LS

FiO

8:00 a.m.–10:00 a.m.
LSThA • X-Ray Imaging I
Aymeric Robert; SLAC Natl. Accelerator Lab, Stanford Univ., USA, Presider

LSThA1 • 8:00 a.m. Invited

What Kind of Data Do We Expect in Single-Molecule Imaging Experiments and How Do We Process It? *Veit Elser, Duane Ne-Te Loh; Cornell Univ., USA.* The proposed experiments to image single molecules with X-ray free-electron lasers present an unprecedented challenge in data processing. We describe for non-experts the computational tasks and some recent progress in solving them.

LSThA2 • 8:30 a.m. Invited

The Coherent X-Ray Imaging Instrument at LCLS, *Sébastien Boutet; SLAC Natl. Accelerator Lab, Stanford Univ., USA.* The LCLS will be the first hard X-ray free-electron laser in the world. I will describe the capabilities and the scientific program of the Coherent X-Ray Imaging instrument utilizing the unique source properties of LCLS.

8:00 a.m.–10:00 a.m.
FThA • Nanofocusing Optics I
Ian McNulty; Argonne Natl. Lab, USA, Presider

FThA1 • 8:00 a.m. Tutorial

Introduction to Diffraction Limited X-Ray Optics, *David Attwood; Lawrence Berkeley Natl. Lab, USA.* We discuss the ability of X-ray optics to form images at or near the diffraction limit. These include diffractive optics and zone plates for soft X-rays, and reflective optics for the extreme ultraviolet.

David Attwood received his Ph.D. in Applied Physics from New York University in 1972. He has been a Professor in Residence at University of California at Berkeley since 1989. He was co-founder of the Applied Science and Technology Ph.D. program and serves on its Executive Committee. His research interests center on the use of short wavelength electromagnetic radiation, soft X-rays and extreme ultraviolet radiation in the 1-30nm range. Applications of particular interest include element specific soft X-ray microscopy and EUV lithography. He and his students are also active in the use of novel Fourier optics, image contrast techniques, and the development and use of coherent sources at these short wavelengths. At the contiguous Lawrence Berkeley National Laboratory, he is founding Director of the Center for X-Ray Optics (CXRO), and was first (1985–1988) Scientific Director of the Advanced Light Source (ALS). He is a Fellow Member of the American Physical Society and The Optical Society. He is author of *Soft X-Rays and Extreme Ultraviolet Radiation: Principles and Applications* (Cambridge University Press, 2000). His lectures are regularly broadcast live over the Internet and electronically archived, at youtube.com and at www.coe.berkeley.edu/AST/sxreuv and www.coe.berkeley.edu/AST/srms.

FThA2 • 8:45 a.m.

Sculpting Nanostructures with Light, *Rajesh Menon[1,2]; [1]MIT, USA, [2]LumArray, Inc., USA.* We show that it is possible to pattern nanostructures with long-wavelength photons, effectively breaking the far-field diffraction barrier. We also present approaches to single-molecule spatial resolution with light in 3 dimensions.

8:00 a.m.–10:00 a.m.
FThB • Diffractive and Holographic Optics III
Yunlong Sheng; Univ. Laval, Canada, Presider

FThB1 • 8:00 a.m.

Bubble Size Measurement in High-Density Air-Water Mixture Flows with Wide Size Distributions Using Digital Holography, *Lei Tian[1], Nick Loomis[1], Jose A. Dominguez-Caballero[1], George Barbastathis[1,2]; [1]MIT, USA, [2]Singapore-MIT Alliance for Res. and Technology (SMART) Ctr., Singapore.* We present experimental results of using in-line digital holography to measure bubble sizes in high-density air-water mixture flows with a wide size distribution.

FThB2 • 8:15 a.m.

Confocal Fluorescence Microscopy Using a Microfabricated Zone Plate, *Ethan F. Schonbrun, Kenneth B. Crozier; Harvard Univ., USA.* We demonstrate a compact confocal fluorescence microscope using a microfabricated zone plate. Using a single fluorescent sphere, we measure the transverse and axial resolution to be below 1.6 and 2.2 micron, respectively.

FThB3 • 8:30 a.m. Invited

Live Cell Imaging with Field-Based 3-D Microscopy, *Michael Feld, Wonshik Choi; MIT, USA.* We report field-based 3-D microscopy for high resolution 3-D mapping of refractive index in live cells and tissues. The technique features simultaneous detection of phase and amplitude of light at multiple incident angles of illumination.

8:00 a.m.–10:00 a.m.
FThC • Micro-Cavity Devices I
Presider to Be Announced

FThC1 • 8:00 a.m. Invited

Crystalline Whispering Gallery Mode Resonators: Recent Advances and Future Trends, *Lute Maleki, Andrey B. Matsko, Anatoliy A. Savchenkov, Vladimir S. Ilchenko, David Seidel; OEwaves, Inc., USA.* We review a variety of optical phenomena recently observed in ultra-high-Q crystalline whispering gallery mode resonators, and speculate on the future trends in the development of the field. Practical applications of these resonators are discussed.

FThC2 • 8:30 a.m.

Thermo-Optical Tuning of Whispering Gallery Modes in Microspheres around the ^{85}Rb Cooling Transition, *Laura Russell[1,2], Sile Nic Chormaic[1,2], Jonathan M. Ward[2,3], Michael J. Morrissey[2,3]; [1]Univ. College Cork, Ireland, [2]Tyndall Natl. Inst., Ireland, [3]Cork Inst. of Technology, Ireland.* We present a method for tuning whispering gallery modes in microspheres and demonstrate tuning to the cooling transition of ^{85}Rb. The tuning method can be used in UHV and is of interest for cavity-QED experiments.

FThC3 • 8:45 a.m.

Spectral Characteristics of Coupled Silica Disc Micro Resonators, *Carsten Schmidt[1], Arkadi Chipouline[1], Thomas Käsebier[1], Lev Deych[2], Ernst-Bernhard Kley[1], Andreas Tünnermann[1,3], Thomas Pertsch[1]; [1]Friedrich-Schiller-Univ. Jena, Germany, [2]Queens College, CUNY, USA, [3]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* Coupled optical microresonators are of great interest due to their potential applications and unique optical characteristics. For coupled disc microresonators the results of rigorous universal theoretical model are in good agreement with experimental data.

For Fall Congress presentations on Thursday, see pages 132-136.

California — FiO

8:00 a.m.–10:00 a.m.
FThD • High-Power Fiber Lasers I
Presider to Be Announced

FThD1 • 8:00 a.m. Invited

High Power CW and Pulsed Fiber Lasers with Double Cladding Fiber Made in China, *Qihong Lou, Jun Zhou, Bin He, Songtao Du; Shanghai Inst. of Optics and Fine Mechanics, China.* 1640W CW high power output and 150W high repetition rate pulsed output are obtained with China-made multimode core fibers. The laser structure and pulse amplifier technology are given in detail.

FThD2 • 8:30 a.m. Invited

100-kW Coherently Combined Nd:YAG MOPA Laser Array, *Stuart J. McNaught, Charles P. Asman, Hagop Injeyan, Andrew Jankevics, Adam M. F. Johnson, Gina C. Jones, Hiroshi Komine, Jason Machan, Jay Marmo, Michael McClellan, Randy Simpson, Jeff Sollee, Marcy M. Valley, Mark Weber, S. Benjamin Weiss; Northrop Grumman Aerospace Systems, USA.* We have demonstrated the world's first 100-kW solid-state laser system with good beam quality. Seven 15-kW MOPA (master oscillator-power amplifier) laser chains are coherently combined to achieve a single output beam.

Glen Ellen — FiO

8:00 a.m.–10:00 a.m.
FThE • Integrated Optics
Amy C. Sullivan; Univ. of Colorado, USA, Presider

FThE1 • 8:00 a.m.

Low Insertion Loss SOI Microring Resonator Integrated with Nano-Taper Couplers, *Minhao Pu[1], Lars Hagedorn Frandsen[2], Haiyan Ou[1], Kresten Yvind[1], Jørn Märcher Hvam[1]; [1]Technical Univ. of Denmark, Denmark, [2]Koheras A/S, Denmark.* We demonstrate a microring resonator working at TM mode integrated with nano-taper couplers with 3.6dB total insertion loss. The measured insertion loss of the nano-taper coupler was only 1.3dB for TM mode.

FThE2 • 8:15 a.m.

Achieving Uniform Chromatic Dispersion over a Wide Wavelength Range in Highly Nonlinear Slot Waveguides, *Lin Zhang[1], Yang Yue[1], Yinying Xiao-Li[1], Jian Wang[1], Raymond G. Beausoleil[2], Alan E. Willner[1]; [1]Univ. of Southern California, USA, [2]HP Labs, USA.* We show dispersion-flattened silicon slot waveguides with high nonlinearity for on-chip signal-processing applications, which exhibits a flat near-zero dispersion within ±0.12ps/nm/m over a 302-nm wavelength range with nonlinear coefficient γ up to 4300/m/W at 1550nm.

FThE3 • 8:30 a.m.

Compact Organic Electro-Optic (EO) Modulator with Ultra Low Switching Voltage and Large Bandwidth Using Transparent Conducting Oxides (TCO) Bridge Electrodes, *Fei Yi[1], Fang Ou[1], Boyang Liu[1], Yingyan Huang[1], Seng-Tiong Ho[1], Yiliang Wang[2], Jun Liu[2], Tobin J. Marks[2], Jingdong Luo[3], Alex Jen[3], Dan Jin[4], Raluca Dinu[4]; [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, [4]Lumera Corp., USA.* We report a new promising voltage-size performance record (0.6V-cm) of the organic EO modulator using transparent conducting oxides as the bridge electrodes. The comprehensive theoretical analysis predicts large electrical bandwidth (>40GHz) is achievable.

FThE4 • 8:45 a.m.

All-Order Waveguide-Type Dispersion Compensator Using Arrayed Waveguide Gratings, *Koichi Kato[1], Hiroshi Takahashi[2], Seiji Fukushima[2], Hiroyuki Tsuda[1]; [1]Graduate School of Science and Technology, Keio Univ., Japan, [2]NTT Photonics Labs, NTT Corp., Japan.* We have proposed an all-order waveguide-type dispersion compensation method using arrayed waveguide gratings (AWGs). We have estimated the dispersion compensation performances for a given diffraction order and number of arrayed waveguides in each AWG.

