lazaro A. Padilha[1], David J. Hagan[1], Eric W. Van Stryland[1], Susan Odom[2], Jon Matichak[2], Stephen Barlow[2], Raghunath R. Dasari[2], Seth R. Marder[2]; [1]College of Optics and Photonics, CREOL and FPCE, College of Optics and Photonics,Univ. of Central Florida, USA, [2]School of Chemistry and Biochemistry and Ctr. for Organic Photonics and Electronics, Georgia Tech, USA.* We performed double pump-probe experiments to study the intra-molecular dynamics of several nonlinear organic dye molecules. The method allows for characterization of triplet states yield and cross-section. Several special cases of molecular dynamics are presented.

FThO4 • 2:15 p.m.

Imaging beyond the Diffraction Limit via Dark States, *George R. Welch[1], Hebin Li[1], Vladimir Sautenkov[1], Michael M. Kash[1,2], Alexei Sokolov[1], Yuri Rostovtsev[1], M. Suhail Zubairy[1,3], Marlan O. Scully[1,4]; [1]Inst. for Quantum Studies, Texas A&M Univ., USA, [2]Dept. of Physics, Lake Forest College, USA, [3]Texas A&M Univ. at Qatar, Qatar, [4]Princeton Univ., USA.* We study the possibility of creating spatial patterns smaller than the diffraction limit using the so-called dark states formed by the interaction between atoms and optical fields.

FThP • Coherence II and General Quantum Electronics—Continued

FThP3 • 2:00 p.m.

Convergence of Far-Field Characteristics upon Ray Dynamics in Stadium Microlasers, *Muhan Choi[1], Susumu Shinohara[1], Takehiro Fukushima[2], Takahisa Harayama[1]; [1]Advanced Telecommunications Res. Inst. Intl., Japan, [2]Dept. of Communication Engineering, Okayama Prefectural Univ., Japan.* We study spectral and far-field characteristics of lasing emission from stadium-shaped semiconductor microlasers. We demonstrate that the correspondence between far-field emission patterns and ray simulation results becomes better as the number of lasing modes increases.

FThP4 • 2:15 p.m.

A Simple Method of Measuring Coherent Backscattering, *Xingyu Zhang, Qingpu Wang, Shuzhen Fan, Chen Zhang, Shutao Li, Zhaojun Liu; School of Information Science and Engineering, Shandong Univ., China.* A simple method for measuring coherent backscattering by using CCD is presented. The recorded data is integrated numerically along one dimension to enhance the signal-to-noise ratio. The transport mean free path is gotten by curve-fitting.

FThQ • Imaging and Detection—Continued

FThQ3 • 2:00 p.m.

Effects of Core Coupling in Fiber Bundles on Imaging, *Xianpei Chen, Chris Xu; Cornell Univ., USA.* We experimentally demonstrate that core coupling dramatically degrades the imaging performance of coherent fiber bundles. The coupling is wavelength and polarization dependent. We further show numerically that large core-clad index contrast lowers couplings between cores.

FThQ4 • 2:15 p.m.

Particle Detection Using Dual-Phase Interferometry, *Bradley M. Deutsch, Lukas Novotny; Inst. of Optics, Univ. of Rochester, USA.* We present a novel scheme for detection of sub-100nm particles using dual-phase interferometry, rendering amplitude and phase of the scattered field without frequency shifting or lock-in detection. We compare results to homodyne and heterodyne detection.

FThR • Diffractive Micro and Nano Structures for Sensing and Information Processing II—Continued

FThR2 • 2:00 p.m.

Optical Birefringence of Nano-porous Dielectric Thin Films, *Mengshu Pan, Andrew Sarangan, Qiwen Zhan; Univ. of Dayton, USA.* Nano-porous thin films grown using oblique-angle electron-beam evaporation are found to exhibit birefringence in addition to ultra-low refractive index. The properties of SiO_2 and TiO_2 films grown using this method are presented in this paper.

FThR3 • 2:15 p.m.

Optimum Image Reconstruction from a Finite Set of Generalized Projections, *Markus Testorf[1], Michael A. Fiddy[2]; [1]Dartmouth College, USA, [2]Univ. of North Carolina at Charlotte, USA.* The so-called PDFT algorithm is introduced as generalized sampling scheme. The algorithm is shown to fuse the data from different subsystems and improve the resolution of the image estimate.

Highland G

Highland H — FiO

FThS • Silicon and III-V Based Optoelectronics for Optical Interconnects III—Continued

FThS2 • 2:00 p.m.
Integrated InGaAsP/InP High-Reflectivity Micro-Loop Mirror Based Laser, *Fang Ou, Yingyan Huang, Yiyi Zeng, Seng-Tiong Ho; Dept. of Electrical and Computer Engineering, Northwestern Univ., USA.* High performance reflectors on one side of Fabry Perot lasers can double the output power. A novel integrated micro loop mirror fabricated on InGaAsP/InP quantum well wafer is used to realize such a laser.

FThS3 • 2:15 p.m.
Frequency Resolved Optical Gating Characterization of a Passively Mode-Locked Quantum Dot Laser, *Yongchun Xin[1], Daniel J. Kane[2], Vassilios Kovanis[3], Nicholas G. Usechak[3], Luke F. Lester[1]; [1]Ctr. for High Technology Materials, Univ. of New Mexico, USA, [2]Southwest Sciences, USA, [3]AFRL, USA.* Pulse shape and chirp of a quantum dot mode-locked laser are unambiguously measured using the frequency resolved optical gating technique. Pulse asymmetry is detected, and evidence that the pulse is recompressable to sub-picoseconds is presented.

Highland J / Highland K — LS

LThC • Quantum Information with Atoms—Continued

LThC2 • 2:00 p.m. Invited
Quantum Metrology with Cold Atoms, *Anthony E. Miller, Andrew Silberfarb, Orion Crisafulli, Hideo Mabuchi; Stanford Univ., USA.* We present our experimental and theoretical work developing measurement-feedback implementations of precision sensors using cold atomic ensembles. We will focus on our work on spin-squeezed magnetometers.

LThD • Cellular Imaging Techniques—Continued

LThD2 • 2:00 p.m. Invited
Optical Fourier Processing of Subcellular Structure, *Nada N. Boustany, Jing-Yi Zheng, Robert M. Pasternack, Zhen Qian; Rutgers Univ., USA.* We demonstrate a microscope for optical Fourier processing with high frequency resolution. Quantitative object maps that encode local morphological parameters with sub-wavelength sensitivity are generated. Applications include analysis of multiple non-spherical scatterers within living cells.

Hyatt Grand Ballroom A/B — META

MThC • Surface Plasmons—Continued

MThC3 • 2:00 p.m.
Surface States at Interface of Magneto-Photonic Crystal and a Medium with Negative Permittivity, *Mikhail K. Khodzitskiy; Inst. of Radiophysics and Electronics Natl. Acad. of Science, Ukraine.* The transmission spectra of magneto-photonic crystal/medium with negative permittivity were studied at microwave band. Surface state was experimentally found out at interface. Tuning of the surface state frequency position by applied magnetic field was shown.

MThC4 • 2:15 p.m.
Modification of Surface Plasmon Absorption Loss via Alloys, *Dwayne A. Bobb, Guohua Zhu, Mohammad Mayy, Q. L. Williams, Patricia F. Mead, Vladimir Gavrilenko, M. A. Noginov; Norfolk State Univ., USA.* We have studied, theoretically and experimentally, modification of the surface plasmon absorption loss via alloying noble metals with other metals, which can contribute two or more electrons to the free electron gas.

Hyatt Grand Ballroom E/F — OF&T

OThC • Materials/Processing/Coatings—Continued

OThC2 • 2:00 p.m.
Building Blocks for Non-Polarizing Optical Coatings, *Ronald R. Willey; Willey Optical, Consultants, USA.* Insight has been gained into the layer patterns which are useful in designing non-polarizing optical coatings. Two such patterns are shown which help maintain the same % reflectance and phases of the s- and p-polarizations.

OThC3 • 2:15 p.m.
Two-Channel Phase Modulated Ellipsometry: An Ultra-Fast-Diagnostic Technique for Uniaxial Media, *Chun-I Chuang, Yu-Faye Chao; Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan.* A two-channel phase modulated ellipsometry has been used to measure the optical properties of an uniaxial material, which include the complex refractive indices and the azimuth angle of its principle axes.

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

FiO

FThN • Virtual Displays and Natural Tasks—Continued

FThN3 • 2:30 p.m. Invited

Using Virtual Environments to Investigate Natural Visually Guided Behavior, *Mary M. Hayhoe; Univ. of Texas at Austin, USA.* Investigation of visual performance in natural tasks is now much more feasible, given developments in monitoring eye, and body movements in unconstrained observers, together with the ability to render complex virtual environments in real time.

FThN4 • 3:00 p.m. Invited

Using Ambulatory VR to Break the Laws of Physics and Optics, *William H. Warren; Brown Univ., USA.* Virtual reality enables researchers to test theories of perception and action by breaking laws of physics and optics. In four studies we manipulate (a) gravity, (b) optics, (c) visual-motor gain, and (d) a non-Euclidean world.

FThO • Imaging and Sensing—Continued

FThO5 • 2:30 p.m.

Spectroscopy of Photonic Molecules in the Terahertz Range, *Harald G. L. Schwefel, Sascha Preu, Stefan Malzer, Gottfried H. Döhler, Lijun Wang; Max Planck Res. Group, Inst. for Optics, Univ. of Erlangen, Germany.* We present photonic molecules in the terahertz range. Two dielectric whispering gallery mode resonators with matched resonance spectra are coupled over tens of resonances. Frequency splitting of multiple modes is observed in excellent agreement with theory.

FThO6 • 2:45 p.m.

A Model Experiment for Stand-Off Sensing, *Gombojav O. Ariunbold[1], Michael M. Kash[1,2], Hebin Li[1], Vladimir Sautenkov[1], Yuri Rostovtsev[1], George R. Welch[1], Marlan O. Scully[1,3]; [1]Inst. for Quantum Studies, Texas A&M Univ., USA, [2]Dept. of Physics, Lake Forest College, USA, [3]Princeton Univ., USA.* We report results for a potentially sensitive and specific remote sensing technique. The experiment uses an organic dye solution excited by short laser pulses. We show amplification and position-controlled creation of a signal.

FThO7 • 3:00 p.m.

Target Detection with Partial Mueller Polarimeters, *Sergio Johnson[1], Zhipeng Wang[1], J. Scott Tyo[1], Brian G. Hoover[2]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]Advanced Optical Technologies, USA.* Active laser polarimetry has been used to discriminate targets from backgrounds in remote sensing applications. We explore the optimization of partial Mueller polarimeters that partially sample the Mueller matrix, and apply those data to discrimination.

