
OSA FRONTIERS IN OPTICS LASER SCIENCE APS/DLS

Technical Conference & Virtual Exhibits: 14 – 17 September 2020

All Sessions Held Online: Eastern Daylight Time (EDT), GMT-04:00

Program & Speakers



Join the Visionaries at FiO + LS

OSA and APS/DLS, after assessing health and travel advisories related to COVID-19, have decided to present this year's conference as scheduled, but in an **all-virtual, web conference format**.

Technical sessions will be presented live from the Eastern Daylight Time Zone (EDT, GMT-04:00) with a recorded archive available later for on-demand viewing.

What Will be Presented Online?

All participants will receive access to the live technical sessions, recorded/archived content AND the Technical Digest. Access includes:

- Plenary sessions and Visionary talks
- All technical sessions (including invited speakers, contributed oral and poster presentations and postdeadline papers)

- Select industry-based, “show floor” programs
- Special events

Conference Themes

The Technical Conference is now organized around two themes that leverage the intersection between science and applications— the end result is intended to illustrate the research within the technology.

- Quantum Technologies (in conjunction with the OSA Quantum 2.0 Conference)
- Virtual Reality and Augmented Vision

Visionary Speakers

Plenary and invited speakers will still be an essential part of the technical program. However, a new category, visionary speakers, has been added to the mix. These individuals come from within and beyond the optics and photonics community — each equipped to provide insight into cutting-edge advances related to the four conference themes.

Format

As befitting the OSA Annual Meeting, all members will be given the ability to present a contributed paper.

Rapid-fire Oral Presentations, held in the Science Showcase Theater during the first hour of each poster session, a select number of poster presenters offer Rapid-fire Oral Presentations, which consist of a brief oral presentation accompanied by slides. This format enables poster presenters to preview key results from their research in brief, five-minute segments. In the session’s second hour, presenters are available for more in-depth discussions adjacent to their accompanying posters.

A select number of presentations will be offered as e-Posters—which supplements the author’s introduction, motivation, results and conclusions with digital capabilities that aid deeper discussion.

Plenary & Visionary Speakers

Plenary Speakers

Federico Capasso

Robert Wallace Professor of Applied Physics, Harvard University, USA

About the Speaker

Federico Capasso is the Robert Wallace Professor of Applied Physics at Harvard University, which he joined in 2003 after a 27-years career at Bell Labs from postdoc to Physical Research VP. He pioneered bandgap engineering of heterostructure materials and devices, including the quantum cascade laser, metasurface based flat optics, MEMS based on the Casimir effect and measured for the first time the repulsive Casimir force. He is a member of NAS, NAE and the American Academy of Arts and Sciences (AAAS). His awards include the Balzan Prize for Applied Photonics, the King Faisal Prize, the APS Arthur Schawlow Prize, the AAAS Rumford Prize, the IEEE Edison Medal, The Optical Society Robert Wood Prize, the Materials Research Society Medal and the Witherill medal of the Franklin Institute.

Talk: Structuring Light with Flat Optics

Metasurfaces can generate arbitrary vector beams. I will discuss recent work on spin to total orbital angular momentum (OAM) converters including high OAM lasing, flat devices that enable light's spin and OAM to evolve, simultaneously, from one state to another along the propagation direction and polarizing elements that virtually rotate their orientation as a function of the propagation distance.

Nergis Mavalvala

Professor, Massachusetts Institute of Technology, USA

About the Speaker

Nergis Mavalvala, Marble Professor of Astrophysics at the Massachusetts Institute of Technology and a 2010 recipient of a MacArthur "genius" award, is a physicist whose research focuses on the detection of gravitational waves. She is a longstanding member of the scientific team that announced the first direct detection of gravitational waves from colliding black holes by the Laser Interferometer Gravitational-wave Observatory. Mavalvala has also conducted pioneering experiments on generation and application of squeezed states of light, and on laser cooling and trapping of macroscopic objects to enable observation of quantum phenomena in human-scale systems. Mavalvala received a BA from Wellesley College and a PhD from MIT. She was a postdoctoral fellow and research scientist at the California Institute of Technology before joining the Physics faculty at MIT in 2002.

Visionary Speakers

Elizabeth Baron

Enterprise Solutions Executive, Unity Technologies, USA

About the Speaker

Elizabeth Baron is an Enterprise Solutions Executive at Unity Technologies, where she creates solutions for the industrial design, engineering and manufacturing space, based on the innovative Unity platform that powers creation at all points in the product development process. She applies holistic and creative solutions for enterprise to connect knowledge with experience for cross-functional teams.

Formerly, Elizabeth became the first Virtual Reality Technical Specialist at Ford. She was awarded the highest individual technical honor at Ford, the Dr. Gandhi Research and Innovation Award, honoring her career in immersive visualization. Elizabeth received the SIGGRAPH Practitioner Award, for her contributions to industrial design, and her influence on multiple industries.