Atherton — LS

8:00 a.m.–10:00 a.m.
LSThB • Single-Molecule Biophysics III
Chris Fecko; Univ. of North Carolina at Chapel Hill, USA, Presider

LSThB1 • 8:00 a.m. Invited

Investigating Amyloid Nucleation and Growth Using Single Molecule Fluorescence Microscopy, *Keith Berland, David G. Lynn, Yan Liang; Emory Univ., USA.* Nucleation and growth mechanisms in amyloid materials are resolved using single molecule fluorescence imaging and spectroscopy. Results identify an intermolecular molten globule state as a key intermediate of the nucleation pathway.

LSThB2 • 8:30 a.m. Invited

3-D Localization in Fluorescence Photoactivation Localization Microscopy and Particle Tracking, *Joerg Bewersdorf[1,2], Michael J. Mlodzianoski[1,2], Stefanie E. K. Kirschbaum[2,3,4,5], Manuel F. Juette[1,2,4,5]; [1]Yale Univ. School of Medicine, USA, [2]Inst. for Molecular Biophysics, The Jackson Lab, USA, [3]Dept. of Physics and Astronomy, Univ. of Maine, USA, [4]Dept. of Biophysical Chemistry, Univ. of Heidelberg, Germany, [5]Dept. of New Materials and Biosystems, Max-Planck-Inst. for Metals Res., Germany.* Particle localization at the nanometer scale plays a central role in particle tracking and localization-based super-resolution microscopy. We compare the experimental performance of two three-dimensional (3-D) localization methods. Additionally, we characterize different photoactivatable fluorescent proteins.

Sacramento — FiO

8:00 a.m.–10:00 a.m.
FThF • Polarization and Birefringence in Optical Design I
Russell Chipman; Univ. of Arizona, USA, Presider

FThF1 • 8:00 a.m. Invited

Photoaligned Liquid Crystal Polymers for Space Variant Polarization Control, *Scott McEldowney[1], David M. Shemo[2], Russell A. Chipman[3]; [1]Microsoft Corp., USA, [2]JDS Uniphase, USA, [3]Univ. of Arizona, USA.* We present photo-aligned liquid crystal polymer devices for creating space variant polarization control. We demonstrate components creating systematic and random polarization orientation profiles. Theoretical and experimental properties of vortex retarders and speckle control are presented.

FThF2 • 8:30 a.m. Invited

Optical Imaging Instrumentation with Spatially Engineered Polarization, *Qiwen Zhan; Univ. of Dayton, USA.* Latest developments of spatial polarization engineering that can benefit optical imaging instrumentation are presented. Applications of spatially variant optical polarization in nonlinear optical imaging, plasmonic focusing and focal field 3-D polarization control will be discussed.

For Fall Congress presentations on Thursday, see pages 132-135.

LSThA • X-Ray Imaging I—Continued

LSThA3 • 9:00 a.m. Invited

Femtosecond Dynamic Diffraction Imaging with Free Electron Lasers: X-Ray Snapshots of Ultra-Fast Nanoscale Phenomena, *Anton Barty[1], Henry N. Chapman[2], Michael J. Bogan[1], Sébastien Boutet[1,3,4], Matthias Frank[1], Stefan P. Hau-Riege[1], Stefano Marchesini[1,5], Bruce W. Woods[1], Saša Bajt[1], W. Henry Benner[1], Richard A. London[1], Elke Plönjes[6], Marion Kuhlmann[6], Rolf Treusch[6], Stefan Düsterer[6], Thomas Tschentscher[6], Jochen R. Schneider[6], Eberhard Spiller[7], Thomas Möller[8], Christoph Bostedt[8], Matthias Hoener[8], David A. Shapiro[5], Keith O. Hodgson[3], David van der Spoel[4], Magnus Bergh[4], Carl Caleman[4], Gösta Huldt[4], Bianca Iwan[4], M. Marvin Seibert[4], Filipe R. N. C. Maia[4], Abraham Szöke[1,4], Nicusor Timneanu[4], Janos Hajdu[3,4]; [1]Lawrence Livermore Natl. Lab, USA, [2]Ctr. for Free Electron Laser Science, Univ. Hamburg, Germany, [3]Stanford Synchrotron Radiation Lab, Stanford Linear Accelerator Ctr., USA, [4]Uppsala Univ., Sweden, [5]Univ. of California at Davis, USA, [6]Deutsches Elektronen-Synchrotron, DESY, Germany, [7]Spiller X-Ray Optics, USA, [8]Inst. für Atomare Physik, Technische Univ. Berlin, Germany.* The ultrafast, ultrabright X-ray pulses offered by a new generation of free-electron lasers is ushering in extraordinary new capabilities in X-ray science, with a wide range of applications in fundamental atomic-physics, ultrafast-chemistry and materials science.

LSThA4 • 9:30 a.m. Invited

Title to Be Announced, *Stefan Hau-Riege; Lawerence Livermore Natl. Lab, USA.* Abstract not available.

FThA • Nanofocusing Optics I—Continued

FThA3 • 9:00 a.m. Invited

Singular and Other Novel X-Ray Diffractive Optics, *Anne Sakdinawat; Lawrence Berkeley Natl. Lab, Univ. of California at Berkeley, USA.* Singular and other novel X-ray diffractive optics have been developed for X-ray microscopy. These optics enhance contrast and resolution by enabling phase contrast, extended depth of field, and other imaging capabilities.

FThA4 • 9:30 a.m. Invited

Laboratory X-Ray Micro- and Nano-Imaging, *Hans M. Hertz, M. Bertilson, E. Chubarova, O. Hemberg, O. v Hofsten, A. Holmberg, M. Lindblom, U. Lundström, D. Nilsson, M. Otendal, J. Reinspach, P. Skoglund, P. Takman, T. Tuohimaa, U. Vogt; Royal Inst. of Technology, Sweden.* We summarize recent progress in laboratory X-ray imaging systems based on compact high-brightness liquid-jet sources, including <25 nm soft X-ray zone-plate microscopy and <10 μm (lens-free) hard X-ray phase-contrast imaging.

FThB • Diffractive and Holographic Optics III—Continued

FThB4 • 9:00 a.m.

Heterodyne Holographic Microscopy for 3-D Imaging of Live Cells Labeled with Gold Nanoparticles, *Nilanthi Warnasooriya[1], Fadwa Joud[2], Philippe Bun[3], Sarah Suck[1], Michel Gross[2], Maité Coppey-Moisan[3], Gilles Tessier[1]; [1]Inst. Langevin, CNRS UMR 7587, ESPCI, France, [2]Lab Kastler Brossel de l'ENS, France, [3]Département de Biologie Cellulaire, Inst. Jacques Monod, France.* Heterodyne holographic microscopy in total internal reflection is used for 3-D imaging of live cells labeled with 40nm gold particles, with shot-noise limited sensitivity. Fast acquisition times enable selective localization of tens of particles simultaneously.

FThB5 • 9:15 a.m.

Determination of Sidewalls in Transparent Media, *Monika Leniec, Jan Masajada; Wroclaw Univ. of Technology, Poland.* The new method for characterization of sidewalls transparent media is presented. The authors introduce optical system based on optical vortex interferometer. Analytical calculation as well as experimental results are shown.

FThB6 • 9:30 a.m.

Generating Superpositions of Higher Order Bessel Beams, *Ruslan Vasilyeu[1], Angela Dudley[2,3], N. Khilo[1], Andrew Forbes[2,3]; [1]B.I. Stepanov Inst. of Physics, Natl. Acad. of Sciences of Belarus, Belarus, [2]Univ. of KwaZulu-Natal, South Africa, [3]CSIR Natl. Laser Ctr., South Africa.* An experimental setup to generate a superposition of higher-order Bessel beams by means of a spatial light modulator and ring aperture is presented. The experimentally produced fields are in good agreement with those calculated theoretically.

FThB7 • 9:45 a.m.

Second Harmonic Generation of Femtosecond Vortex Beams with a Programmable Pulse Shaper, *Nicolas Cusnir, Matt E. Anderson; San Diego State Univ., USA.* We have used a liquid crystal spatial light modulator (SLM) to produce optical vortices (OVs) with 50 fs pulses. The second harmonic generation of these vortex beams has been investigated both theoretically and experimentally.

FThC • Micro-Cavity Devices I—Continued

FThC4 • 9:00 a.m. Invited

Applications of High-Q Optical Microresonators in Communication, *Mani Hossein-Zadeh; Ctr. for High Technology Materials, Univ. of New Mexico, USA.* This talk summarizes various applications of high-Q resonance in optical and RF-photonic communication systems. We highlight recent advances and future challenges in high-Q microring/microdisk based photonic communication devices.

FThC5 • 9:30 a.m.

Absorption-Controlled Resonator for All-Optical Memory, *Yingyan Huang[1], Vivek Krishnamurthy[2], Seng-Tiong Ho[3]; [1]OptoNet Inc., USA, [2]Data Storage Inst., Agency for Science, Technology and Res., Singapore, [3]Dept. of Electrical Engineering and Computer Science, Northwestern Univ., USA.* Bistability induced in an absorption-controlled resonator is explored with a semi-analytical analysis. A sub-mW power requirement along with a maximum speed of ~100 Gbps is demonstrated, making the device apt for high-speed, power-efficient all-optical memory.

FThC6 • 9:45 a.m.

Thermal and Free Electron Nonlinearities in Silica and Hybrid Silica/Silicon Disc Micro Resonators, *Carsten Schmidt[1], Arkadi Chipouline[1], Thomas Käsebier[1], Ernst-Bernhard Kley[1], Andreas Tünnermann[1,2], Lev Deych[3], Thomas Pertsch[1]; [1]Friedrich-Schiller-Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany, [3]Queens College, CUNY, USA.* Bistability effects in silica and hybrid silca-silicon microdisc resonators are investigated experimentally and numerically. The opposite signs of nonlinear responses promise a way to design disc microresonators less sensitive to higher optical powers.

10:00 a.m.–10:30 a.m. Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

For Fall Congress presentations on Thursday, see pages 132-136.

FThD • High-Power Fiber Lasers I—Continued

FThD3 • 9:00 a.m.
Experimental Demonstration of Reduced Path-Length Sensitivity in Coherent Beam Combining Architectures, *Mercedeh Khajavikhan, James Robert Leger; Univ. of Minnesota, USA.* Proper exploitation of spatial supermodes in Michelson-type cavities reduces the sensitivity to path-length variations. The radiance improvement is experimentally demonstrated in a common-path generalized Michelson cavity formed by polarization multiplexing the two gain arms.