FThP • Coherence II and General Quantum Electronics—Continued

FThP5 • 2:30 p.m.

Superradiance and Rabi Oscillation in FDTD Simulation with Use of Multi-Level Medium Rate Equations, *Yingyan Huang, Zhengquan Zhang, Seng-Tiong Ho; Northwestern Univ., USA.* The lorentzian-gain model used in FDTD cannot model superradiance and Rabi oscillation. We show that superradiance and Rabi oscillation can occur in the recent multi-level multi-electron FDTD model and shall be dealt with carefully in applications.

FThP6 • 2:45 p.m.

Optical Tunneling from an On-Chip Resonator, *Matthew Tomes, Tal Carmon; Univ. of Michigan at Ann Arbor, USA.* We experimentally observe light emission from a region that is far away from our on-chip device. We photograph 5-μm tunneling distance; this gap is >20% of the device size.

FThP7 • 3:00 p.m.

Selective and Efficient Excitation of a Diatomic Molecule by a Train of Weak Ultrashort Pulses, *Luís E. E. de Araujo; Univ. Estadual de Campinas, Brazil.* I show that a train of weak ultrashort pulses can selectively and efficiently transfer population between electronic states of a diatomic molecule. Almost 100% transfer between the ground and an excited vibrational state is demonstrated.

FThQ • Imaging and Detection—Continued

FThQ5 • 2:30 p.m.

Passive Focus Detection of Monochromatic Spatially Incoherent Sources, *Se Baek Oh, George Barbastathis; MIT, USA.* We present a new passive focus detection method for monochromatic and spatially incoherent sources. Using a volume holographic interferometer, we detect the object's axial position without using active illumination, additional cameras, or prior information.

FThQ6 • 2:45 p.m.

The Transverse Transmission/Reflection Method: An Experimental/Numerical Prism-Coupling-Based Approach for Leaky Mode Characterization in Planar Waveguides, *Chien-I Lin, Thomas K. Gaylord; School of Electrical and Computer Engineering, Georgia Tech, USA.* A prism-coupler-based experimental/numerical method is presented to characterize leaky waveguide modes from the transmitted/reflected powers in the transverse direction. The loss is obtained without multi-site longitudinal measurements as in conventional methods.

FThQ7 • 3:00 p.m.

Heterodyned Optical Coherence Tomography for Complete Stokesmetric Imaging, *Selim M. Shahriar, Xue Liu, Shih Tseng, Alexander Heifetz; Northwestern Univ., USA.* We show theoretically and experimentally that a novel type of optical coherence tomography employing heterodyned interferometry is capable of determining all sixteen elements of the Mueller matrix for the target, by measuring all Stokes parameters.

FThR • Diffractive Micro and Nano Structures for Sensing and Information Processing II—Continued

FThR4 • 2:30 p.m.

Nonlinear Optics of Photonic Crystals, *Anna D. Kudryavtseva, Nickolay V. Tcherniega; Lebedev Physical Inst. RAS, Russian Federation.* Nonlinear effects—photonic flame effect (PFE), stimulated globular scattering (SGS) and stimulated Raman scattering (SRS)—have been investigated in photonic crystals (synthetic opal matrices and nanocomposites on their base) under ruby laser excitation.

FThR5 • 2:45 p.m.

Coupled Wave Theory of Two-Dimensional Gratings Using the Complex Fourier Factorization Method, *Roman Antos; Inst. of Physics of Charles Univ., Czech Republic.* Coupled wave theory treating optics of two-dimensional gratings, photonic crystals or cylindrical waveguides is reformulated by using a complex Fourier factorization method, which is a generalization of the classical fast Fourier factorization rules.

FThR6 • 3:00 p.m.

Ultra-Compact Integrated Curved Diffraction Grating with Novel Non-Blocking Geometry for DWDM Chips, *Yongming Tu, Yingyan Huang, Seng-Tiong Ho; Northwestern Univ., USA.* A millimeter-size DWDM wavelength multiplexer can be realized with integration of nanoscale input-output waveguides and ultra-large-angle grating. However, it suffers from beam blocking due to large beam diffraction. A non-blocking geometry is proposed and demonstrated.

Highland G

Highland H

FiO

FThS • Silicon and III-V Based Optoelectronics for Optical Interconnects III—Continued

FThS4 • 2:30 p.m.
Efficient Couplers and Splitters from Dielectric Waveguides to Plasmonic Waveguides, *Rami A. Wahsheh, Zhaolin Lu, Mustafa A. G. Abushagur; Rochester Inst. of Technology, USA.* We introduce a novel design and analysis of an ultra-compact coupler and a 1×2 splitter from silicon waveguides into plasmonic waveguides with high coupling efficiency and flexible splitting ratios.

FThS5 • 2:45 p.m.
Ultra-Short High-Efficiency Power-Function Waveguide Tapers for Micro-Photonic Applications, *Xi Chen, Yingyan Huang, Seng-Tiong Ho; Northwestern Univ., USA.* A series of power-function shaped tapers are analyzed. Optimized design can achieve 99% transmission for 4μm to 0.3μm mode conversion with 9.95μm taper, which saves 85% of the length compared with conventional straight tapers.

FThS6 • 3:00 p.m.
Enhancement of Surface Near-Field Using 2-D Guided Mode Resonance Structure, *Sakoolkan Boonruang[1], Mountlearn Wu[2]; [1]Natl. Electronics and Computer Technology Ctr., Thailand, [2]Dept. of Optics and Photonics, Natl. Central Univ., Taiwan.* Cone-shaped two-dimensional guided mode resonance structure with a strong surface near-field is proposed for surface enhanced Raman scattering applications. The degree of enhancement is directly related to the confinement of resonance mode and resonance linewidth.

Highland J / Highland K

LS

LThC • Quantum Information with Atoms—Continued

LThC3 • 2:30 p.m. Invited
Progress towards Scalable Quantum Information Processing with Trapped Ions, *Jonathan Home[1], J. D. Jost[1], J. M. Amini[1], M. J. Biercuk[1], R. B. Blakestad[1], J. J. Bollinger[1], J. W. Britton[1], K. R. Brown[1], D. Hanneke[1], D. Hume[1], W. M. Itano[1], E. Knill[1], C. Langer[2], D. Leibfried[1], C. Ospelkaus[1], R. Ozeri[3], T. Rosenband[1], S. Seidelin[4], H. Uys[1], A. P. VanDevender[1], N. Walrath[1], J. Wesenburg[5], D. J. Wineland[1]; [1]NIST, USA, [2]Lockheed Martin, USA, [3]Weizmann Inst., Israel, [4]Univ. of Grenoble, France, [5]Oxford Univ., UK.* I will discuss progress at NIST towards scaling up ion-trap quantum information processing. This will include developments in segmented trap microfabrication, sympathetic cooling, and new methods for reducing the complexity of control fields.

LThC4 • 3:00 p.m.
Quantum Information Protocol for a Raman-Coupled Spinor BEC, *Kevin C. Wright[1], L. Suzanne Leslie[2], Nicholas P. Bigelow[1,2]; [1]Dept. of Physics and Astronomy, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* We demonstrate the use of a ^{87}Rb Bose condensate as a quantum information storage medium, using both the internal and external angular momentum states of the spinor wavefunction of the condensate.

LThD • Cellular Imaging Techniques—Continued

LThD3 • 2:30 p.m. Invited
Detecting Alterations in Cell Nanoarchitecture with Optical Imaging: Implications for Cancer Detection, *Vadim Backman, Hariharan Subramanian, Prabhakar Pradhan, Yang Liu, Ilker Capoglu, Jeremy Rogers; Northwestern Univ., USA.* We report a spectroscopic microscopy technique that, coupled with mesoscopic theory analysis, measures cellular nanoarchitecture otherwise undetectable by conventional microscopy. Human studies demonstrated that this technique can detect the earliest cellular alterations in carcinogenesis.

LThD4 • 3:00 p.m.
Single-Scattering Optical Tomography, *Lucia Florescu[1], John C. Schotland[1], Vadim A. Markel[2]; [1]Dept. of Bioengineering, Univ. of Pennsylvania, USA, [2]Depts. of Radiology and Bioengineering, Univ. of Pennsylvania, USA.* We present a three-dimensional optical imaging technique of mesoscopic systems. Using the single-scattering approximation to the radiative transport equation enables to simultaneously recover the scattering and absorption coefficients from angularly-resolved measurements of light intensity.

Hyatt Grand Ballroom A/B

META

MThC • Surface Plasmons—Continued

MThC5 • 2:30 p.m.
Tailoring and Cancelling Dispersion of Slow or Stopped and Subwavelength Surface-PlasmonoDielectric-Polaritonic Light, *Aristeidis Karalis, John D. Joannopoulos, Marin Soljacic; MIT, USA.* We present a nanostructured plasmonodielectric material platform, enabling a mechanism to tailor the dispersion of slow/stopped surface-polaritonic light. As a special case, unusually-high-order dispersion cancellation is achievable, with great applications in optical buffers and active devices.

MThC6 • 2:45 p.m.
Tailoring the Properties of Designer Surface Plasmons for Subdiffraction Light Manipulation, *Stavroula Foteinopoulou, Eleftherios N. Economou, Maria Kafesaki, Costas M. Soukoulis; Inst. of Electronic Structure and Laser, FORTH, Greece.* We investigate the properties of engineered surface plasmons at the surfaces of periodic media. We further show how these can be exploited for long-range subdiffraction light guiding and also discuss other possible applications.

MThC7 • 3:00 p.m.
Role of Cylindrical Surface Plasmons in Generating Non-Diffraction Beams by Plasmonic Lens, *Tsung-Dar Cheng, Ding-Zheng Lin, Chih-Kung Lee; Inst. of Applied Mechanics, Natl. Taiwan Univ., Taiwan.* We investigated the optical properties of metallic sub-wavelength annular apertures (SAA). We found that cylindrical surface plasmons (CSP) not only increase optical transmission, but they help to focus the sub-wavelength and create a non-diffracting spot.

Hyatt Grand Ballroom E/F

OF&T

OThC • Materials/Processing/Coatings—Continued

OThC4 • 2:30 p.m.
Manufacturability Study of CLEARCERAM®-Z (T008) Compared to Other Low CTE Materials, *Chris Ghio[1], Kousuke Nakajima[2], Jessica E. DeGroote[3]; [1]Ohara Corp., USA, [2]Ohara Inc., Japan, [3]Optimax Systems Inc., USA.* CLEARCERAM®-Z, CLEARCERAM®-Z HS and CLEARCERAM®-Z (T008) are ultra-low thermal expansion materials. This paper gives a comparison of their thermal properties as well as their manufacturability using traditional grinding and polishing methods.