Talk: Experiential Immersion — Enhanced Insight from Virtual Experiences

Elizabeth will detail her experience acquiring stereoscopic vision as an adult, and how perception and presence were affected. She will provide insight into the importance of visual cues for scientific discovery and artistic creativity (and the link between art and science), based on her work creating immersive environments and her personal experience.

Michael Escuti

Chief Technology Officer and Co-Founder, ImagineOptix, USA

About the Speaker

Michael Escuti is a leading liquid crystal and photonics expert pioneering the development of polarization gratings, geometric phase holograms, and devices/systems using them. As Associate Professor of Electrical Engineering at North Carolina State University, he pursues interdisciplinary research topics in opto-electronics, telecom, flat-panel displays, and well beyond. He has been recognized by the Presidential Early Career Award for Scientists and Engineers (PECASE, 2011) and the Alcoa Foundation Engineering Research Achievement Award (2011) for his work at NCSU. He earned his PhD and MS degrees at Brown University and completed a Post-Doc at the Eindhoven University of Technology (Netherlands). As of February 2015, he is a named inventor on 21 issued and 52 pending patents. He has published more than 108 refereed journal and conference publications, has presented 30 invited research talks, and has co-authored 1 book chapter. He has also served as expert witness in patent litigation before the US Patent & Trademark Office and US International Trade Commission.

Mikhail Lukin

George Vasmer Leverett Professor of Physics, Harvard University, USA

About the Speaker

Mikhail Lukin received the Ph.D. degree from Texas A&M University in 1998. He has been a Professor of Physics at Harvard since 2004, where he is currently co-Director of the Harvard Quantum Initiative in Science and Engineering and co-Director of the Harvard-MIT Center for Ultracold Atoms. He has co-authored over 400 technical papers and has received a number of awards, including the Alfred P. Sloan Fellowship, David and Lucile Packard Fellowship for Science and Engineering, NSF Career Award, Adolph Lomb Medal of the Optical Society of America, AAAS Newcomb Cleveland Prize, APS I.I.Rabi Prize, Vannevar Bush Faculty Fellowship, Julius Springer Prize for Applied Physics, and the Willis E. Lamb Award for Laser Science and Quantum Optics. He is a fellow of the OSA, APS, and AAAS and a member of the National Academy of Sciences. Mikhail Lukin's research is in the areas of quantum optics and quantum information science. His current interests include quantum manipulation of atomic and nanoscale solid-state systems, quantum metrology and its applications, quantum nonlinear optics and nanophotonics. He and his group are developing new techniques for controlling strongly interacting photons, ultracold atoms, and solid-state atom-like systems. These techniques are used to study fundamental physical phenomena associated with quantum dynamics of many-body systems and to facilitate implementation of novel applications in quantum information processing, quantum communication and quantum metrology. These include realization and studies of novel quantum states of matter away from equilibrium, realization of quantum computers and quantum networks, and development of nanoscale quantum sensors with applications ranging from material science to biological imaging. In the course of this work they are also exploring the new scientific interfaces between quantum optics, atomic physics, condensed matter and information science.

Talk: Programmable Quantum Systems for Simulations, Computation and Networking

Realization of quantum systems that may be capable of outperforming the existing classical counterparts in executing useful tasks is a central challenge in quantum science and engineering. In this talk, I will describe two related examples of our recent work towards these goals. In the first example, I will describe the recent advances involving programmable, coherent manipulation of quantum many-body systems using atom arrays excited into Rydberg states. I will describe our recent technical upgrades that now allow the control over 200 atoms in two-dimensional arrays. Recent progress involving the exploration of exotic many-body phenomena, as well as realization and testing of quantum optimization algorithms using such systems, will be discussed. In the second example, I will report on our progress towards realization of quantum repeaters for long-distance quantum communication. Specifically, I will describe

experimental realization of memory-enhanced quantum communication, which utilizes a solid-state spin memory integrated in a nanophotonic diamond resonator to implement asynchronous Bell-state measurements. This enables a four-fold increase in the secret key rate of measurement device independent quantum key distribution over the loss-equivalent direct-transmission method while operating at megahertz clock rates. Prospects for scaling up these techniques, including realization of larger quantum processors and quantum networks will be discussed.

Shaul Mukamel

Distinguished Professor, University of California, Irvine, USA

About the Speaker

Shaul Mukamel, a Distinguished Professor of Chemistry and Physics and Astronomy at the University of California, Irvine, had received his PhD in 1976 from Tel Aviv University and held faculty positions at Rice University, the Weizmann Institute of Science and the University of Rochester. He is a member of the American Academy of Arts & Sciences and the National Academy of Sciences. Mukamel had pioneered coherent ultrafast multidimensional spectroscopy techniques, which are used for monitoring elementary energy and charge transfer molecular events. Recently he had developed nonlinear attosecond X-ray techniques and employed quantum light and photon entanglement as spectroscopic tools.