FThD4 • 9:15 a.m.
Wavelength-Tunable Figure-Eight Erbium-Doped Fiber Laser with a Sagnac Fiber Filter, *Baldemar Ibarra-Escamilla[1,2], Olivier Pottiez[3], Evgeny A. Kuzin[1], Joseph W. Haus[2], Miguel A. Bello-Jiménez[1], Ariel Flores-Rosas[1]; [1]INAOE, Mexico, [2]Univ. of Dayton, USA, [3]Ctr. de Investigaciones en Optica, Mexico.* A passively mode-locked Erbium-doped figure-eight fiber laser is continuously wavelength-tunable over a range from 1525 to 1555 nm using a fiber interferometer, with an autocorrelation trace of 3.1 ps and pulse spectrum of 1.5 nm.

FThD5 • 9:30 a.m. Invited
Spatial Filtering Properties of Large-Mode-Area Fibers with Confined Gain Dopants, *John R. Marciante; Univ. of Rochester, USA.* Simulations and experiments will be used to reveal the spatial filtering properties of large-mode-area gain-tailored fibers, where the overlap of the gain with the various modes provides preferential modal discrimination even at high saturation levels.

FThE • Integrated Optics—Continued

FThE5 • 9:00 a.m.
Nanoimprinted Polysiloxane Optical Devices, *Ting Han[1], Steve Madden[1], Mathew Zhang[1], Barry Luther-Davies[1], Robbie Charters[2]; [1]Australian Natl. Univ., Australia, [2]RPO Inc., Australia.* UV-Nanoimprint lithography is demonstrated to be a low cost and high throughput technique to replicate complicated optical devices. We present high quality nanoimprinted Polysiloxane optical waveguides and waveguide grating devices for WDM system.

FThE6 • 9:15 a.m.
Characterization of Guided Modes of Ti: $LiNbO_3$ Channel Waveguide in Comparison with Beam Propagation Method, *Jieda Li, Jay Kirk, Marc P. Christensen; Southern Methodist Univ., USA.* Optical properties of Ti: $LiNbO_3$ waveguide have been related to the structural properties by SIMS and BPM. The comparison of the mode diameters between the experiment and the BPM method have been performed.

FThE7 • 9:30 a.m.
Fabrication of Rib Waveguides in Germanium-Selenium Chalcogenide Glass through Electron Beam Direct Writing, *Galen B. Hoffman, Wei Zhou, R. Sooryakumar, Ronald M. Reano; Ohio State Univ., USA.* We report the fabrication of direct write rib waveguides in $Ge_{0.2}Se_{0.8}$ chalcogenide glass films on thermally oxidized silicon substrates using electron beams. Numerical modeling of the fundamental TE mode yields an effective index of 2.0.

FThE8 • 9:45 a.m.
Asymmetric Waveguide Writing Modeled with GAFFE, *Edward J. Grace; Imperial College London, UK.* For the first time to our knowledge we numerically demonstrate the effect of simple self-focusing on the generation of the characteristic "bite-mark" pattern in transverse waveguide writing.

LSThB • Single-Molecule Biophysics III—Continued

LSThB3 • 9:00 a.m. Invited
Single Molecule Imaging of Axonal Transport in Live Neurons, *Harsha V. Mudrakola, Chengbiao Wu, Kai Zhang, Bianxiao Cui; Stanford Univ., USA.* We report a single molecular imaging method that tracks axonal transport in live neurons, and a super-resolution method, dynamic object tracking that resolves individual microtubules in live neurons below the diffraction barrier.

LSThB4 • 9:30 a.m. Invited
Probing Cellular Events with Single Quantum Dot Imaging, *Maxime Dahan; Lab Kastler Brossel, École Normale Supérieure, France.* Quantum dots (QDs) are fluorescent inorganic probes that enable the visualization of single molecules in live cells. The state-of-the art in QD tracking will be presented as well as some important remaining challenges.

FThF • Polarization and Birefringence in Optical Design I—Continued

FThF3 • 9:00 a.m.
Enhancement of Polarization Rotation in Azobenzene Films, *Chandra S. Yelleswarapu, Devulapalli V. Rao; Univ. of Massachusetts Boston, USA.* We observed enhancement of photoinduced polarization rotation, as much as 24°, when the input laser beam propagates through azobenzene doped polymer thin films that were placed in tandem.

FThF4 • 9:15 a.m.
Snapshot Imaging Polarimeter for Polychromatic Light Using Savart Plates and Diffractive Lenses, *Kazuhiko Oka[1], Ryosuke Suda[1], Masayuki Ohnuki[1], Darren Miller[2], Eustace L. Dereniak[2]; [1]Hokkaido Univ., Japan, [2]Univ. of Arizona, USA.* The imaging polarimeter using the Savart plates is modified for use with the polychromatic light by incorporating an imaging system utilizing diffractive lenses. Its feasibility is numerical simulated for the visible light with 50nm-bandwidth.

FThF5 • 9:30 a.m.
Large Tuning of Birefringence in Two Strip Silicon Waveguides via Optomechanical Motion, *Jing Ma, Michelle Povinelli; Univ. of Southern California, USA.* Adjusting the separation between two strip waveguides by an optical force, we obtain widely tunable birefringence dependent on the separation. The maximum difference of phase birefringence before and after tuning is calculated to be 0.026.

FThF6 • 9:45 a.m.
Magneto-Optical Control of Nonlinear Light Collapse, *Katarzyna A. Rutkowska[1,2], Yoav Linzon[1], Boris A. Malomed[3], Roberto Morandotti[1]; [1]INRS-Énergie et Matériaux, Univ. du Québec, Canada, [2]Faculty of Physics, Warsaw Univ. of Technology, Poland, [3]Faculty of Engineering, Tel Aviv Univ., Israel.* We present the theoretical and experimental demonstration of light collapse control in nonlinear magneto-optical Kerr media. The required management of the birefringence is achieved via a combination of the Cotton-Mouton and Faraday effects.

10:00 a.m.–10:30 a.m. Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

For Fall Congress presentations on Thursday, see pages 132-135.

10:30 a.m.–12:00 p.m.
LSThC • X-Ray Photon Correlation Spectroscopy

Sébastien Boutet; SLAC Natl. Accelerator Lab, Stanford Univ., USA, Presider

LSThC1 • 10:30 a.m. Invited

The X-Ray Photon Correlation Spectroscopy Instrument at LCLS, *Aymeric Robert; Linac Coherent Light Source, SLAC Natl. Accelerator Lab, Stanford Univ., USA*. The X-ray Photon Correlation Spectroscopy Instrument (XCS) will probe dynamical phenomena in condensed matter systems down to nanometric lengthscales using the LCLS. The design, status and capabilities of XCS will be presented.

LSThC2 • 11:00 a.m. Invited

Title to Be Announced, *Simon Mochrie; Yale Univ., USA*. Abstract not available.

10:30 a.m.–12:00 p.m.
FThG • Nanofocusing Optics II

Lahsen Assoufid; Argonne Natl. Lab, USA, Presider

FThG1 • 10:30 a.m. Invited

X-Ray Nano-Tomography at HZB, *Gerd Schneider[1], Peter Guttmann[1], Stefan Heim[1], Waltraud Müller[2], Jim McNally[2]; [1]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Elektronenspeicherring BESSY II, Germany, [2]Lab of Receptor Biology and Gene Expression, Natl. Cancer Inst., Natl. Inst. of Health, USA*. We developed a new full-field transmission X-ray microscope (TXM) for automated cryo-tomography and spectroscopy. The system operates at the BESSY undulator U41 at a focusing spherical grating monochromator beamline, which provides an energy resolution up to 104. In the talk, we present the new TXM and selected applications.

FThG2 • 11:00 a.m. Invited

X-Ray Refractive Optics for Nanofocusing, *Anatoly Snigirev; European Synchrotron Radiation Facility, France.* The paper covers the latest status of X-ray refractive optics which become standard elements in synchrotron beamlines instrumentation. The main emphasis will be put on those methods which aim to produce submicron and nanometer resolution.

10:30 a.m.–11:45 a.m.
FThH • Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment I

Marty Valente; Univ. of Arizona, USA, Presider

FThH1 • 10:30 a.m. Invited

Can You Make/Measure this Asphere for Me? *Greg Forbes; QED Technologies Inc., USA*. The conventional characterization of an asphere's shape is problematic: its coefficients hold many unnecessary digits and are unintelligible at first sight. There are related-complications in design, fabrication, and testing. Solutions are demonstrated for these shortcomings.

FThH2 • 11:00 a.m.

Extending Stavroudis's Solution of the Eikonal Equation to Multi-Element Optical Systems, *John A. Hoffnagle[1], David L. Shealy[2]; [1]John A. Hoffnagle, USA, [2]Univ. of Alabama at Birmingham, USA*. We show how Stavroudis's solution to the eikonal equation in terms of the k-function can be continued across an arbitratry reflecting or refracting surface, allowing it to be applied to multi-element optical systems.

FThH3 • 11:15 a.m.

Orthogonal Field-Dependent Aberrations for Misaligned Optical Systems, *Anastacia M. Manuel[1], James H. Burge[1], Régis Tessieres[2]; [1]Univ. of Arizona, USA, [2]DxO Labs, France*. We present a set of orthogonal field-dependent aberrations, useful for describing optical systems with tilted and decentered elements, derived from combinations of Zernike polynomials in both field space and pupil space.

10:30 a.m.–12:00 p.m.
FThI • Novel Nonlinear Optical Phenomena

Nathaniel Phillips; College of William & Mary, USA, Presider

FThI1 • 10:30 a.m.

The Effect of Domain Distribution on Second Harmonic Generation in Disordered Nonlinear Media, *Vito Roppo[1,2], Solomon Saltiel[2,3], Wenjie Wang[2], Ksawery Kalinowski[2], Jose F. Trull[1], Crina M. Cojocaru[1], Dragomir N. Neshev[2], Wieslaw Krolikowski[2], Ramon Vilaseca[1], Kestutis Staliunas[1], Yuri S. Kivshar[2]; [1]Univ. Politécnica de Catalunya, Spain, [2]Australian Natl. Univ., Australia, [3]Sofia Univ., Bulgaria.* We study theoretically and experimentally the second harmonic generation in nonlinear crystal with random distribution of ferroelectric domains. We show that the specific features of disordered domain structure greatly affect emission pattern of second harmonic.

FThI2 • 10:45 a.m.

Harnessing Self-Focusing: Direct Writing of Periodic Structures, *Andrew W. Norfolk, Edward J. Grace; Imperial College London, UK.* We investigate the exploitation of self-focusing for the composition of periodic integrated nanostructures using nonparaxial Bessel-Gauss beams. We elegantly relate the nonlinear period to experimentally controllable quantities using a numerical model for the first time.