OThC5 • 2:45 p.m.
Stress and Subsurface Damage in Polycrystalline SiC, *Joseph A. Randi[1], William J. Everson[1], Aric Shorey[2], Shai N. Shafrir[3], Chunlin Miao[3], Stephen D. Jacobs[3]; [1]Penn State Electro-Optics Ctr., USA, [2]QED Technologies, USA, [3]Lab for Laser Energetics, Univ. of Rochester, USA.* Stress from material removal processes are compared by observation of the Twyman effect. Stress scales with the abrasive size used during mechanical removal processes, and is reduced by chemical removal processes. SSD was also measured.

OThC6 • 3:00 p.m. Invited
Trends in Ultra-Precision Machining of Freeform Optical Surfaces, *Yazid Tohme; Moore Nanotechnology Systems LLC, USA.* This paper discusses the steps and trends used in the fabrication of freeform optical surfaces. The discussion includes ultra precision machining techniques like fast tool servo, slow slide servo, raster machining and micro milling.

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

FiO

FThN • Virtual Displays and Natural Tasks—Continued

FThO • Imaging and Sensing—Continued

FThO8 • 3:15 p.m.
Evanescent Wave Focusing in Zone Plate Structures, *Yi-Wei Cheng, Jia-Han Li; Natl. Taiwan Univ., Taiwan.* The angular spectrum representation is used to study the field distribution in Fresnel zone plate structures. It is found that the evanescent waves are important to shape the electric field intensity in the focal plane.

FThP • Coherence II and General Quantum Electronics—Continued

FThP8 • 3:15 p.m.
An Atom Interferometer for Gradient Magnetometry, *Jon P. Davis, Francesco A. Narducci; Naval Air Systems Command, USA.* We theoretically demonstrate that an atom interferometer can be used to measure gradient magnetic fields. We report on our development of such a device to be used in a potentially noisy environment.

FThQ • Imaging and Detection—Continued

FThQ8 • 3:15 p.m.
Spectroscopic Mueller Matrix Polarimeter Using Four Channeled Spectra, *Yukitoshi Otani[1], Toshitaka Wakayama[2], Kazuhiko Oka[3], Norihiro Umeda[1]; [1]Tokyo Univ. of Agriculture and Technology, Japan, [2]Saitama Medical Univ., Japan, [3]Hokkaido Univ., Japan.* A Mueller matrix polarimeter acquired for four channeled spectra is proposed by polarizing and analyzing optics with high-order retarder. Nine elements of matrix can be deconvoluted without modifying the configuration of polarizing and analyzing optics.

FThR • Diffractive Micro and Nano Structures for Sensing and Information Processing II—Continued

FThR7 • 3:15 p.m.
Wavefront Manipulation Applying the Zeroth-Order Phase-Contrast Technique, *Jose Carlos Pizolato Jr., Giuseppe A. Cirino, Christhiane Goncalves, Luiz G. Neto; Univ. of São Paulo, Brazil.* A new phase-contrast technique is proposed to obtain a direct a wavefront manipulation using spatial light modulators and binary diffractive optical elements.

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

NOTES

Highland G | Highland H | Highland J | Highland K | Hyatt Grand Ballroom A/B | Hyatt Grand Ballroom E/F

FiO | LS | META | OF&T

FThS • Silicon and III-V Based Optoelectronics for Optical Interconnects III—Continued

FThS7 • 3:15 p.m.
Inverse Filter Radon-Transformed Synthetic Discriminant Correlator for Facial Recognition, *Bahareh Haji-saeed[1], John Kierstead[1], Charles L. Woods[2], Jed Khoury[2]; [1]Solid State Scientific Corp., USA, [2]AFRL/RYHC, USA.* A power-law correlation based on an inverse filter Fourier-radon-transform synthetic-discriminant-function (SDF) for facial recognition is proposed. Superposition of rotationally variant sets of inverse filter Fourier-transformed radon-processed templates is used to generate the SDF.

LThC • Quantum Information with Atoms—Continued

LThC5 • 3:15 p.m.
Correlated Photon Pairs from FWM Mixing in a Diamond Configuration: Experiments with Rubidium Vapor, *Richard T. Willis, Francisco E. Becerra, Luis A. Orozco, Steven L. Rolston; Dept. of Physics, Joint Quantum Inst, Univ. of Maryland and NIST, USA.* We present measurements of photon correlations and Bell's inequalities of photons generated in a rubidium vapor cell with four-wave mixing using a diamond configuration that includes the 5s, 5p and 6s levels.

LThD • Cellular Imaging Techniques—Continued

LThD5 • 3:15 p.m.
Polymer Gratings for Protein and Glial Cells Adsorption, *Ildar Salakhutdinov, Pamela VandeVord, Olena Palyvoda, Howard Matthew, Golam Newaz, Gregory Auner; Wayne State Univ., USA.* We investigated fibronectin and glial cells adsorption to the polymer gratings as controlled rough surface. We found that such surface works quite well for the fibronectin and cell binding.

MThC • Surface Plasmons—Continued

MThC8 • 3:15 p.m.
Breakdown of Surface Plasmon Enhancement due to Ponderomotive Forces, *Pavel Ginzburg, Alex Hayat, Meir Orenstein; Technion - Israel Inst. of Technology, Israel.* Breakdown of plasmonic field enhancement over metal surface imperfections is predicted due to ponderomotive force at intense electric fields. Resonant excitation of $\sim 10^9$ *V/m* field significantly changes the resonant condition, preventing field localization.

OThC • Materials/Processing/Coatings—Continued

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

NOTES

Highland A

Highland B

Highland C

FiO

4:00 p.m.–6:00 p.m.
SThE • The Stiles-Crawford Effects of the First and Second Kinds, 75 Years of Scientific Achievements
Melanie C. Campbell; Univ. of Waterloo, Canada, Presider

SThE1 • 4:00 p.m. Invited
The Stiles-Crawford Effects: A Brief History and Experiences at the National Physical Laboratory (Teddington, UK) with W. S. Stiles nd B. H. Crawford, *Jay M. Enoch; Univ. of California at Berkeley, USA.* In 1933, retinal directional sensitivity, reported by Stiles and Crawford, was a landmark discovery in vision science. Monochromatic and chromatic propeties are affected. Photoreceptor waveguide optics and properties are largely responsible. We celebrate this discovery.

SThE2 • 4:20 p.m. Invited
Photometric and Radiometric Issues Associated with Measurements of the Integrated Stiles-Crawford Effect and Specification of the Visual Stimulus, *Vasudevan Lakshminarayanan[1], J. M. Enoch[2]; [1]Univ. of Waterloo, Canada, [2]Univ. of California at Berkeley, USA.* Integrating Stiles-Crawford effect I by employing individually-determined multipoint psychophysical determinations made across the eye's entrance pupil often don't match measured comparable values determined using different size pupil diameters. Means of resolving these discrepancies are addressed.

4:00 p.m.–6:00 p.m.
FThT • Coherence in Optical Fields
Yoshitomo Okawachi; Cornell Univ., USA, Presider

FThT1 • 4:00 p.m.
Coherence-Induced Polarization Changes in Stochastic Electromagnetic Beams, *Mohamed F. Salem[1], Emil Wolf[1,2]; [1]Dept. of Physics and Astronomy, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* We show that coherence properties of the field in the source plane induce changes in polarization properties of the beam which the source generates.

FThT2 • 4:15 p.m.
Complete Representation of an Optical Correlation Singularity, *Greg Gbur[1], Grover Swartzlander[2]; [1]Univ. of North Carolina at Charlotte, USA, [2]College of Optical Sciences, Univ. of Arizona, USA.* An understanding of correlation singularities is fundamentally important in imaging science. Until now spatial coherence studies have examined two-dimensional projections of the four-dimensional correlation function. Here we describe the properties of the complete correlation function.

FThT3 • 4:30 p.m.
Phase and Coherence Singularities Generated by the Interference of Partially Coherent Fields, *Choon How Gan, Greg Gbur; Univ. of North Carolina at Charlotte, USA.* Phase singularities of both the wavefield and correlation function, generated by partially coherent fields emerging from pinholes in an opaque screen, were numerically investigated. A new type of mixed field/correlation singularity was found to occur.

Highland D

Highland E

Highland F

FiO

4:00 p.m.–6:00 p.m.
FThU • Novel Optical Design and Measurement
Wanli Chi; Univ. of Rochester, USA, Presider

FThU1 • 4:00 p.m.
Determination of Nodal Aberration Field Locations from Measured Performance Data for Large Operational Astronomical Telescopes, *Tobias Schmid[1], Kevin Thompson[2], Jannick Rolland[1]; [1]College of Optics and Photonics, CREOL, Univ. of Central Florida, USA, [2]Optical Res. Associates, USA.* Methods for efficiently locating the nodal positions for astigmatism in astronomical telescopes are presented. Results will show how many field points need to be measured, dependent on the system aberration correction-state and required alignment tolerances.

FThU2 • 4:15 p.m.
Meshfree Approximation Methods for Surface Representation of Free-Form Optical Surfaces, *Ozan Cakmakci, Jannick Rolland; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* This paper summarizes the impact of a change of basis from polynomials to radial basis functions for describing free-form optical surfaces.

FThU3 • 4:30 p.m.
Effects of Light Coherence for Micro-Lens Arrays, *Nikolai I. Petrov; LG Technology Ctr., Moscow, Russian Federation.* The method based on coherent states representation is developed for investigation of propagation of partially coherent light beams through the micro-lens arrays. Numerical simulations of intensity distributions of a diffracted beam are carried out.

4:00 p.m.–6:00 p.m.
FThV • Diffractive Micro and Nano Structures for Sensing and Information Processing III
Jose Azana; Inst. Natl. de la Recherche Scientifique (INRS), Canada, Presider

FThV1 • 4:00 p.m. Invited
Infrared Antennas, *Glenn D. Boreman; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Radiofrequency components such as antennas, transmission lines, phased arrays, frequency-selective surfaces, reflectarrays and meanderline waveplates are demonstrated in the infrared. Usual design methodologies apply, providing that IR material properties are used in the computations.

FThV2 • 4:30 p.m.
Inverse Self-Healing of Talbot Self-Imaging, *Markus E. Testorf; Dartmouth College, USA.* The self-healing of Talbot self-images is used to design 3-D intensity distributions. Heuristic and numerical techniques are discussed for computing diffractive optical element which exhibit the inverse self-healing effect.