FThI3 • 11:00 a.m.

Self-Trapping of Light Due to Balance between Saddle-Shaped Diffraction and Hybrid Nonlinearity, *Yi Hu[1], Cibo Lou[1], Peng Zhang[1,2,3], J. Zhao[2], J. Xu[1], J. Yang[4], Zhigang Chen[1,3]; [1]Nankai Univ., China, [2]Northwestern Polytechnical Univ., China, [3]San Francisco State Univ., USA, [4]Univ. of Vermont, USA*. Saddle-shaped diffraction and hybrid nonlinearity in a two-dimensional ionic-type photonic lattice leads to self-trapping of a new type of discrete spatial gap solitons, with phase and spectrum characteristics different from all previously observed gap solitons.

FThI4 • 11:15 a.m.

Interaction of Few-Cycle Optical Solitons in a Two-Component Medium, *Herve Leblond[1], Igor V. Mel'nikov[2,3], Dumitru Michalache[4]; [1]Univ. of Angers, France, [2]Optolink Ltd., Russian Federation, [3]High Q Labs, Inc., Canada, [4]Horia Hulubei Natl. Inst. for Physics and Nuclear Engineering, Romania.* The interaction of few-cycle optical pulses in a two-component nonlinear medium is studied within the framework of the modified Korteweg-de Vries - sine Gordon equation. The pulse envelopes, temporal and phase shifts are calculated explicitly.

For Fall Congress presentations on Thursday, see pages 132-136.

California — FiO

10:30 a.m.–12:00 p.m.
FThJ • High-Power Fiber Lasers II
Stuart J. McNaught; Northrop Grumman Space Technology, USA, Presider

FThJ1 • 10:30 a.m. Invited
Title to Be Announced, *Valentin Gapontsev; IPG Photonics Corp., USA.* Abstract not available.

FThJ2 • 11:00 a.m.
Power Scaling of Single-Frequency Hybrid Brillouin/Ytterbium Fiber Lasers, *Weihua Guan, John R. Marciante; Lab for Laser Energetics and Inst. of Optics, Univ. of Rochester, USA.* The proposed dual-clad fiber laser can generate 80 W of single-frequency output with a side-mode suppression ratio (SMSR) greater than 50 dB. Beyond this limit, multi-order stimulated Brillouin scattering affects the laser efficiency and SMSR.

FThJ3 • 11:15 a.m.
Far-Field Splitting in Broad Area Quantum Dot Lasers via Thermo-Optic Cavity Detuning, *Jayanta Mukherjee[1], Harendra N. J. Fernando[1], Brian Corbett[2], John G. McInerney[1]; [1]Optoelectronics Group, Dept. of Physics, Univ. College Cork, Ireland, [2]Photonics Sources Group, Tyndall Natl. Inst., Ireland.* We experimentally demonstrate the collapse of a single lobed far-field into multiple lobes via thermo-optic detuning of the cavity in broad area quantum dot laser under CW operation, in accordance with our recent Maxwell-Bloch analysis.

Glen Ellen — FiO

10:30 a.m.–12:00 p.m.
FThK • Optoelectronics
Fei Yi; Northwestern Univ., USA, Presider

FThK1 • 10:30 a.m.
Cavity Design of Monolithic Long-Wavelength InAs/InP Quantum Dash Passively Mode-Locked Lasers, *Chang-Yi Lin[1], Yongchun Xin[2], Yan Li[1], Furqan L. Chiragh[1], Luke F. Lester[1]; [1]Ctr. for High Technology Materials, Univ. of New Mexico, USA, [2]IBM Systems and Technology Group, Semiconductor Solutions, USA.* A theory for the cavity design of quantum dash passively mode-locked lasers is reported based on a microwave photonics perspective. It is a valuable tool for realizing monolithic InAs/InP quantum dash passively mode-locked lasers.

FThK2 • 10:45 a.m.
Analysis of the Relative Intensity Noise Characteristics of the Strained AlGaInN LDs under High Frequency Modulation, *Hyung Uk Cho, Jong Chang Yi; Electronic Engineering Dept., Hongik Univ., Republic of Korea.* The RIN characteristics in AlGaInN LDs were investigated using the rate equations with the quantum Langevin noise model. The device parameters were extracted by using the self-consistent multiband Hamiltonian for the strained wurtzite crystal.

FThK3 • 11:00 a.m.
High-Spatial-Resolution Quantum Well Intermixing Technique for All-Optical Nano-Device Fabrications, *Chee Wei Lee[1], Yicheng Lai[1], Yingyan Huang[2], Boyang Liu[2], Seng-Tiong Ho[3]; [1]Data Storage Inst., Agency for Science, Technology and Res., Singapore, [2]OptoNet Inc., USA, [3]Dept. of Electrical Engineering and Computer Science, Northwestern Univ., USA.* We present technique of achieving high-spatial-resolution quantum well intermixing in InP/InGaAsP-based quantum well structures. It utilizes submicron-width deeply-etched trench as diffusion-stopper during the intermixing. Results indicate <0.4 μm spatial control with >100 nm bandgap blueshift.

FThK4 • 11:15 a.m.
UPML for Gain Medium in FDTD Simulation with Multi-Level Multi-Electron Model, *Qian Wang[1], Seng-Tiong Ho[2]; [1]Data Storage Inst., Singapore, [2]Northwestern Univ., USA.* Perfect matched layer with un-split field for gain medium in FDTD simulation incorporating multi-level multi-electron model is presented. Numerical validation indicates the boundary derived can absorb the wave effectively under different carrier densities (injection currents).

Atherton — LS

10:30 a.m.–12:00 p.m.
LSThD • Single-Molecule Biophysics IV
Joerg Bewersdorf; Jackson Lab, USA, Presider

LSThD1 • 10:30 a.m. Invited
Imaging Gene Transcription, *Christopher J. Fecko; Univ. of North Carolina at Chapel Hill, USA.* Multiphoton microscopy can resolve actively transcribed genes within live polytene cells of *Drosophila* larval salivary gland tissues. We are exploring the utility of multiphoton photoactivation to observe the three-dimensional movement of proteins involved in transcription.

LSThD2 • 11:00 a.m. Invited
Total Internal Reflection with Fluorescence Correlation Spectroscopy, *Nancy Thompson; Univ. of North Carolina at Chapel Hill, USA.* Recent advances in combining total internal reflection illumination with fluorescence correlation spectroscopy will be described. If time permits, combining total internal reflection illumination with continuous photobleaching will also be presented.

Sacramento — FiO

10:30 a.m.–11:45 a.m.
FThL • Polarization and Birefringence in Optical Design II
Scott McEldowney; Microsoft, USA, Presider

FThL1 • 10:30 a.m. Invited
Polarization Aberration Functions in Three Dimensions, *Russell Chipman; Univ. of Arizona, USA.* A generalization of the Jones calculus avoids difficulties in applying the Jones calculus to polarization ray tracing, eliminating a notorious minus sign, and clarifying the description of non-polarizing optical systems.

FThL2 • 11:00 a.m.
Polarimetry Using Stress-Engineered Optical Elements, *Amber M. Beckley, Thomas G. Brown; Univ. of Rochester, USA.* We describe a method of polarimetry using stress-engineered optical elements. By using the deterministic, space-variant nature of retardance due to stress birefringence, the Stokes parameters can be deduced from a single camera frame.

FThL3 • 11:15 a.m.
Nonparaxial Polarization Vortex Illumination Described Using a 2x2 Correlation Matrix, *Dean P. Brown, Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA.* Vector fields in three dimensions generally require a 3x3 correlation matrix to describe (second-order) statistics of the field. We describe a class of nonparaxial fields that can be described using a two-dimensional correlation matrix.

For Fall Congress presentations on Thursday, see pages 132-135.

LSThC • X-Ray Photon Correlation Spectroscopy—Continued

LSThC3 • 11:30 a.m. Invited

Using X-Ray Correlation Spectroscopy to Test Dynamical Scaling, *Mark Sutton; McGill Univ., Canada.* X-ray correlation spectroscopy is used to study non-equilibrium fluctuations in Cu3Au. In particular, measuring two-time correlation functions after a temperature quench gives a new test of dynamical scaling.

FThG • Nanofocusing Optics II—Continued

FThG3 • 11:30 a.m. Invited

10nm-Level Focusing of Hard X-Rays by KB Mirrors, *Kazuto Yamauchi; Osaka Univ., Japan.* 10nm-level line focusing of hard X-ray of the wavelength of 0.06nm was achieved by using an elliptically figured and multilayer coated mirror with an on-site wavefront correction system.

FThH • Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment I—Continued

FThH4 • 11:30 a.m.

Separating Astigmatic Mirror Figure Error from Alignment Induced Misalignment Aberrations Using Nodal Aberration Theory, *Tobias Schmid[1], Andrew Rakich[2], Jannick P. Rolland[1,3], Kevin P. Thompson[4]; [1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Large Binocular Telescope Observatory, USA, [3]Inst. of Optics, Univ. of Rochester, USA, [4]Optical Res. Associates, USA.* Nodal aberration theory (NAT) has revealed that misalignment astigmatism displays a different signature field dependence than signature nodal positions caused by astigmatic mirror figure error. These differences will be derived and demonstrated for astronomical telescopes.

FThI • Novel Nonlinear Optical Phenomena—Continued

FThI5 • 11:30 a.m.

Soliton Interaction and Bound States in Dissipative Fiber Systems, *Sofia C. V. Latas, Mário F. Ferreira; Univ. of Aveiro, Portugal.* Pulse interaction and the formation of multisoliton bound states in dissipative fiber systems described by the complex Ginzburg-Landau equation are investigated. The impact of intrapulse Raman scattering in such processes is also discussed.

FThI6 • 11:45 a.m.

Photonic Crystals Acting on Instabilities and Squeezed States in OPOs, *M. Moreno, M. A. García March, D. Gomila, R. Zambrini; IFISC (UIB-CSIC), Campus Univ. Illes Balears, Spain.* Optical parametric oscillators (OPOs) are known to induce non-classical spatial correlations in the transverse profile of emitted light. We show how intracavity photonic crystals modify their stability as well as quantum fluctuations improving squeezed states.

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

NOTES

For Fall Congress presentations on Thursday, see pages 132-136.

FiO

FThJ • High-Power Fiber Lasers II—Continued

FThJ4 • 11:30 a.m. Invited

High-Power Fiber Lasers and Amplifiers, *Andreas Tünnermann[1,2], Thomas Schreiber[1,2], Jens Limpert[1,2]; [1]Friedrich-Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* We report on the current status of our developments in high power fiber laser and amplifiers for continuous wave and pulsed operation as well as their components, which is the basis for further performance scaling.

FThK • Optoelectronics—Continued

FThK5 • 11:30 a.m.

A Computationally Efficient Finite Difference Time Domain (FDTD) Model for Incorporating Quantum Well Gain in Optoelectronic Devices, *Koustuban Ravi[1], Yicheng Lai[1], Yingyan Huang[2], Seng-Tiong Ho[3]; [1]Data Storage Inst., Agency for Science, Technology and Res., Singapore, [2]Optonet Inc., USA, [3]Northwestern Univ., USA.* A new computationally efficient FDTD model for quantum wells is proposed using a multi-level, multi-electron system. Gain simulation results concur with standard theory. This scheme is useful for the simulation of devices with complex geometries.

FThK6 • 11:45 a.m.

Observation of Injection Locking in a Long-Cavity InAs/InP 1.56 µm Quantum Dash Laser, *Ehsan Sooudi[1,2], Herendra N. J. Fernando[1,2], John G. McInerney[1,2]; [1]Optoelectronics Group, Physics Dept., Natl. Univ. of Ireland, Univ. College Cork, Ireland, [2]Tyndall Natl. Inst., Univ. College Cork, Ireland.* We report CW injection locking of a Fabry-Perot InAs/InP quantum dash laser. Injection power (~0.1 mW) at 1.5 Ith is sufficient to obtain 30 dB SMSR of single mode locked output.

LS

LSThD • Single-Molecule Biophysics IV—Continued

LSThD3 • 11:30 a.m. Invited

DNA Repair Protein Dynamics through Single-Molecule Fluorescence, *Keith R. Weninger[1], Lauryn E. Sass[2], Vanessa C. DeRocco[2], Trevor Anderson[1], Dorothy A. Erie[2]; [1]North Carolina State Univ., USA, [2]Univ. of North Carolina at Chapel Hill, USA.* Crystal structures of mismatch repair proteins bound to mismatched DNA reveal kinked DNA. With single molecule FRET we observed dynamic switching among different bent states, which suggests the dynamics of bending may influence mismatch repair.

FiO

FThL • Polarization and Birefringence in Optical Design II—Continued

FThL4 • 11:30 a.m.

Stroboscopic Illumination Mueller Matrix Image Polarimetry, *Hsiu-Ming Tsai, Tsung-Han Tsai, Yu-Faye Chao; Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan.* Utilizing stroboscopic illumination technique, we present a Mueller matrix imaging polarimetry with Photoelastic modulator. The figure of merit of this methodology will be discussed, and its results will be compared with others.

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

NOTES

For Fall Congress presentations on Thursday, see pages 132-135.

LS

1:30 p.m.–2:45 p.m.
LSThE • X-Ray Imaging II
Veit Elser; Cornell Univ., USA, Presider

LSThE1 • 1:30 p.m. Invited

Ankylography: Three-Dimensional Structure Determination from a Single View, *Jianwei Miao; Univ. of California at Los Angeles, USA.* I will present a novel 3-D imaging modality, denoted ankylography, enabling complete 3-D structure determination from a single exposure using a monochromatic incident beam. We demonstrate ankylography with theoretical analysis, numerical simulations and experimental data.

LSThE2 • 2:00 p.m. Invited

Imaging of Domain Structures by Coherent X-Ray Diffraction, *Ian Robinson; Univ. College London, UK.* Following successful ab-initio imaging small objects by Coherent X-ray Diffraction using their three-dimensional diffraction patterns, comes the harder problem of domain structures. This talk summarises progress solving them using the new method of X-ray ptychography.

FiO

1:30 p.m.–3:30 p.m.
FThM • Nanoscale Methods and Instruments I
Gene Ice; Oak Ridge Natl. Lab, USA, Presider

FThM1 • 1:30 p.m. Invited

Intracellular Nanoscale Imaging with Fluorescence Photoactivation Localization Microscopy, *Samuel Hess; Univ. of Maine, USA.* Abstract not available.

FThM2 • 2:00 p.m. Invited

Nanoscale X-Ray Focusing with Reflective Optics, *Gene E. Ice[1], Jonathan Z. Tischler[1], Jae-Young Choi[2], Wenjun Liu[3], Ali Khounsary[3], Lahsen Assoufid[3], Deming Shu[3], Chian Liu[3]; [1]Oak Ridge Natl. Lab, USA, [2]Pohang Accelerator Lab, Republic of Korea, [3]Advanced Photon Source, Argonne Natl. Lab, USA.* Achromatic mirror optics offer important advantages for nanospectroscopy and nanodiffraction. We describe efforts to develop stable hard X-ray nanofocusing optics for practical studies of local crystal structure and elemental composition.

1:30 p.m.–3:30 p.m.
FThN • Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment II
Peter Blake; NASA Goddard Space Flight Ctr., USA, Presider

FThN1 • 1:30 p.m. Tutorial

Fabrication and Testing of Large Free-Form Surfaces, *James Burge; Univ. of Arizona, USA.* Modern computer-controlled grinding and polishing equipment, combined with advances in mechanical and optical metrology, now allow fabrication of large diameter free-form aspherical surfaces to optical precision.

Dr. Burge has led the development of metrology systems and implementation of computer controlled manufacturing methods for making large mirrors for astronomical telescopes. Dr. Burge also teaches optomechanics and optical engineering at the College of Optical Sciences, University of Arizona. Prior to joining the faculty at the College of Optical Sciences, he worked as project scientist at the Steward Observatory Mirror Lab. Dr. Burge is a member of OSA, ASME, and a fellow of SPIE. He received his B.S. from Ohio State University and his M.S. and Ph.D. from The University of Arizona.

FThN2 • 2:15 p.m. Invited

Application of Radial Basis Functions to the Design of a Freeform Single Element See-through Head-Worn Display, *Ozan Cakmakci[1], Jannick Rolland[2]; [1]Optical Res. Associates, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* This paper presents the impact of a change of basis from polynomials to radial basis functions for describing free-form optical surfaces. A design example of a single free-form element see-through head-worn display is presented.

1:30 p.m.–3:30 p.m.
FThO • Micro-cavity Devices II
Tomoyuki Yoshie; Duke Univ., USA, Presider

FThO1 • 1:30 p.m.

Microscale Lasers Based on Patterned Electrospun Polymer Nanofibers, *Andrea Camposeo, Stefano Pagliara, Francesca Di Benedetto, Elisa Mele, Luana Persano, Roberto Cingolani, Dario Pisignano; Univ. del Salento, Italy.* In this work we demonstrate cavity effects in single light-emitting polymer nanofibers. The single nanofiber emit single mode laser light at visible wavelengths, with a linewidth of a few Å and Q-factor of about 1000.

FThO2 • 1:45 p.m.

Spherical Microcavity Stabilization of a Fiber Loop Laser, *Benjamin Sprenger, Harald G. L. Schwefel, L. J. Wang; Max-Planck-Inst. for the Science of Light, Germany.* We present a compact method of stabilizing an Erbium fiber loop laser using a whispering gallery mode microsphere as an etalon. Single-mode lasing is demonstrated and the laser is precisely tuned using temperature control.

FThO3 • 2:00 p.m. Invited

Simultaneous Oscillation of Wavelength-Tunable Singlemode Lasers Using Er:ZBLALiP Whispering Gallery Mode Resonator, *Patrice Féron[1], Lei Xiao[1,2], Stéphane Trébaol[1], Yannick Dumeige[1], Yann G. Boucher[1], ZhiPing Cai[2], Michel Mortier[3]; [1]Univ. de Rennes 1, France, [2]Xiamen Univ., China, [3]Lab de Chimie Appliquée de l'Etat Solide-LCAES, CNRS-UMR, France.* The coupling by two half tapers on the same micro-spherical resonator in Er:ZBLALiP allows two independent single mode laser emissions to be obtained simultaneously. We study the emission characteristics and the resulting beat note signal.

For Fall Congress presentations on Thursday, see pages 132-136.

FiO

1:30 p.m.–3:30 p.m.
FThP • Optics in Interventional Medicine
Presider to Be Announced

FThP1 • 1:30 p.m. Invited

Photodynamic Therapy: A Bridge between Technology and Medicine, *Tayyaba Hasan; Massachusetts General Hospital, Harvard Medical School, USA.* Photodynamic therapy (PDT) is an interventional treatment modality for the destruction of cancerous and non-neoplastic pathologies. An overview of PDT and its impact on therapy and diagnostics will be presented.

FThP2 • 2:00 p.m.

Tissue-Specific Laser Surgery: Hard Tissue Differentiation by Diffuse Reflectance Spectroscopy *ex vivo*, *Azhar Zam[1], Florian Stelzle[2], Emeka Nkenke[2], Katja Tangermann-Gerk[3], Michael Schmidt[3], Werner Adler[4], Alexandre Douplik[1]; [1]Erlangen Graduate School in Advanced Optical Technologies, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, [2]Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, [3]Bavarian Laser Ctr., Germany, [4]Dept. of Medical Informatics, Biometry and Epidemiology, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany.* Diffuse reflectance spectroscopy provides a straightforward and simple approach for optical tissue differentiation. The results obtained show a potential for differentiating hard tissues as guidance for tissue-specific laser surgery.

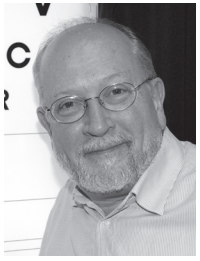
FThP3 • 2:15 p.m.

Design and Prototype Fabrication of a Neonatal Video Laryngoscope, *Katherine A. Baker, Wade Rich, Neil Finer, Joseph E. Ford; Univ. of California at San Diego, USA.* We describe a prototype miniaturized video laryngoscope for extremely low birth weight infants, where a curved acrylic blade acts as a tongue depressor, light guide for an LED illuminator, and holds a 1.8mm CCD imager.

1:30 p.m.–3:30 p.m.
FThQ • Molecular Imaging in the Eye
Austin Roorda; Univ. of California at Berkeley, USA, Presider

FThQ1 • 1:30 p.m. Tutorial

Molecular Imaging in the Eye, *Frederick Fitzke; Univ. College London, UK.* Optical imaging of the eye has considerable advantages for molecular imaging compared to non-optical techniques of molecular imaging for autofluorescence, Green Fluorescence Protein and Annexin V apoptosis confocal imaging in the living eye.