Highland G

Highland H

FiO

4:00 p.m.–6:00 p.m.
FThW • Silicon and III-V Based Optoelectronics for Optical Interconnects IV
Stefan Preble; Rochester Inst. of Technology, USAPresider

FThW1 • 4:00 p.m. Invited
Optical Interconnects in Large Computer Systems, *Ashok Krishnamoorthy, John E. Cunningham, X. Zheng; Sun Microsystems Inc., USA.* Multi-core, multi-threaded processor chips provide opportunity for Si-compatible optical interconnects in the computing system hierarchy. We discuss energy, bandwidth, and density requirements for such interconnects and potentially achieving these requirements with advanced silicon photonics technologies.

FThW2 • 4:30 p.m.
Optical Packet Delay Using Channelized Slow Light, *Zhimin Shi, Robert W. Boyd; Inst. of Optics, Univ. of Rochester, USA.* We propose a new scheme of channelized slow light without the need of dynamic phase control among all spectral channels. Such a device with practical designs can achieve discretely-tunable packet delays with very small data-distortion.

Highland J

LS

4:00 p.m.–6:00 p.m.
LThE • Quantum Information Processing
Carl J. Williams; NIST, USA, Presider

LThE1 • 4:00 p.m. Invited
Quantum Information Processing in Optical Fibers, *Prem Kumar, Joseph B. Altepeter, Milja Medic, Matthew A. Hall, Monika S. Patel; Northwestern Univ., USA.* We will review recent progress in generating high fidelity quantum correlated and entangled photons via spontaneous four-wave mixing in standard optical fiber. We will also present applications of such photons in quantum information processing tasks.

LThE2 • 4:30 p.m.
Fourier Relationship between Angular Position and Orbital Angular Momentum of Entangled Photons, *A. K. Jha[1], B. Jack[2], E. Yao[2], J. Leach[2], R. W. Boyd[1], G. S. Buller[3], S. M. Barnett[4], S. Franke-Arnold[2], M. J. Padgett[2]; [1]Univ. of Rochester, USA, [2]Univ. of Glasgow, UK, [3]Heriot-Watt Univ., UK, [4]Univ. of Strathclyde, UK.* We study the Fourier relationship between angular position and orbital angular momentum of entangled photons. We establish that the amplitudes of the angular position and the orbital angular momentum distributions are related as conjugate Fourier-pairs.

Highland K

Hyatt Grand Ballroom A/B

META

4:00 p.m.–6:00 p.m.
MThD • Plasmonics—Devices and Applications II
Brooke Hester; NIST, USA, Presider

MThD1 • 4:00 p.m. Invited
Plasmonic Photovoltaic and Photonic Switching Devices, *Harry Atwater; Caltech, USA.* Abstract not available.

MThD2 • 4:30 p.m.
Electrically Switchable Organic Surface Plasmon Source, *Daniel M. Koller[1], Andreas Hohenau[1], Harald Ditlbacher[1], Nicole Galler[1], Franz R. Aussenegg[1], Alfred Leitner[1], Joachim R. Krenn[1], Emil J. W. List[2]; [1]Karl-Franzens Univ. Graz, Austria, [2]Graz Univ. of Technology, Austria.* Modified organic light emitting diodes (OLEDs) are used as direct surface plasmon (SP) sources. We thereby introduce an electrically switchable SP emitter, as demonstrated by leaky mode extraction.

Hyatt Grand Ballroom E/F

OF&T

4:00 p.m.–6:00 p.m.
OThD • Beams/Jets/Belts/Wheels
Tayyab Suratwala; Lawrence Livermore Natl. Lab, USA, Presider

OThD1 • 4:00 p.m. Invited
Broad Ion-Beam Milling Techniques, Results and Prospects, *Raymond Mercier, Michel Mullot, Michel Lamare; Inst. d'Optique Graduate School, Lab Charles Fabry, France.* We have developed exotic versions of ion beam milling, using a broad beam. A mask modulates spatially the ion beam, allowing the generation of high precision and low roughness axisymmetrical and cylindrical surfaces.

OThD2 • 4:30 p.m.
Atmospheric Plasma Jet Machining: Simulation of Spatio-Temporal Substrate Surface Temperature Distributions, *Thomas Arnold, Johannes Meister, Georg Böhm; Leibniz Inst. of Surface Modification, Germany.* The plasma-induced material removal based on chemical mechanisms depends on surface temperature. The temperature field caused by the jet heat flux is modeled by EEM to predict the local etching behavior during large surface machining.

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

FiO

SThE • The Stiles-Crawford Effects of the First and Second Kinds, 75 Years of Scientific Achievements—Continued

SThE3 • 4:40 p.m. Invited

Effect of Accommodation on the Stiles-Crawford Effect, *David Andrew Atchison, Nisha Singh, Sanjeev Kasthurirangan, Huanqing Guo; Queensland Univ. of Technology, Australia.* The Stiles-Crawford effect became steeper with accommodation increase, but without a systematic peak shift. Considering aberration and accommodative lag artefacts, there appears to be little change in SCE up to 6 D accommodation stimulus levels.

SThE4 • 5:00 p.m. Invited

Optical Properties of Human Cone Photoreceptors Revealed with Adaptive Optics, *Austin Roorda[1], David R. Williams[2]; [1]Univ. of California at Berkeley, USA, [2]Univ. of Rochester, USA.* AO has generated details regarding optics and arrangement of human cones, but questions remain about the source and variability of cone reflections. I will present our research on these properties in normal and diseased eyes.

SThE5 • 5:20 p.m. Invited

Waveguide Models and the Stiles-Crawford Effects, *Brian Vohnsen; Univ. College Dublin, Ireland.* Photoreceptors are biological waveguides of light with important implications for vision and retinal imaging as evidenced by the Stiles-Crawford effects. Here waveguide models are analyzed for the characteristic directionality factors, their wavelength and eccentricity dependence.

FThT • Coherence in Optical Fields—Continued

FThT4 • 4:45 p.m.

Exact Ray-Based Nonparaxial Propagation of Coherence and Polarization through Anisotropic Media, *Jonathan C. Petruccelli[1,2], Miguel A. Alonso[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Physics and Astronomy, Univ. of Rochester, USA.* A generalized tensor radiance is defined that enables rigorous ray-like propagation of paraxial and nonparaxial electromagnetic fields of any state of coherence or polarization through homogeneous, transparent anisotropic media.

FThT5 • 5:00 p.m.

Coherence Matrix Theory Application in Statistical Studies of Light Scattering by Small Rough Particles, *Karine J. Chamaillard[1], Ari Friberg[2], Chris Dainty[1]; [1]Natl. Univ. of Ireland, Galway, Ireland, [2]Royal Inst. of Technology, Sweden.* A statistical analysis of the Stokes parameters after light scattering by small randomly rough grains shows a linear regression law between I_s^2 and Q_s^2. A physical interpretation based on the coherence matrix is proposed.

FThT6 • 5:15 p.m.

Coherence Properties of Unpolarized Beams, *Taco D. Visser[1], David Kuebel[2], Emil Wolf[2]; [1]Vrije Univ., Netherlands, [2]Univ. of Rochester, USA.* We show that completely unpolarized beams may have very different spatial coherence properties. Several examples will be presented.

FThU • Novel Optical Design and Measurement—Continued

FThU4 • 4:45 p.m.

Tunable Dispersion Compensation by a Rotating Cylindrical Lens, *Michael E. Durst, Chris Xu; Cornell Univ., USA.* We present a new technique for tunable dispersion compensation that is low cost, high speed, and has a large range that is sufficient for compensating the dispersion of several meters of optical fiber.

FThU5 • 5:00 p.m.

Generation of Vortex Spectra Based on Geometric Phase, *Toshitaka Wakayama[1], Yukitoshi Otani[2], Toru Yoshizawa[1]; [1]Saitama Medical Univ., Japan, [2]Tokyo Univ. of Agriculture and Technology, Japan.* We propose the mechanism of vortex spectra, generation of the spatially variant polarized beam and SLM which works as geometric phase. We succeeded to observe from 0th to 4th of vortex spectra.

FThU6 • 5:15 p.m.

Self-Healing of Optical Airy Beams, *Georgios A. Siviloglou, John Broky, Aristide Dogariu, Demetrios N. Christodoulides; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We report the first observation of self-reconstructing Airy optical beams. It is demonstrated that these accelerating Airy beams can re-form along propagation. The robustness of their intensity features in adverse environments will be discussed.

FThV • Diffractive Micro and Nano Structures for Sensing and Information Processing III—Continued

FThV3 • 4:45 p.m.

Moved to JWA82

FThV4 • 5:00 p.m.

Stability of Inversion in Digital Holographic Particle Imaging: Theory and Experimental Validation, *Jose A. Dominguez-Caballero, George Barbastathis; MIT, USA.* A stability metric is proposed for the inverse problem in digital holographic particle imaging on a probabilistic model. This metric is experimentally validated and is used to find the optimum particle density.

FThV5 • 5:15 p.m.

A Fast-Convergent Global-Search Method for Designs of Phase-Only Computer-Generated Holograms, *Wei-Feng Hsu[1], Chia-Hung Lin[2]; [1]Dept. of Electro-Optical Engineering, Natl. Taipei Univ. of Technology, Taiwan, [2]Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan.* We propose a method which adopts the crossover operation in the genetic algorithm with a newly designed mask. This method generates a pseudo-global solution to the phase-only CGH with a fast convergent speed.

Highland G

Highland H

FiO

FThW • Silicon and III-V Based Optoelectronics for Optical Interconnects IV—Continued

FThW3 • 4:45 p.m.
Fundamental Limits for 2-D Optical Components, *Rafael Piestun[1], Martijn de Sterke[2]; [1]Univ. of Colorado at Boulder, USA, [2]Univ. of Sydney, Australia.* We derive a fundamental limit for the performance of 2-D optical components in terms of size, permittivity, and noise level. We apply it to establish a bound on the number of demultiplexing channels of superprisms.

FThW4 • 5:00 p.m.
A Novel Micromachining Technique for Achieving Optical Structures with Arbitrary Sidewall Profiles, *Lirong Sun, Andrew Sarangan; Univ. of Dayton, USA.* We present a micromachining technique using a fluorocarbon inductively coupled plasma for achieving arbitrary sidewall profiles in silicon, silicon dioxide and lithium niobate that are independent of the substrate crystal orientation.

FThW5 • 5:15 p.m.
Towards a Low-Q Erbium Doped Silicon Laser, *Ali W. Elshaari, Stefan F. Preble, Cory Cress, Ryne Raffaelle, Mustafa A. G. Abushagur; Rochester Inst. of Technology, USA.* In this paper we characterize the photoluminescence spectra of erbium doped yttrium oxide and propose a design for making a low-quality factor on chip laser with this material.