Fred Fitzke is Professor of Visual Optics and Psychophysics in the Department of Visual Neuroscience of University College London Institute of Ophthalmology (UCL IoO). He holds a B.A. in Natural Sciences from The Johns Hopkins University and a Ph.D. in Biophysics from the University of London. He is Director of the Foundation Fighting Blindness Research Center for the Study of Retinal Degenerative Diseases at the UCL IoO and Moorfields Eye Hospital and founding Investigator for the National Institute for Health Research Biomedical Research Centre for Ophthalmology. He has been a member of OSA beginning in the 1970s and has been at UCL IoO since 1982 where he heads the Laboratory of Physiological Optics. His research covers two broad areas: the development of novel techniques for imaging the eye and investigations of visual function using psychophysical methods.

FThQ2 • 2:15 p.m.

Fundus Autofluorescence at 594 nm and Comparison with Near Infrared Reflectance and Fluorescence Imaging, *Ann E. Elsner, Stephen A. Burns, Dean A. VanNasdale, Bryan P. Haggerty, Benno L. Peetrig, Matthew S. Muller; Indiana Univ., USA.* A scanning laser autofluorescent technique at 594 nm reveals features at retinal locations seen with near infrared reflectance and polarization imaging techniques. The autofluorescence from melanin is too weak to account for 594 nm autofluorescence.

LS

1:30 p.m.–3:00 p.m.
LSThF • Single-Molecule Biophysics V
Keith Berland; Emory Univ., USA, Presider

LSThF1 • 1:30 p.m. Invited

Non-Scanning Two-Photon Microscopy for Imaging in Live Cells, *Christine Payne; Georgia Tech, USA.* Live cell imaging with two-photon microscopy is limited by the scanning necessary to construct an image. We describe the application of two-photon excitation used in a total internal reflection configuration that does not require scanning.

LSThF2 • 2:00 p.m. Invited

Tracking Single Quantum Dots in Three Dimensions: Following Cell Receptor Traffic and Membrane Topology, *Nathan P. Wells[1], Diane S. Lidke[2], M. Lisa Phipps[1], Peter M. Goodwin[1], Bridget S. Wilson[2], James Werner[1]; [1]Los Alamos Natl. Lab, USA, [2]Univ. of New Mexico, USA.* We have designed a fluorescence microscope that uses a unique spatial filter geometry and active feedback to follow the three dimensional motion of individual quantum dots at biologically relevant transport rates (microns/second).

FiO

1:30 p.m.–3:30 p.m.
FThR • Computational Imaging and Photography I
Anat Levin; MIT, USA, Presider

FThR1 • 1:30 p.m. Invited

Emerging Integrated Computational Imaging Systems, *Nicholas George, Wanli Chi; Univ. of Rochester, USA.* We illustrate the achievements of ICIS in extended depth of field as well as in an emerging new correlation-based camera system.

FThR2 • 2:00 p.m. Invited

Multi-Channel Incoherent Digital Holography, *Joseph Rosen, Barak Katz; Ben Gurion Univ. of the Negev, Israel.* We present a new holographic system operating in a synthetic aperture mode. Spatial resolution exceeding the Rayleigh limit is obtained by digital tiling several Fresnel elements into a complete hologram of the observed object.

For Fall Congress presentations on Thursday, see pages 132-135.

LSThE • X-Ray Imaging II—Continued

LSThE3 • 2:30 p.m.
Holographic Image Reconstruction Using a Reference of a Pair of Crossed Wires, *Manuel Guizar-Sicairos[1], Diling Zhu[2,3], James R. Fienup[1], Benny Wu[2,3], Andreas Scherz[3], Joachim Stöhr[3]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Stanford Univ., USA, [3]SSRL, Stanford Synchrotron Radiation Lightsource, USA.* We introduce a novel closed-form image reconstruction technique for x-ray coherent diffractive imaging. The overlap region of a pair of crossed wires serves as an off-axis holographic reference structure and allows a direct, non-iterative reconstruction.

FThM • Nanoscale Methods and Instruments I—Continued

FThM3 • 2:30 p.m. Invited
Fabrication of Freeform Mirrors: Metrology and Figuring, *Helge Thiess, H. Lasser; Carl Zeiss Laser Optics GmbH, Germany.* Application of mirror manufacturing and its appropriate metrology at Carl Zeiss Laser Optics shall be illustrated by recent examples. Specifications and achieved results of finalized mirrors with different geometries and sets of specifications are discussed.

FThM4 • 3:00 p.m. Invited
The Hard X-Ray Nanoprobe Beamline at Argonne National Laboratory, *Jörg Maser, Martin V. Holt, Robert P. Winarski, Volker Rose, Gregory Brian Stephenson, Peter Fuesz; Argonne Natl. Lab, USA.* The hard X-ray nanoprobe at the Advanced Photon Source provides characterizing of composition and structure of nanoscale materials and devices with high spatial-resolution using X-ray fluorescence, diffraction and Bragg coherent diffraction, and full-field transmission imaging.

FThN • Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment II—Continued

FThN3 • 2:45 p.m.
Deterministic Approach for Aspheric Fabrication: SPDT Processing Parameters vs. Surface Quality, *Rama Gopal V. Sarepaka, Vinod Mishra, Dole Ram, Amandeep Singh, Amrinder Kumar, Ganga Sharan Singh, Pawan Kapur; Central Scientific Instruments Organisation, India.* A systematic compensation procedure to minimize aspheric surface waviness during Single Point Diamond Turning (SPDT) is discussed. This method combines SPDT processing parametric space exploration and tool path compensation deployed in deep and shallow profiles.

FThN4 • 3:00 p.m.
A Virtual-Interferometer Technique for Surface Metrology, *Scott M. Jobling[1], Paul G. Kwiat[2]; [1]Dept. of Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA, [2]Dept. of Physics, Univ. of Illinois at Urbana-Champaign, USA.* We have demonstrated a novel technique for performing surface metrology within wavefront-feedback systems. By using wavefront sensing to measure surface gradients via displacements of an optic, we have reconstructed several surfaces with 40-nm RMS error.

FThN5 • 3:15 p.m.
Tailored Freeform Reflectors for Extended Non-Lambertian Sources, *Florian R. Fournier[1], Jannick P. Rolland[1,2], William J. Cassarly[3]; [1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Inst. of Optics, Univ. of Rochester, USA, [3]Optical Res. Associates, USA.* We propose a design method for tailored freeform reflectors. This method uses a shape generation algorithm that is embedded into an iterative algorithm in order to account for the source extent and emission pattern.

FThO • Micro-cavity Devices II—Continued

FThO4 • 2:30 p.m.
Radial-Waveguide-Coupled Micro-Resonator Lasers with Unidirectional Output, *Fang Ou[1], Xiangyu Li[1], Boyang Liu[1], Yingyan Huang[2], Eng-Huat Khoo[3], Er-Ping Li[3], Iftikhar Ahmed[3], Qian Wang[4], Seng-Tiong Ho[1]; [1]Northwestern Univ., USA, [2]OptoNet Inc., USA, [3]Inst. of High Performance Computing, Singapore, [4]Data Storage Inst., Singapore.* We demonstrate single-directional output coupling of light from micro-resonator laser using a radially placed waveguide based on a new enhanced-radiation-loss output coupling mechanism. The 20μm-diameter electrically pumped laser has 11.5mA lasing threshold with >0.2mW output.

FThO5 • 2:45 p.m.
Hybrid Diode-Microresonator Laser, *Tianhe Yang[1], Matthew Tomes[1], Carl C. Aleksoff[2], Tal Carmon[1]; [1]Univ. of Michigan, USA, [2]Coherix Corp., USA.* We present a new technology allowing on-chip integration of a micro-resonator and its energy source for fundamental studies and commercial applications. As a proof-of-concept we demonstrate four-wave mixing and Raman lines.

FThO6 • 3:00 p.m.
Dynamics of Face-to-Face Coupled Lasers: Effects of a Small Gap, *Hartmut Erzgräber[1], Sebastian Wieczorek[1], Bernd Krauskopf[2]; [1]Univ. of Exeter, UK, [2]Univ. of Bristol, UK.* Locking characteristics of two face-to-face coupled lasers change drastically when they are separated by a gap with size on the order of the wavelength. The results are explained with the gap-induced modifications in composite-mode coupling.

FThO7 • 3:15 p.m.
InGaAsP/InP QW Microdisk Laser Fabricated by Focused Ion Beam, *Luis A. M. Barea, Felipe Vallini, David S. L. Figueira, Newton C. Frateschi; Univ. Estadual de Campinas (UNICAMP), Brazil.* InGaAsP/InP quantum wells microdisk lasers were fabricated for the evaluation of Ga^+ focused ion beam milling of mirrors. Electrical and optical proprieties were investigated and the effects of the milling in the sidewalls were investigated.

3:30 p.m.–4:00 p.m. Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

For Fall Congress presentations on Thursday, see pages 132-136.

FThP • Optics in Interventional Medicine—Continued

FThP4 • 2:30 p.m. Invited
User-Friendly, Open-Source Computational Tools for Biophotonics, *Vasan Venugopalan; Univ. of California at Irvine, USA.* This talk will introduce the Virtual Photonics Technology Initiative which aims to develop and disseminate open-source computational tools for the simulation of biophotonic processes in cells and tissues via a user-friendly, graphical user interface.

FThP5 • 3:00 p.m.
FCS Measurement of Von Willebrand Factor Multimer Distributions for Coagulation Disorder Subtyping, *Richard Torres, Michael J. Levene; Yale Univ., USA.* We present measurement of von Willebrand Factor (vWF) multimer distributions using FCS as an early example of its applicability to clinical laboratory diagnostics.

FThP6 • 3:15 p.m.
Measurement of 1210nm Laser Induced Thermo-Elastic Expansion in Tissue Phantoms with Nanoparticles Using Swept Source Phase-Sensitive OCT, *Oscar D. Ayala, Amit S. Paranjape, Tianyi Wang, Li L. Ma, Keith P. Johnston, Roman Kuranov, Thomas E. Milner; Univ. of Texas at Austin, USA.* We demonstrate experimental results for measurement of thermo-elastic expansion of laser excited tissue phantoms containing near-infrared absorbing nanoparticles we call nanorose. Our technique uses excitation at 1210nm and PhS-OCT at 1328nm.

FThQ • Molecular Imaging in the Eye—Continued

FThQ3 • 2:30 p.m. Invited
***In vivo* Cellular Imaging of the Rodent Retina**, *Jason Porter; Univ. of Houston, USA.* Developing *in vivo* imaging techniques in rodent models will enhance our understanding of disease mechanisms and treatments. We review a fluorescence adaptive optics scanning laser ophthalmoscope that can resolve sub-cellular features in living rat retinae.

FThQ4 • 3:00 p.m. Invited
Molecular Imaging with OCT, *Joseph Izatt; Dept. of Biomedical Engineering, Duke Univ., USA.* Abstract not available.

LSThF • Single-Molecule Biophysics V—Continued

LSThF3 • 2:30 p.m. Invited
Dissecting the Molecular Mechanism of Kinesin with Single Molecule Imaging, *Ahmet Yildiz; Univ. of California at Berkeley, USA.* Single molecule assays on kinesin bipedal-motor showed that it moves by alternating movement of its two motor-domains. Such coordination is mediated by intramolecular tension generated by the neck-linkers, mechanical elements that span between the motor-domains.

FThR • Computational Imaging and Photography I—Continued

FThR3 • 2:30 p.m.
Phase from Defocused Color Images, *Laura Waller[1], George Barbastathis[1,2]; [1]MIT, USA, [2]Singapore-MIT Alliance for Res. and Technology (SMART) Ctr., Singapore.* We introduce a method for recovering-phase information inspired by transport of intensity (TIE). Instead of images at multiple planes, we use defocused images at a single plane with multiple wavelengths, obtained using standard Bayer filters.

FThR4 • 2:45 p.m.
Enhanced Background Rejection in In-Phase Focal Modulation Microscopy, *Ke Si[1], Wei Gong[2], Nanguang Chen[2], Colin J. R. Sheppard[1,2,3]; [1]NUS Graduate School for Integrative Sciences and Engineering (NGS), Natl. Univ. of Singapore, Singapore, [2]Div. of Bioengineering, Natl. Univ. of Singapore, Singapore, [3]Dept. of Biological Sciences, Natl. Univ. of Singapore, Singapore.* We present the in-phase focal modulation microscopy (IPFMM). Compared with the conventional confocal microscopy, IPFMM can more effectively reject background signal, thus can achieve greater imaging penetration depth.

FThR5 • 3:00 p.m.
Incoherently Combining Logarithmic Aspheres for Extended Depth of Field, *Kaiqin Chu, Nicholas George, Wanli Chi; Inst. of Optics, Univ. of Rochester, USA.* Images from concentric logarithmic lenses are combined incoherently to extend the depth of field as much as 14 times the Rayleigh limit for a conventional lens. Diffraction limited resolution is also obtained after digital processing.

FThR6 • 3:15 p.m.
2-D Nonlinear Image Up-Conversion and Filtering Using Enhanced Sum Frequency Generation, *Christian Pedersen[1], Emir Karamehmedović[1], Jeppe D. Seidelin[1], Preben Buchhave[2], Peter L. Tidemand-Lichtenberg[2]; [1]DTU Fotonik, Technical Univ. of Denmark, Denmark, [2]DTU Physics, Technical Univ. of Denmark, Denmark.* Based on continous-wave enhanced up-conversion we demonstrate a novel and highly efficient method for converting a full image from one part of the electromagnetic spectrum into a new desired wavelength region.

3:30 p.m.–4:00 p.m. Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

For Fall Congress presentations on Thursday, see pages 132-135.

FiO

4:00 p.m.–5:45 p.m.
FThS • Optical Nonlinear Properties of Materials
Muzammil A. Arain; Dept. of Physics, Univ. of Florida, USA, Presider

FThS1 • 4:00 p.m.
Third-Order Nonlinearity of Nickel Nanocolloids, *Tâmara R. Oliveira[1], Gemima Barros[1], André Galembeck[1], Luis A. Gómez[2], Cid B. de Araújo[1]; [1]Univ. Federal de Pernambuco, Brazil, [2]Univ. de Pernambuco, Brazil.* Colloids containing nickel nanoparticles were synthesized and the behavior of their nonlinear refractive index and nonlinear absorption coefficient was explained with basis on a quantum model, correlating their values with the nanoparticles' sizes.

FThS2 • 4:15 p.m.
Four-Wave Mixing in a Stored Light Regime, *Nathaniel B. Phillips[1], Irina Novikova[1], Alexey V. Gorshkov[2]; [1]College of William & Mary, USA, [2]Harvard Univ., USA.* We experimentally and theoretically analyze the propagation of weak optical signal pulses under the conditions of electromagnetically induced transparency in hot Rb vapor, and study the effects of resonant four-wave mixing on light storage.

FThS3 • 4:30 p.m.
Resonant Nonlinear Optical Transmission in Pure Water at 1445 nm, *David Lukofsky[1], Ulf Österberg[1], Marc Currie[2]; [1]Dartmouth College, USA, [2]NRL, USA.* We present the results of an experiment investigating the transmission of intense femtosecond pulses on the 1445 nm resonance of water. Up to 500% increase in relative transmission was observed for 5 mm path lengths.

FThS4 • 4:45 p.m.
Dielectric Analysis on Optical Properties of Silver Nano Particles in ZrO_2 Thin Film Prepared by Sol-Gel Method, *Eisuke Yokoyama, Hironobu Sakata, Moriaki Wakaki; Tokai Univ., Japan.* ZrO_2 thin films containing silver nanoparticles in wide molar ratio were prepared using the sol-gel methods. The films were analyzed by XRD and TEM. Optical absorption spectra were analyzed using Maxwell-Garnett and Bruggeman theory.

4:00 p.m.–5:15 p.m.
FThT • Nanoscale Methods and Instruments II
David Attwood; Lawrence Berkeley Natl. Lab, USA, Presider

FThT1 • 4:00 p.m. Invited
Multi-Modal Scanning X-Ray Microscopy, *Andreas Menzel[1], Pierre Thibault[1], Martin Dierolf[2], Cameron M. Kewish[1], Franz Pfeiffer[2], Oliver Bunk[1]; [1]Paul Scherrer Inst., Switzerland, [2]École Polytechnique Fédérale de Lausanne, Switzerland.* Scanning X-ray microscopy offers a wide variety of contrast modes. The combination with coherent diffractive imaging allows image resolution to be increased beyond the size of the X-ray probe.

FThT2 • 4:30 p.m.
At-Wavelength and Optical Metrology of Bendable X-Ray Optics for Nanofocusing at the ALS, *Sheng Yuan, Kenneth Goldberg, Valeriy V. Yashchuk, Richard Celestre, Tony Warwick, Wayne R. McKinney, Gregory Morrison, Senajith B. Rekawa, Iacopo Mochi, Howard A. Padmore; Lawrence Berkeley Natl. Lab, USA.* We describe a new R&D program at the Advanced Light Source, LBNL, directed to establish both at-wavelength and conventional optical-metrology techniques suitable to characterize the surface profile of super-high-quality X-ray optics with sub-microradian precision.

FThT3 • 4:45 p.m. Invited
Future Developments for Hard X-Ray Zone Plates, *Wenbing Yun; XRADIA Inc., USA.* Abstract not available.

NOTES

FiO

4:00 p.m.–6:00 p.m.
FThU • Micro-Cavity Devices III
Mani Hossein-Zadeh; Univ. of New Mexico, USA, Presider

FThU1 • 4:00 p.m.
On-Chip Microcavities Coupled to Diamond NV Centers, *Paul E. Barclay, Kai-Mei C. Fu, Charles Santori, Raymond G. Beausoleil; Hewlett-Packard Labs, USA.* High-*Q* gallium phosphide (GaP) whispering gallery mode microcavities optically coupled to nitrogen vacancy centers in a single crystal diamond substrate are demonstrated experimentally with $Q > 20000$.

FThU2 • 4:15 p.m.
On-Chip Woodpile Photonic Crystal for Light Localization and 3-D Integrated Optics, *Lingling Tang, Tomoyuki Yoshie; Duke Univ., USA.* Simple fabrication method, which consists of two lithography and two etching processes, is utilized to construct woodpile photonic crystals in GaAs wafers. The developed resonator and waveguide designs enable 3-D optical integration in semiconductor wafer.

FThU3 • 4:30 p.m. Invited
Quantum Computing with Rydberg Atoms in Cavities, *M. Everitt, J. Dunningham, B. T. H. Varcoe; Univ. of Leeds, UK.* Microwave cavity QED has a long history of fundamental measurements, in this talk new directions of Rydberg interactions, ranging from quantum information to quantum gravity, will be presented.

For Fall Congress presentations on Thursday, see pages 132-136.

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FiO

4:00 p.m.–6:00 p.m.
FThV • Microscopy and OCT II
Vasan Venugopalan; Univ. of California at Irvine, USA, Presider

FThV1 • 4:00 p.m. Invited
Advances in High-Speed Imaging by Objective-Coupled Planar Illumination Microscopy, *Timothy Holy, Diwakar Turaga; Washington Univ. in St. Louis, USA.* For measuring neuronal activity, planar illumination microscopy possesses advantages of speed and low phototoxicity. I will describe optical strategies to improve resolution as well as applications measuring neuronal function.

FThV2 • 4:30 p.m.
Early Mammalian Embryonic Imaging at Different Developmental Stages with Optical Coherence Tomography, *Kirill Larin[1], Irina V. Larina[2], Mary E. Dickinson[2]; [1]Univ. of Houston, USA, [2]Baylor College of Medicine, USA.* Live imaging of mammalian embryos is important for many biomedical applications including early assessment of cardiovascular abnormalities. Here we demonstrate capability of OCT for high-resolution structural imaging of live mouse embryos at different developmental stages.

FThV3 • 4:45 p.m.
Complete Two-Dimensional Muellermetric Imaging of Biological Tissue Using Heterodyned Optical Coherence Tomography, *Selim M. Shahriar, Xue Liu, Shih Tseng; Northwestern Univ., USA.* A polarization-sensitive, heterodyned optical coherence tomography system is used to measure partially-polarized reflections from a porcine tendon sample. The complete 4×4 Mueller-metric images of a layer within the sample is produced using such a system.

4:00 p.m.–5:45 p.m.
FThW • Plasmonic Waveguides and Devices
Arash Mafi; Univ. of Wisconsin-Milwaukee, USA, Presider

FThW1 • 4:00 p.m.
IPP Waveguides: Experimental Results and Integrated Devices, *Michelle Y.-C. Xu, J. Stewart Aitchison; Univ. of Toronto, Canada.* We demonstrate a waveguide structure to confine interface plasmon polaritons. We characterized the loss, dispersion of the waveguides, as well as demonstrated functional y-junction power splitters.