Highland J

LS

LThE • Quantum Information Processing—Continued

LThE3 • 4:45 p.m.
New S-Scopic and Multipartite EPR and Bell Inequalities, *Margaret D. Reid, Eric G. Cavalcanti, Chris J. Foster, Qiongyi He, Peter D. Drummond; ARC Ctr. for Quantum-Atom Optics, Univ. of Queensland, Australia.* We consider tests for macroscopic, or S-scopic, entanglement, using EPR inequalities. We then test an S-scopic local realism by deriving Bell inequalities applicable to either moments or binned correlations of multi-partite observables.

LThE4 • 5:00 p.m.
A Toolkit for Analyzing Quantum Imaging Systems, *Hugo Cable, Jonathan P. Dowling; Louisiana State Univ., USA.* I will discuss some simple examples of quantum imaging, for which a multi-photon absorbing material is illuminated with light with nonclassical correlations, demonstrating an alternative theoretical approach to an analysis based on optical transfer functions.

LThE5 • 5:15 p.m.
Entangled Fock States for Robust Quantum Optical Sensors, *Sean D. Huver, Christoph F. Wildfeuer, Jonathan P. Dowling; Louisiana State Univ., USA.* We show that particular entangled number states, which contain a special superposition of photons in both arms of a Mach-Zehnder interferometer, are resilient to environmental decoherence.

Highland K

Hyatt Grand Ballroom A/B

META

MThD • Plasmonics—Devices and Applications II—Continued

MThD3 • 4:45 p.m.
Femtosecond Active Plasmonics, *Kevin F. MacDonald[1], Zsolt L. Sámson[1], Nikolay I. Zheludev[1], Mark I. Stockman[2]; [1]Univ. of Southampton, UK, [2]Georgia State Univ., USA.* We report that optical illumination of a metal/dielectric plasmonic waveguide can affect the propagation of a surface plasmon polariton signal in the waveguide, thereby enabling direct femtosecond optical modulation of plasmonic signals.

MThD4 • 5:00 p.m.
Dielectric Sensing with Supported Gold Bipyramids, *Julien Burgin, Mingzhao Liu, Philippe Guyot-Sionnest; James Franck Inst., Univ. of Chicago, USA.* The surface plasmon resonance shift of gold bipyramids deposited on glass slides is investigated as a function of dielectric environement. Due to their narrow ensemble resonance, the bipyramids prove to be highly sensitive near-infrared sensors.

MThD5 • 5:15 p.m.
Plasmon-Resonance Enhanced Infrared Spectroscopy Using Gold Nanoantennas Fabricated by Electron-Beam Lithography, *Frank Neubrech[1], Javier Aizpurua[2], Manuel Lopes[3], Marc Lamy de la Chapelle[4], Annemarie Pucci[1]; [1]Univ. of Heidelberg, Germany, [2]Donostia Intl. Physics Ctr., Spain, [3]Universite de Technologie de Troyes, France, [4]Univ. Paris 13, France.* We observed extraordinary strong vibrational signatures from a molecular monolayer adsorbed on lithographically prepared gold nanowires, which shows their capacity to enhance the local field as well as perfect crystalline wires.

Hyatt Grand Ballroom E/F

OF&T

OThD • Beams/Jets/Belts/Wheels—Continued

OThD3 • 4:45 p.m.
Exploiting the Process Stability of Fluid Jet Polishing, *Wilhelmus A. Messelink, Oliver W. Faehnle; Fisba Optik AG, Switzerland.* Fluid jet polishing (FJP) is a sub-aperture fabrication technique for corrective polishing of geometries that are traditionally difficult to process due to tool restrictions. FJP can also remove mid-frequencies due to its small footprint size.

OThD4 • 5:00 p.m.
Atmospheric Plasma Jet Machining of Optical Surfaces, *Georg Böhm, Inga-Maria Eichentopf, Thomas Arnold; Leibniz-Inst. of Surface Modification, Germany.* Deterministic surface machining with high spatial resolution and nanometric depth accuracy is urgently required in the fabrication of high-end optics. Thus, plasma jet tools with sub-mm tool width and high removal rates have been developed.

OThD5 • 5:15 p.m.
Finishing of Deep Concave, Aspheric, and Plano Surfaces Utilizing the UltraForm 5-Axis Computer-Controlled System, *Scott Bambrick, Michael Bechtold, Scott DeFisher, David Mohring, Joe Meisenzahl; OptiPro Systems, USA.* UltraForm Finishing is a precision polishing machine capable of finishing a large variety of surfaces. An explanation of the process flow is presented as well as the results from a figure corrected asphere.

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

FiO

SThE • The Stiles-Crawford Effects of the First and Second Kinds, 75 Years of Scientific Achievements—Continued

SThE6 • 5:40 p.m. Invited
Studies of the Stiles-Crawford Effect of the First Kind in Myopic Conditions, *Stacey S. Choi[1,2,3]; [1]Univ. of California at Berkeley, USA, [2]Univ. of Auckland, New Zealand, [3]The New England College of Optometry, USA.* Cone photoreceptor orientations were investigated in myopic eyes having varying dioptric errors in order to enhance our understanding of the implications and effects of retinal traction induced by elongation of axial length in myopic eyes.

FThT • Coherence in Optical Fields—Continued

FThT7 • 5:30 p.m.
The Degree of Coherence of Azimuthally Polarized Laser Modes, *Dean P. Brown[1], Thomas G. Brown[1], Sergei N. Volkov[2], Emil Wolf[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Johns Hopkins Univ., USA.* Coherence properties of azimuthally polarized electromagnetic laser modes are described, as well as experimental verification of the theoretical predictions.

FThT8 • 5:45 p.m.
Identifying Non-Stationarities in Random EM Fields: Are Speckles Really Disturbing? *John Broky, Jeremy Ellis, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We demonstrate that spatial non-stationarities can be identified from one realization of wave interaction with a random medium. Fourth-order correlations between field components at two different spatial points are shown to provide the necessary information.

FThU • Novel Optical Design and Measurement—Continued

FThU7 • 5:30 p.m.
Beam Steering Using a Liquid Crystal Optical Phase Plate with a Variable In-Plane Gradient, *Lei Shi[1], Paul F. McManamon[2], Doug Bryant[1], Bentley Wall[1], Merrill Groom[1], Philip J. Bos[1]; [1]Liquid Crystal Inst., Kent State Univ., USA, [2]AFRL, USA.* We develop a multiple-angle beam steering device with high efficiency using a nematic liquid crystal (LC) optical phase plate, with a large continuous in-plane gradient. High steering efficiency of over 95% is demonstrated.

FThU8 • 5:45 p.m.
Design of a Single Lens as Laser Beam Shaper, *Jyh Rou Sze[1], Yi Hsien Chen[2], Guo Dung John Su[2], Fong Zhi Chen[1]; [1]Instrument Technology Res. Ctr., Taiwan, [2]Graduate Inst. of Photonics and Optoelectronics, Natl. Taiwan Univ., Taiwan.* The design of a single lens to transform a circular symmetric Gaussian beam to a uniform illuminance distribution is proposed. The optimized results show that the optical uniformity is 93.68%.

FThV • Diffractive Micro and Nano Structures for Sensing and Information Processing III—Continued

FThV6 • 5:30 p.m. Invited
Light Manipulation by Use of Inhomogeneous Anisotropic Nanoscale Structures, *Erez Hasman; Technion - Israel Inst. of Technology, Israel.* Polarization-dependent inhomogeneous anisotropic nanoscale structures are presented. We experimentally demonstrate vectorial vortex mode transformation, extraordinary coherent thermal emission from coupled resonant cavities supporting surface waves, plasmonic bandgap structures and observation of spin-based plasmonic effect.

4:30 p.m.–8:00 p.m. Science Educator's Day, *Lilac Ballroom North and South, Rochester Riverside Convention Center*

Highland G

Highland H

FiO

FThW • Silicon and III-V Based Optoelectronics for Optical Interconnects IV—Continued

FThW6 • 5:30 p.m.
Transparent Conducting Oxide (TCO) Electrode Based Organic Electro-Optic (EO) Modulator with Ultra High Switching Voltage-Size Performance, *Fei Yi[1], Fang Ou[1], Boyang Liu[1], Yingyan Huang[1], Seng-Tiong Ho[1], Yiliang Wang[2], Jun Liu[2], Shuai Ding[2], Tobin J. Marks[2], Jingdong Luo[3], Neil Tucker[3], Alex Jen[3]; [1]Dept. of Electrical Engineering and Computer Science, Northwestern Univ., USA, [2]Dept. of Chemistry, Material Res. Ctr., Northwestern Univ., USA, [3]Dept. of Material Science and Engineering, Univ. of Washington, USA.* Initial result of a TCO electrode based organic electro-optic modulator with new device structure which can achieve sub-1v, sub-1cm length is reported. High frequency structure design and simulation for 40GHz operation are discussed.

FThW7 • 5:45 p.m.
Optical Properties of Holographically Generated Twisted Nematic Liquid Crystal Gratings, *Hyunhee Choi, Jeong W. Wu; Ewha Womans Univ., Republic of Korea.* Reflection holographic configuration is adopted to fabricate an electro-optically tunable twisted nematic liquid crystal grating. The diffraction efficiency is related with the twisted angle and cell thickness. The polarization modulation is described by Stokes parameters.

Highland J

LS

LThE • Quantum Information Processing—Continued

LThE6 • 5:30 p.m.
Selecting Quantum Pathways in Nonlinear Spectroscopy by Entangled Photons, *Oleksiy Roslyak, Shaul Mukamel; Univ. of California at Irvine, USA.* We show how two-photon absorption and homodyne detected difference frequency generation conducted with entangled photons can be used to manipulate interference effects and select desired pathways of matter.

LThE7 • 5:45 p.m.
Bloch Sphere Like Construction of SU(3) Hamiltonians, *Sai Vinjanampathy, Ravi Prakash A. Rau; Louisiana State Univ., USA.* The geometric structure of the time evolution operator for a three-level atom is presented via unitary integration. The time dependence of the operator equations is recast in the form of real rotations.

Highland K

Hyatt Grand Ballroom A/B

META

MThD • Plasmonics – Devices and Applications II—Continued

MThD6 • 5:30 p.m. Invited
Metal Coated Nano-Cavities for Plasmonic and Metallic Nano-Lasers, *Martin T. Hill; Eindhoven Univ. of Technology, Netherlands.* The metallic nano-cavities employed in recently demonstrated metallic cavity nano-lasers and their further miniaturization are examined here. An overview will also be given of latest results from devices employing metal-insulator-metal structures with sub-wavelength dimensions.