FThW2 • 4:15 p.m.
Phase-Locked Second Harmonic Generation in Sub-Wavelength Channels, *Domenico de Ceglia, Maria Antonietta Vincenti, Vito Roppo, Neset Akozbek, Mark J. Bloemer, Michael Scalora; Charles M. Bowden Res. Ctr. AMSRD-AMR-WS-ST, RDECOM, USA.* The phase-locked second harmonic generation process has been investigated for extremely thin, sub-wavelength channels. The possibility to circumvent resolution exploiting the trapping and dragging mechanisms between the fundamental and the phase-locked SH pulse is discussed.

FThW3 • 4:30 p.m.
Dispersion and Polarization Dependence on the Geometry of Non-Ideal Stripe Plasmonic Waveguides, *Michelle Y.-C. Xu, J. Stewart Aitchison; Univ. of Toronto, Canada.* We simulate the effective indices and the polarizations of the guided surface plasmon modes as a function of the silver stripe waveguide shapes, at both 1550 nm and 633 nm wavelengths.

FThW4 • 4:45 p.m.
Mach-Zehnder Interferometer Based on a Metal-Insulator-Silicon Waveguide Mode and a Surface Plasmon Polariton, *Min-Suk Kwon; Dept. of Optical Engineering, Sejong Univ., Republic of Korea.* An integrated-optical Mach-Zehnder interferometer, which is shorter than 5 μm and has extinction larger than 60 dB, is proposed and investigated theoretically. It is based on a metal-insulator-silicon waveguide mode and a surface plasmon polariton.

4:00 p.m.–6:00 p.m.
FThX • Computational Imaging and Photography II
Joseph Rosen; Ben Gurion Univ., Israel, Presider

FThX1 • 4:00 p.m. Invited
4-D Frequency Analysis of Computational Cameras for Depth of Field Extension, *Anat Levin; Weizmann Inst. of Science, Israel.* We study extended depth of field systems in the 4-D lightfield space and derive bounds on the maximal frequency content they can preserve. We propose a new lens extending the DOF of all known designs.

FThX2 • 4:30 p.m. Invited
Optimization and Application of Hybrid Optical-Digital Imaging Systems, *Andrew Harvey, Mads Demenikov, Gonzalo D. Muyo, Tom Vettenburg; Heriot-Watt Univ., UK.* Whereas previous reported wavefront coding research has emphasised constancy of the PSF, we show that optimal image quality normally occurs for systems in which the PSF varies significantly; placing increased demands on image restoration algorithms.

For Fall Congress presentations on Thursday, see pages 132-135.

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FThS • Optical Nonlinear Properties of Materials—Continued

FThS5 • 5:00 p.m.
Size Dependence of Two-Photon Absorption in Lead Salt Quantum Dots, *Gero Nootz[1,2], Lazaro A. Padilha[1], Scott Webster[1], David J. Hagan[1,2], Eric W. Van Stryland[1,2], Larissa Levina[3], Vladimir Sukhovatkin[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]Edward S. Rogers Sr. Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.* Two-photon absorption (2PA) is measured for different sizes of lead-salt quantum dots, a slight increasing of the 2PA for smaller quantum-dots is observed and the results is discussed based on a four-band envelop function formalism.

FThS6 • 5:15 p.m.
The Creation of Metallic and Silicon Nanoclusters at the Surface of Silicates by Action of CO_2 Laser Radiation, *Anel F. Mukhamedgalieva, Anatolii M. Bondar', Igor M. Swedov; Moscow States Mining Univ., Russian Federation.* The continuous and pulsed CO_2 laser irradiation (10^5-10^7 W/cm^2) of silicates (quartz-SiO_2, nepheline - $Na[AlSiO_4]$, rodonite - $CaMn_4[Si_5O_{15}]$, zircon - $ZrSiO_4$ etc.) lead to the creation of metallic and silicon nanoclusters at the surface.

FThS7 • 5:30 p.m.
Modifications in the Optical Properties of Thin Film Oxides with Annealing, *Peter Langston[1], Dinesh Pate[1], A. Markosyan[2], Erik Krous[1], D. Nguyen[2], L. Emmert[2], W. Rudolph[2], R. Route[3], M. Fejer[3], M. Shinn[4], Carmen Menoni[1]; [1]Colorado State Univ., USA, [2]Univ. of New Mexico, USA, [3]Stanford Univ., USA, [4]Thomas Jefferson Natl. Accelerator Facility, USA.* Post-annealing of HfO_2 and SiO_2 thin films affects the absorption loss at 1 μm, and the subpicosecond laser breakdown. These effects are explained by modifications in the density of intrinsic defects and photo-induced defects respectively.

FThT • Nanoscale Methods and Instruments II—Continued

Thank you for attending FiO/LS/Fall Congress. Look for your post-conference survey via email and let us know your thoughts on the program.

NOTES

FiO

FThU • Micro-Cavity Devices III—Continued

FThU4 • 5:00 p.m.
Active Optical Isolator Using Adiabatic Wavelength Conversion in Microcavities, *Ali W. Elshaari, Stefan F. Preble; Rochester Inst. of Technology, USA.* We present an integrated optical isolator based on adiabatic wavelength conversion in microcavities. The isolator uses a time-division sampling method to ensure complete isolation of optical pulses with an extinction of 24 dB.

FThU5 • 5:15 p.m.
High-Q Resonance in Subwavelength High Contrast Gratings, *Vadim Karagodsky, Connie Chang-Hasnain; Univ. of California at Berkeley, USA.* A simple analytic formalism is presented to explain the resonance phenomenon in subwavelength high contrast gratings. This unique resonance does not require distributed reflections, and it relies on neither gain medium nor highly reflective mirrors.

FThU6 • 5:30 p.m.
Direct Measurement of High Q-Factors in Individual Salt-Water Microdroplets by Photothermal Tuning Spectroscopy, *Mustafa Gündogan, Michael Mestre, Saime C. Yorulmaz, Alper Kiraz; Koç Univ., Turkey.* We present measurements of high quality (Q) factors in liquid microdroplets standing on a superhydrophobic surface using the new photothermal tuning spectroscopy technique. Q-factors up to ~10^5 are observed from degenerate whispering gallery modes.

FThU7 • 5:45 p.m.
Reversible Photothermal Tuning of Single Salt-Water Microdroplets on a Superhydrophobic Surface, *Yasin Karadag, Saime Cigdem Yorulmaz, Michael Mestre, Metin Muradoglu, Alper Kiraz; Koç Univ., Turkey.* We demonstrate large (up to 15 nm) and reversible spectral tuning of the whispering gallery modes of single NaCl-water microdroplets standing on a superhydrophobic surface by local heating with an infrared laser.

5:30 p.m.–8:00 p.m. Science Educators' Day, *McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021*

For Fall Congress presentations on Thursday, see pages 132-136.

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FThV • Microscopy and OCT II—Continued

FThV4 • 5:00 p.m.
Cornea Microstructural and Mechanical Response Measured Using Optical Coherence and Nonlinear Optical Microscopy with Sub-10-fs Pulses, *Qiaofeng Wu, Brian E. Applegate, Alvin T. Yeh; Texas A&M Univ., USA.* Co-registered nonlinear optical microscopy (NLOM) and Fourier domain optical coherence microscopy (OCM) are integrated using sub-10-fs laser pulses. This NLOM-OCM setup is used to characterize cornea microstructure and mechanical response as a function of depth.

FThV5 • 5:15 p.m.
Trimodal Optical Microscopy, *Chandra S. Yelleswarapu, Alexey Veraksa, Devulapalli V. G. L. N. Rao; Univ. of Massachusetts Boston, USA.* We present a microscope that uses single source and single detector, and capable of imaging multiple features like brightfield+fluorescence, phase+fluorescence, and edge enhanced+fluorescence of the biological specimen without the need of image registration and fusion.

FThV6 • 5:30 p.m. Invited
Title to Be Announced, *Max Diem; Northeastern Univ., USA.* Abstract not available.

FThW • Plasmonic Waveguides and Devices—Continued

FThW5 • 5:00 p.m.
All-Optical Absorption Switches in Subwavelength Metal-Dielectric-Metal Plasmonic Waveguides, *Changjun Min, Georgios Veronis; Louisiana State Univ., USA.* We introduce extremely compact all-optical absorption switches for subwavelength metal-dielectric-metal plasmonic waveguides. The switches consist of a cavity either directly-coupled or side-coupled to the waveguide, and filled with an active material with tunable absorption coefficient.

FThW6 • 5:15 p.m.
Coupling Characteristics of Directional Couplers Utilizing Long Range Surface Plasmon Polaritons, *Triranjita Srivastava, Arun Kumar; Indian Inst. of Technology, Delhi, India.* We examine the coupling characteristics of lateral and vertical directional couplers utilizing long range surface plasmon polaritons. In both the cases optimum thickness of the metal stripes is found to exhibit minimum coupling lengths.

FThW7 • 5:30 p.m.
Design of Novel Plasmonic Waveguide, *Michelle Y.-C. Xu, J. Stewart Aitchison; Univ. of Toronto, Canada.* We present effective index method analysis and experimental demonstrations of a novel interface plasmon polariton waveguide structure.

FThX • Computational Imaging and Photography II—Continued

FThX3 • 5:00 p.m.
Ghost Imaging via Compressed Sensing, *Ori Katz, Yaron Bromberg, Yaron Silberberg; Weizmann Inst. of Science, Israel.* We describe an advanced image reconstruction algorithm for pseudothermal ghost imaging, based on compressed sensing. Utilizing this algorithm, we experimentally demonstrate a 10-fold reduction in the required acquisition times for faithful image reconstruction.

FThX4 • 5:15 p.m.
Digital Reconstruction of Optically Induced Potentials, *Christopher Barsi, Jason W. Fleischer; Princeton Univ., USA.* The holographic reconstruction of objects in nonlinear media is experimentally verified. We demonstrate a simple approach for axially thick, optically induced potentials in a photorefractive crystal and compare results with a scattering experiment.

FThX5 • 5:30 p.m.
Efficient Propagation of Highly Aspheric Wavefronts for Computational Imaging, *James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Efficient computation of the propagation of wavefronts needed to analyze some computational imaging systems is accomplished by a divide-and-conquer approach.

FThX6 • 5:45 p.m.
Modulation of Polarization and Phase of Beams in a Tight Focusing System, *Jixiong Pu, Baosuan Chen, Ziyang Chen; Huaqiao Univ., China.* In the tightly focusing system, the modulation of polarization and phase of beams have been used to generate desired sub-wavelength focused spots, such as sub-wavelength bottle beams, and top-hat beams etc.

5:30 p.m.–8:00 p.m. Science Educators' Day, *McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021*

For Fall Congress presentations on Thursday, see pages 132-135.