Hyatt Grand Ballroom E/F

OF&T

OThD • Beams/Jets/Belts/Wheels—Continued

OThD6 • 5:30 p.m. Invited
High-Speed Fabrication of Aspheres and Free-Form Surfaces, *Matthias Pfaff; OptoTech Optikmaschinen GmbH, Germany.* Increased demand on system performance is driving optical designers to use more aspheres and even free-form surfaces in their systems. I introduce a new concept for grinding and polishing of aspheres and free-form surfaces, including wheel polishing and the greatly anticipated active fluid jet polishing process (AFJP).

4:30 p.m.–8:00 p.m. Science Educator's Day, *Lilac Ballroom North and South, Rochester Riverside Convention Center*

Hyatt Grand Ballroom E/F

OF&T

8:00 a.m.–10:00 a.m.
OFA • Polishing and Figuring
Jessica E. DeGroote; Optimax Systems Inc., USA, Presider

OFA1 • 8:00 a.m. Invited
CMP Slurry Design and Developments Related to New Materials, *Rajiv K. Singh; Univ. of Florida, USA.* CMP is recognized by the semiconductor industry as the technology of choice for eliminating local and global topographic variations on flat wafers. An important variable is the slurry composition, which includes chemical additives and abrasive particles. I will discuss a fundamental basis for slurry design to control the CMP output parameters.

OFA2 • 8:30 a.m.
Enabling Optical Performance on Challenging Materials via Chemical Mechanical Polishing, *Kevin J. Moeggenborg, Michael White, Stanley Lesiak, Daniel McMullen, Stan Reggie; Cabot Microelectronics Corp., USA.* Chemical-mechanical polishing (CMP) was developed for semiconductor manufacturing to allow rapid, reproducible finishing of varied materials. This paper discusses the benefits and challenges of CMP for finishing of high-quality optical materials.

OFA3 • 8:45 a.m.
Performance of CMP-Processed Monolithic Aluminum Mirrors, *Kevin J. Moeggenborg, Nevin Naguib, Carlos Barros, Stanley Lesiak, Stan Reggie; Cabot Microelectronics Corp., USA.* CMP processing of bare aluminum alloys has been shown to yield low surface roughness. The translation of roughness into mirror performance is compared through BRDF and veiling glare measurements for various aluminum processing techniques.

OFA4 • 9:00 a.m.
Contributions of Kinematics and Viscoelastic Lap Deformation on the Surface Figure during Full Aperture Polishing of Fused Silica, *Tayyab Suratwala, R. Steele, M. Feit; Lawrence Livermore Natl. Lab, USA.* The effects of kinematics and lap viscoelastic properties have been quantitatively correlated to a revised Preston model by monitoring the surface figure and material removal rate during fused silica polishing (ceria on pad or pitch).

OFA5 • 9:15 a.m.
New Metrics for Polishing Pitch, *Brigid Mullany, Elizabeth Corcoran; Univ. of North Carolina at Charlotte, USA.* Polishing pitch is evaluated in the frequency domain. Both the testing technique and results are presented. Frequency domain testing results can be correlated to indentation tests. The shop floor value of the test is discussed.

OFA6 • 9:30 a.m. Invited
Analysis of Shape, Pressures and Movements of Tools for an Accurate Control of Wearing in Classical Polishing, *Alberto Cordero-Dávila; Benemérita Univ. Autónoma de Puebla, Mexico.* Wear profiles obtained with tools that oscillate in one direction and displace in another perpendicular simultaneously, are classified and analyzed. To do numerical calculations, we used a generalized equation to describe inner points of tools.

10:00 a.m.–10:30 a.m. Coffee Break, *Hyatt Grand Ballroom D*

10:30 a.m.–12:30 p.m.
OFB • Optical Systems
Jannick Rolland; Univ. of Central Florida, USA, Presider

OFB1 • 10:30 a.m. Invited
"Design to Manufacture" from the Perspective of Optical Design and Fabrication, *Alexander Epple[1], Hexin Wang[2]; [1]Carl Zeiss SMT AG, Germany, [2]Carl Zeiss AG, Germany.* Insensitive optical designs are of interest because they facilitate assembly and reduce system costs. We will show how sensitivities can be incorporated in optical design and present design means to reduce sensitivities.

OFB2 • 11:00 a.m. Invited
Optical Engineering of the OMEGA EP System for Petawatt Operation, *Jack Kelly, R. Jungquist, L. J. Waxer, M. J. Guardalben, B. E. Kruschwitz, J. Qiao, I. A. Begishev, J. Bromage, C. Dorrer, J. L. Edwards, L. Folnsbee, S. D. Jacobs, T. J. Kessler, R. W. Kidder, S. J. Loucks, J. R. Marciante, D. N. Maywar, R. L. McCrory, D. D. Meyerhofer, S. F. B. Morse, A. V. Okishev, J. B. Oliver, G. Pien, A. L. Rigatti, W. Schmid, M. J. Shoup III, C. Stoeckl, K. A. Thorp, J. D. Zuegel; Lab for Laser Energetics, Univ. of Rochester, USA.* OMEGA EP (Extended Performance) is a petawatt-class addition to the existing 30-kJ, 60-beam OMEGA Laser Facility at the University of Rochester. The optical engineering involved in subsystems of the OMEGA EP Laser is described.

OFB3 • 11:30 a.m. Invited
Title to Be Announced, *Eric G. Johnson; Univ. of North Carolina at Charlotte, USA.* Abstract not available.

NOTES

FiO/LS/META/OF&T Key to Authors and Presiders

(Bold denotes presider or presenting author. Presentation numbers are listed in alphabetical order.)

ADDENDUM

What's Hot in Optics Today

Updated program:

- **Frontiers in Biomedical Optics: Nanometer-Scale Optical Imaging inside Cells**, *Chris Schaffer; Cornell Univ., USA*
- **What's Hot in Vision and Color: Pwning Normal Vision**, *Daphne Bavelier; Ctr. for Visual Science, Univ. of Rochester, USA*
- **What's Hot in Photonics and Opto-Electronics**, *Juerg Leuthold; Univ. of Karlsruhe, Germany*
- **What's Hot in Fabrication, Design and Instrumentation: The Optics in Energy and Imaging Systems**, *R. John Koshel; Photon Engineering LLC and Univ. of Arizona, USA*
- **What's Hot in Optical Interaction Science**, *Martin Richardson; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA*

OSA Division Meetings

The Institute of Optics at the University of Rochester is pleased to host a meeting of the **Fabrication, Design, and Instrumentation Division** of the OSA on Sunday. Activities include an overview of the division and two short presentations along with tours of the teaching laboratories at the Institute, featuring a glimpse into the Robert E. Hopkins Center for Optical Design and Engineering, an educational initiative aimed at bringing a new level of design experience to students at The Institute of Optics.

Schedule:

7:00 p.m.–7:30 p.m.: Transportation from the Convention Center (The bus will depart outside the North Promenade of the Rochester Riverside Convention Center on Main Street at 7:00 p.m.)

7:30 p.m.–8:15 p.m.: Program

- **Overview of the Fabrication, Design, and Instrumentation Division,** *John Koshel; Photon Engineering LLC and Univ. of Arizona, USA*
- **Optical Design and Engineering at the Institute of Optics**, *Thomas G. Brown; Univ. of Rochester, USA*
- **The Highs and Lows of Student Design Projects,** *Prof. Julie Bentley; Corning Tropel and Univ. of Rochester, USA*

8:15 p.m.–9:00 p.m.: Laboratory Tours

9:00 p.m.–9:30 p.m.: Return Transportation to the Convention Center

FiO Photonics Subcommittee

Thanks to **Mihaela Dinu** *(Bell Labs, Alcatel-Lucent, USA)* and **Stanley Pau** *(Univ. of Arizona, USA)* for their work on the FiO Photonics Subcommittee!

Presentation Updates and Additions

SMD3 is now **How the Maser and Laser Came to Be**, *Anthony E. Siegman; Stanford Univ., USA.* I will present an illustrated tour of some of the notable events and individuals along the timeline from Einstein in 1916 to Townes in 1951, Schawlow and Townes in 1958, Shawanga Lodge in 1959, Maiman in 1960, and the first few of the incredibly productive years that followed.

STuA3 is now **Advancing Science with the Hubble Space Telescope,** *Ken Sembach; Space Telescope Science Institute, USA*. This talk will review past science highlights of the Hubble Space Telescope and describe planned improvements that will significantly enhance the science return of the observatory.

FTuQ3 has become **FMH7** and will be presented Monday at 5:45 p.m.

FTuY1 is now **Femtosecond Laser Pulse Shaping for Molecular Imaging in Biological Tissue,** *Martin C. Fischer[1], Henry C. Liu[2], Dan Fu[2], Prathyush Semineni[1], Thomas Matthews[1], Ivan Piletic[1], Warren S. Warren[1]; [1]Duke Univ., USA, [2]Princeton Univ., USA.* Recently developed ultrafast laser pulse shaping technology allows high-sensitivity measurements of nonlinear optical effects in highly scattering media. We present applications of these techniques to extract intrinsic structural, metabolic and functional contrast in biological tissue.

FWJ2 is now **Receptor Targeted Mono-Molecular Imaging Agents (MOMIAs) for Optical and Nuclear Imaging**, *W. Barry Edwards, Washington Univ. in St. Louis, USA.* Optical imaging is an emerging *in vivo* imaging modality that could act synergistically when paired with nuclear imaging methods such as SPECT or PET. The synthesis, *in vitro* and *in vivo* evaluation of MOMIAs will be presented.

Updated author block for **FThB8**: *Xusheng Zhou[1], Jifeng Zu[1], Yalong Gu[2]; [1]Shanghai Inst. of Optics and Fine Mechanics, China, [2]Univ. of North Carolina at Charlotte, USA*. Yalong Gu will present.

LWA1 is now **The Near-Field Infrared Experiment (NFIRE) Satellite Program Laser Communication Terminal (LCT): International Cooperation for Joint LCT Experiments,** *Renny A. Fields; Aerospace Corp, USA.*

LWA3 is now **"Astro-comb": A Femtosecond Laser Frequency Comb for Precision Astrophysical Spectroscopy**, *Chih-Hao Li; Harvard Univ. and Harvard-Smithsonian Center for Astrophysics, USA*. We report the successful test of a 40-GHz comb generated from a 1-GHz source combined with a Fabry-Perot cavity, without compromise on long-term stability, reproducibility and resolution. Application of this novel technique should allow more than a 10-fold improvement in Doppler-shift sensitivity.

Updated author block for **LWI3:** *Te-yuan Chung[1], Tanant Waritanant[2], Sakoolkan Boonruang[3]; [1]Dept. of Optics and Photonics, Natl. Central Univ., Taiwan, [2]International School of Engineering, Chulalongkorn University, Thailand, [3]Natl. Electronics and Computer Technology Ctr. (NECTEC), Thailand.*

OWA5 is now **"Just-Good-Enough" Optical Fabrication**, *James E. Harvey[1], Joshua Lentz[1], Joseph B. Houston, Jr.[2]; [1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Houston Res. Associates, USA.* The characterization of figure, finish, and mid-spatial frequency optical fabrication errors with an all-inclusive surface PSD leaves us poised to implement a "Just-Good-Enough" optical fabrication philosophy/strategy modeled after the successful "Just-in-Time" manufacturing of decades ago.

JWD3 is now **Extended Optimization Method for Non-Image Optical Design**, *Yi-Chin Fang, Yih-Fong Tzeng; Inst. of Engineering, Natl. Kaohsiung First Univ. of Science and Technology, Taiwan.* This research proposes a new extended optimization method for non-image optics, introducing integration of the Taguchi method and principal component analysis in order to optimize the multiple quality characteristics of non-image optics.

The presentation **Non-Destructive Evaluation of Diamond Tool Materials for Optical Manufacturing Applications,** *Yuansun Wu, Paul Funkenbusch; Dept. of Mechanical Engineering, Univ. of Rochester, USA*, which was JWD3, is now **OThC1** and will be presented orally on Thursday at 1:30 p.m.

OWD1 (was OFB3) is now **Device Programs at the National Science Foundation**, *Eric G. Johnson; Natl. Science Foundation, USA.* In this talk, an overview of the Division of Electrical, Communications and Cyber Systems will be provided and specific programs will be highlighted as examples of NSF's investments in the area of Photonics. Current and emerging areas will be addressed.

OWD7 (Wednesday, 5:45 p.m.–6:00 p.m.): **Parametric Model for Mirror Deflection with Axial Support**, *Won Hyun Park[1], Dae Wook Kim[1], James H. Burge[1], Sug-Whan Kim[2]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]Space Optics Lab, Yonsei Univ., Republic of Korea.* The parametric model based on the four empirical equations was derived from the FEA simulations. We can effectively estimate the surface RMS ("total" and "after power removed") within 8% accuracy using the parametric model.

JWD45 (Wednesday 6:00 p.m.–7:30 p.m.): **Lens Design and Optimization via Genetic Algorism**, *Yi-Chin Fang[1], Chen-Mu Tsai[2]; [1]Natl. Kaohsiung First Univ. of Science and Technology, Taiwan, [2]Kun Shan Univ., Taiwan.* We propose an optimization method with genetic algorism (GA) applied to various optical designs. GA is employed in optimization work to eliminate specific aberrations in order to meet the demand of modern optical design.

Updated title and author block for **OThB1**: **Pseudo-Random Tool Paths for CNC Sub-Aperture Polishing and Other Applications**, *D. D. Walker[1,2], C. Dunn[1,3]; [1] Zeeko Ltd., UK, [2]University College London, UK, [3]Zeeko Technologies LLC, USA.*

ADDENDUM

OThC7 (Thursday, 1:45 p.m–2:00 p.m.).: **Ion Beam Figuring (IBF) Solutions for the Correction of Surface Errors of Small High Performance Optics,** *Thomas Franz[1], Thomas Hänsel[2]; [1]NTG Neue Technologien GmbH & Co. KG, Germany, [2]Leibniz-Inst. für Oberfl ächenmodifi zierung e.V., Germany.* We describe ultra precise figure error correction of small optics down to the sub-nm RMS level as well as for a time-saving figure error correction with nm-RMS accuracy by using the new IBF-100 plant.

OFB3 (Friday, 11:30 a.m.–11:45 p.m.) is now **Measurement of Damage Threshold for Metallic Gratings under Intense Laser Pulse Irradiation**, *Suman Bagchi, Jun Zhang, Sudeep Banerjee, Vidya Ramanathan, Nate C.-Smith, Kevin Brown, Donald Umstadter; Univ. of Nebraska-Lincoln, USA.* The resistance to the damage of metallic diffraction gratings subject to intense laser pulses is reported. We find that the substrate material plays a crucial role in determining the damage resistance of the gratings.

Presenter Updates

- **FTuB1** will be presented by *Dirk Englund; Edward L. Ginzton Lab, Stanford Univ., USA.*
- **FThP6** will be presented by *Matthew Tomes; Univ. of Michigan at Ann Arbor, USA.*
- **JWD7** will be presented by *Hubert M. Martin; Univ. of Arizona, USA.*
- **MThD4** will be presented by *Philippe Guyot-Sionnest; James Franck Inst., Univ. of Chicago, USA.*

Symposium on Undergraduate Research

Please see the six-page program in your registration bag for updates.

Withdrawn Presentations

FMH1	LTuA3
FMN5	LTuA5
FTuF6	LThE6
FTuL3	JSuA24
FTuP5	JWA3
FTuX4	JWA18
FWI3	JWA61
FWL4	JWA67
FThB4	JWA68
FThP4	

Presider Updates

- FTuE, *Urs Utzinger; Univ. of Arizona, USA.*
- FTuT, *Karl Koch; Corning Inc., USA.*
- FWU, *Valeriy Yashchuk; Lawrence Berkeley Natl. Lab, USA.*
- FThP, *Tal Carmon; Univ. of Michigan at Anne Arbor, USA.*
- LThB, *Lewis Rothberg; Univ. of Rochester, USA.*
- MTuD, *David A. Powell; Australian Natl. Univ., Australia.*
- MWB, *Stefan Linden; Univ. Karlsruhe, Germany.*
- MWC, *Jon Schuller; Stanford Univ., USA.*
- OWB, *Chris Evans; Zygo Corp., USA.*

New Exhibitors

New Focus
Booth 500

OSA Corporate Member

2584 Junction Ave.
San Jose, CA 95134
Phone: +1.866.NUFOCUS
Fax: 408.980.8883
E-mail: contact@newfocus.com
URL: www.newfocus.com

New Focus is a brand of Bookham, Inc. New Focus products encompass all the key components you need for your optical tabletops. Product lines include tunable lasers, motion control (Picomotor™ actuators), optomechanics and opto-electronics. The company also designs and develops OEM solutions incorporating its product technologies specifically to meet the OEM's needs. Featured products: Servo-controller; Fiber-coupled, Single-wavelength laser; USB-compatible PSDs and Quad cells; 2" motorized Flipper™ mount; GuideStar Universal Beam-Stabilization controller.

Note: The OSA Corporate Member designation was not included on the original listing for New Focus.

Princeton Instruments
Table 112

3660 Quakerbridge Rd.
Trenton, NJ 08619
Phone: 609.587.9797
Fax: 609.587.1970
E-mail: ppranzo@princetoninstruments.com
URL: www.princetoninstruments.com

With 30+ years of providing flexible and efficient solutions, Princeton Instruments is the proven choice for high-performance CCD cameras, spectroscopy systems and optical coatings for research and industrial applications. Acton Series spectrographs provide limitless flexibility and performance in numerous applications. CCD cameras feature the PIXIS, with a variety of sensors for imaging and spectroscopic measurements, thermo-electric cooling and lifetime vacuum guarantee for the CCD chamber. Stop by our exhibit to discuss your specific application challenges.

Tecport Optics
Table 316

6901 TPC Dr., Suite 450
Orlando, FL 32822
Phone: 407.855.1212
Fax: 407.855.1213
E-mail: sales@tecportoptics.com
URL: www.tecportoptics.com

Thin Film Deposition Systems. Manufacturer of Vacuum Coating Systems for Precision Optics. Ion Assisted Deposition, Plasma Assisted Deposition, Ion Beam Sputtering, Magnetron Sputtering System. An industry leader in innovation, quality, reliability, software and service. Sophisticated yet user friendly systems employ leading edge technology such as high density plasma source. Systems are custom built and pre-configured for your process and your volume. Installed systems are production-ready within one week. Onsite service and annual service contracts available. Top Quality + Extremely Competitive Pricing.

Volpi USA
Table 114

OSA Corporate Member

5 Commerce Way
Auburn, NY 13021
Phone: 315.255.1737 ext.36
Fax: 315.255.1202
E-mail: lbruno@volpiusa.com
URL: www.volpiusa.com

Specializes in the design, prototyping, and manufacture of custom illumination / sensing solutions utilizing fiber optic and LED technologies. Complete design engineering capability for multi-leg fiber optic assemblies, illumination sources and electro-optic subassemblies. Excel in markets such as medical, life-sciences, DOD, machine-vision, colorimetry, microscopy and aerospace.

FiO Management thanks the following corporate sponsors for their generous support:

ColdQuanta · CORNING · OSA Corporate Associates · JK Consulting Thin Film Design & Applications · OPTIKOS · Swamp Optics · New York Photonics Photonics Rochester · SYDOR OPTICS · THORLABS · TOPTICA PHOTONICS A Passion for Precision.

•Wednesday, October 22, 2008•

Highland A/B, Rochester Riverside Convention Center
7:00 p.m.–8:36 p.m.
PDPA • FiO Postdeadline Papers I
Taco D. Visser; Free Univ., Netherlands, Presider

PDPA1 • 7:00 p.m.
Adaptive Optics with an LCOS Spatial Light Modulator and Its Application to Retinal Imaging, *Tomohiro Shirai, Kohei Takeno, Hidenobu Arimoto, Hiromitsu Furukawa; AIST, Japan.* We have constructed an adaptive optics system with an LCOS (liquid crystal on silicon) spatial light modulator and applied it to retinal imaging. Closed-loop operation has been successfully achieved to obtain a clear retinal image.

PDPA2 • 7:12 p.m.
Phase Shift Formulas for Waveplates in Oblique Incidence, *Francisco E. Veiras[1], Liliana I. Perez[1,2]; [1]Grupo de Optica y Visión, Univ. de Buenos Aires, Argentina, [2]Consejo Nacional de Investigaciones Cientificas y Técnicas, Argentina.* An explicit expression for phase difference introduced by ideal waveplates is obtained based on Fermat's principle. The results obtained differ from the ones in literature and turn out to be useful for their design.

PDPA3 • 7:24 p.m.
The Primary Aberration Coefficients of Cross-Cylindrical Anamorphic Optical Systems, *Sheng Yuan, Jose Sasian; College of Optical Sciences, Univ. of Arizona, USA.* A method of calculating the primary aberration coefficients for cross-cylindrical anamorphic systems has been found. The monochromatic primary aberration coefficients for this anamorphic system have been developed, in a form parallel to the Seidel aberrations.

PDPA4 • 7:36 p.m.
Polarimeter-Based Optical Spectrum Analyzer, *X. Steve Yao[1], Bo Zhang[1,2], Xiaojun Chen[1], Alan E. Willner[2]; [1]General Photonics Corp., USA, [2]Univ. of Southern California, USA.* We propose and experimentally demonstrate a novel polarimeter-based optical spectrum analyzer. The high-speed and high-resolution nature enables measurement of fast swept sources beyond 100-KHz. A unique 3-D display shows the spectra of a fast-scanning source.

PDPA5 • 7:48 p.m.
302 W Diode-Pumped Cryogenic Yb:YAG Ceramics Zigzag Slab Laser with 60% Conversion Efficiency, *Toshiyuki Kawashima, Tadashi Ikegawa, Hirofumi Miyajima, Hirofumi Kan; Hamamatsu Photonics K.K., Japan.* A novel high power laser architecture has been demonstrated using a cryogenic Yb:YAG ceramics slab in zigzag optical geometry. The laser oscillator has generated 302-W CW output power with optical-to-optical conversion efficiency of 60.6%.

PDPA6 • 8:00 p.m.
1.04-J CPA Output from Diode-Pumped Nd:glass Zig-Zag Slab Laser for 30 TW Few-Cycle NOPA Laser System, *Takashi Kurita[1,2], Keiichi Sueda[2,3], Takashi Sekine[1,2], Toshiyuki Kawashima[1,2], Junji Kawanaka[2,3], Noriaki Miyanaga[2,3]; [1]Hamamatsu Photonics K.K., Japan, [2]Japan Science and Technology Agency, CREST, Japan, [3]Inst. of Laser Engineering, Osaka Univ., Japan.* A diode-pumped Nd:glass chirped pulse amplification system has been designed for pumping OPCPA. 1.04-J pulse energy in 4.1-nm spectral width at 1Hz has been obtained. The potential over 2-TW output is addressed.

PDPA7 • 8:12 p.m.
Stereometamaterials, *Na Liu[1], Hui Liu[2], Harald Giessen[1]; [1]Univ. of Stuttgart, Germany, [2]Nanjing Univ., China.* We introduce a novel concept to nano-photonics, namely stereometamaterials. Specifically, we study stacked twisted split-ring resonator metamaterials and demonstrate how their optical properties depend on the particular arrangement of the individual constitutents.

PDPA8 • 8:24 p.m.
Dynamic Polarization-Holographic Diffraction Gratings, *George Kakauridze, Barbara Kilosanidze, Irakli Chaganava; Inst. of Cybernetics, Georgian Acad. of Sciences, Georgia.* The investigation of recording of dynamic polarization-holographic diffraction gratings is presented. Dynamic polarization-sensitive materials with conformation-orientation mechanism of anisotropy induction were used. The possibility of switching of informative beams (500-1550 nm) is shown.

•Wednesday, October 22, 2008•

Highland D/E, Rochester Riverside Convention Center
7:00 p.m.–8:24 p.m.
PDPB • FiO Postdeadline Papers II
Andrew J. Berger; Inst. of Optics, Univ. of Rochester, USA, Presider

PDPB1 • 7:00 p.m.
Total Internal Reflection Holographic Microscopy, *William M. Ash III, Myung K. Kim; Univ. of South Florida, USA.* Evanescent wave surface profiling is incorporated with digital holography into a new technique termed Total Internal Reflection Holographic Microscopy. Quantitative cellular images are presented. Applications include measurement of membranes and motility sans fluorophores.

PDPB2 • 7:12 p.m.
Medical Endoscopes for Multiphoton Microscopy, *Hyungsik Lim, Chris Xu, Watt W. Webb; Cornell Univ., USA.* We present a new design of medical endoscope, which is ideal for multiphoton microscopy of human tissue *in vivo*. We discuss the properties of our reflective objective lens and the advantages in deep tissue imaging.

PDPB3 • 7:24 p.m.
Carbon Nanotubes in an Optical Trap, *Gopika Ramanandan[1], Aditya K. Dharmadhikari[2], Hema Ramachandran[3], Jayasree A. Dharmadhikari[2], Deepak Mathur[2]; [1]Ctr. of Excellence in Lasers and Optoelectronic Sciences, Cochin Univ. of Science and Technology, India, [2]Tata Inst. of Fundamental Res., India, [3]Raman Res. Inst., India.* Study of carbon nanotubes (CNTs) in a single beam optical trap (1064 nm) was done. In the optical trap, repulsion of the CNTS from the laser radiation, bubble formation, broad band emission, etc. were observed.

PDPB4 • 7:36 p.m.
Optical Trapping Near Resonance, *Brooke Hester[1], Kristian Helmerson[1], Carly Levin[2], Naomi Halas[2]; [1]NIST, USA, [2]Rice Univ., USA.* We explore the enhancement of optical forces associated with optical trapping near resonance absorption. Gold nanoshells, particles with a tunable resonance, are manipulated and studied using a single-focus optical trap with tunable wavelength.

PDPB5 • 7:48 p.m.
GHz Micron-Scale Electro-Optic Modulator in Deposited Polysilicon, *Kyle Preston, Sasikanth Manipatruni, Carl B. Poitras, Michal Lipson; Cornell Univ., USA.* We demonstrate 2.5 Gbps electro-optic modulation using microring resonators fabricated in a deposited thin film of polycrystalline silicon. This device is a critical building block for the 3-D integration of high-performance integrated optical data networks.

PDPB6 • 8:00 p.m.
Low Loss Nanoimprinted Polymer Waveguides, *Ting Han, Steve Madden, Matthew Zhang, Barry Luther-Davies, Robbie Charters; Australian Natl. Univ., Australia.* We demonstrate the fabrication of small-core high-index contrast Polysiloxane waveguides using Ultraviolet Nanoimprint Lithography for the first time, and report zero process induced excess loss at 1550nm in the finished devices.

PDPB7 • 8:12 p.m.
Functional Composite Magnetic Microparticles Based on Silicon Dioxide Microspheres, *Z. M. Tomova, I. V. Soboleva, A. A. Fedyanin; M.V. Lomonosov Moscow State Univ., Russian Federation.* The fabrication technique for magnetic-shell silica microspheres is developed. 20 nm-sized magnetite nanoparticles are deposited on the silica microspheres covered with polyelectrolyte. These microparticles are prospective for using in nanophotonic devices such as magnetophotonic crystals.

•Wednesday, October 22, 2008•

Highland G/F, Rochester Riverside Convention Center
7:00 p.m.–8:24 p.m.
PDPC • FiO Postdeadline Papers III
Karl Koch; Corning, Inc., USA, Presider

PDPC1 • 7:00 p.m.
Dynamic Range Compression Two-Beam Coupling Correlation with Enhanced Scattering Centers SAR Images, *Bahareh Haji-Saeed[1], John Kierstead[1], Charles L. Woods[2], Jed Khoury[2]; [1]Solid State Scientific Corp., USA, [2]AFRL, USA.* Here a dynamic range compression two-beam coupling joint transform correlator for detecting synthetic aperture radar targets is introduced. The input consists of an enhanced-scattering-center of the input and a linearly synthesized enhanced scattering center template.

PDPC2 • 7:12 p.m.
Design and Fabrication for the Hybrid Diffractive-Refractive Optical Lens Used in High Density Data Storage, *Samuel I En Lin; Natl. Formosa Univ., Taiwan.* By using a hybrid diffractive-refractive objective lens with extended depth of focus, we have achieved a reading beam size ~2μm and effective focal length ~1mm. The spherical aberration is less than 4 μm.

PDPC3 • 7:24 p.m.
Photonic MEMS Vibrating at 11 GHz, *Matthew Tomes, Tal Carmon; Univ. of Michigan, USA.* We experimentally observe an opto-mechanical whispering gallery (WG) resonator vibrating at 11 GHz. We use optical electrostriction to drive mechanical vibration at frequencies which scale inversely with optical wavelength, irrespective of device size.

PDPC4 • 7:36 p.m.
Band-Gap Engineering and Light Manipulation with Reconfigurable Ionic-Type Photonic Lattices, *Peng Zhang[1,2,3], Cibo Lou[2], Sheng Liu[1], Fajun Xiao[1], Jianlin Zhao[1], Jingjun Xu[2], Zhigang Chen[2,3]; [1]School of Science, Northwestern Polytechnical Univ., China, [2]TEDA Applied Physics School, Nankai Univ., China, [3]Dept. of Physics and Astronomy, San Francisco State Univ., USA.* We report on the first demonstration of ionic-type photonic lattices, with lattice potentials resembling that of ionic crystals in solids. Such optically induced reconfigurable non-Bravais lattices enable the observations of band-gap engineering and light manipulation.

PDPC5 • 7:48 p.m.
Reconstruction of Short Pulses via Transverse Second-Harmonic Generation in Disordered Media, *Dragomir N. Neshev[1], Andrey A. Sukhorukov[1], David Dumay[1], Sangwoo Ha[1], Vito Roppo[2], Jose Trull[2], Crina Cojocaru[2], Solomon Saltiel[1,3], Kestutis Staliunas[2], Ramon Vilaseca[2], Wieslaw Krolikowski[1], Yuri S. Kivshar[1]; [1]Australian Natl. Univ., Australia, [2]Univ. Politécnica de Catalunya, Spain, [3]Univ. of Sofia, Bulgaria.* We study experimentally second-harmonic generation by two noncollinear beams in disordered ferroelectric crystals and demonstrate implementation of this process in a novel approach for fs-pulse reconstruction, enabling full retrieval of pulse profile, phase, and front-tilt.

PDPC6 • 8:00 p.m.
Extraction of Correlated 2-Photons with Near Unit Efficiency, *Alexander Ling[1,2], Jun Chen[1,2], Jingyun Fan[1,2], Alan Migdall[1,2]; [1]Optical Technology Div., NIST, USA, [2]Joint Quantum Inst., Univ. of Maryland, USA.* We demonstrate the extraction of high purity correlated 2-photons ($g^2(0)$=0.0055) from a microstructure-fiber source with near unit efficiency. Such a source may help many quantum information applications including loop-hole free Bell-type tests.

PDPC7 • 8:12 p.m.
Biexciton Lineshapes in Semiconductor QWs are Revealed by Cross-Polarized 2D Fourier-Transform Spectroscopy, *Alan D. Bristow, Denis Karaiskaj, Xingcan Dai, Steven T. Cundiff; JILA, Univ. of Colorado and NIST, USA.* Real part of cross-polarized 2-D Fourier-transform spectra of GaAs QWs show biexciton lineshapes without excitonic many-body effects dominating the spectra. This is the first observation, enabled by an all-optical method for "phasing" the 2-DFT spectra.

Key to Authors and Presiders

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