Talk: Ultrafast Spectroscopy and Imaging of Molecules with X-ray and Quantum Light

Strongly-coupled nonadiabatic electron and nuclear dynamics at conical intersections are studied by stimulated X-ray Raman and diffraction signals with high spatial, spectral and temporal resolutions. Nonlinear optical signals induced by quantized light fields and entangled photon pairs are shown to reveal information about elementary molecular events not accessible by classical light.

Nathalie Picqué

Research Scientist, Max-Planck Institute of Quantum Optics, Germany

About the Speaker

Nathalie Picqué (Doctoral degree, Université Paris-Sud Orsay, France 1998) is a senior scientist at the Max-Planck Institute of Quantum Optics, Garching, Germany, where she leads a research group on frequency combs and molecular spectroscopy since 2011. Before, she was a permanent research scientist with the Centre National de la Recherche Scientifique (CNRS) in Orsay (France). An OSA Fellow, she has received numerous prizes, including the Bronze Medal of the CNRS, the Jean-Jerphagnon Prize of the French Physical Society, the Beller-Lectureship Award of the American Physical Society and the Coblentz Award of the Coblentz Society.

Talk: Frequency Comb Spectroscopy: Stop or Go?

Frequency combs have revolutionized time and frequency metrology. Their application to spectroscopy over broad spectral bandwidths attracts an ever-increasing number of scientists because of the intriguing potential for high accuracy, resolution and recording speed. Building on some exciting recent developments, this talk will draw a personal perspective on the prospects of frequency comb spectroscopy.

Invited Speakers

Fabrication, Design, and Instrumentation

- Aaron Bauer
University of Rochester, USA
Exploring the Design Space of 3-mirror Freeform Imagers
- Changhe Zhou
Shanghai Institute of Optics, China
From Picometer Comb to Picooptics
- Rongguang Liang
University Arizona, USA
On-machine Metrology for Precision Diamond Turning Process
- Siddharth Ramachandran
Boston University, USA
Optical Activity in Strictly Isotropic Materials (Fibers)

Optical Interactions

- Benjamin Sprenger
Menlo Systems GmbH, Germany
Complete Laser System for Strontium Lattice Clock Based on Frequency Comb
- Clara Saraceno
Ruhr Universität Bochum, Germany
High-power Ultrafast Thin-disk Lasers and their Applications for Terahertz Generation
- Din Ping Tsai
Hong Kong Polytechnic University, Hong Kong
Optical Meta Devices: Eyes to the Future
- Henry Kapteyn
KMLabs, USA
A New Class of MHz Repetition-rate Vacuum-ultraviolet Laser Source Based on Highly-cascaded Harmonic Generation
- Michelle Sander
Boston University, USA
Mode-locked High Repetition Rate Fiber Laser Dynamics
- Raktim Sarma
Sandia National Laboratories, USA
An All-dielectric Polaritonic Metasurface with Giant Nonlinear Response
- Tingyi Gu
University of Delaware, USA
Foundry Integrated Nanophotonic Devices and Metasystems
- Xiaojun Wu
Beihang University, CHINA

Quantum Electronics

- Amir Safavi-Naeini
Stanford University, USA
Quantum Optomechanics
- Blair Morrison
Xanadu, Australia
Integrated Squeezed Light Sources for Photonic Quantum Computing
- Joerg Wrachtrup
University of Stuttgart, Germany
Si Vacancy Centers in SiC
- Julien Laurat
Laboratoire Kastler Brossel, France
Quantum Optics with Nanoscale Waveguides and Cold Atoms
- Marina Radulaski
University of California Davis, USA
Silicon Carbide Color Center Quantum Nanophotonics
- Val Zwiller
Kungliga Tekniska Hogskolan Kista, Sweden
Integrated Quantum Nanophotonics

Fiber Optics and Optical Communications

- David A. B. Miller
Stanford University, USA
Finding the Right Modes for Communicating with Optics
- Ming Jun Li
Corning Research, USA
Optical Fiber Evolution over the Past Five Decades
- Xi (Vivian) Chen
Nokia Bell Labs, USA
Ultra-high Symbol Rate Generation via Electrical Multiplexing
- Zhixin Liu
University College London, UK
Dual-frequency Comb Assisted Analog-to-digital Conversion

Integrated Devices for Computing, Sensing and Other Applications

- Costanza Toninelli
LENS, Italy
Quantum Optics with Single Organic Molecules Coupled to Integrated Circuit
- Jelena Vuckovic
Stanford University, USA
Particle Accelerator on an Integrated Photonic Chip
- Juerg_x000D_ Leuthold
Zurich, Switzerland

Atomic-scale Photonic Memristive and Nano-opto-electro-mechanical Devices Enabled by Plasmonics

- Milan Mashanovitch
Freedom Photonics, LLC, USA
Photonic Integrated Circuits and Packaging
- Otto Muskens
University of Southampton, UK
Ultrafast Control of On-chip Plasmonics

- Po Dong
Nokia Bell Labs, USA
Directly Reflectivity Modulated Laser for Optical Communications
- Wim Bogaerts
Universiteit Gent - IMEC, Belgium
Programmable Photonic Circuits: A Flexible Way of Manipulating Light on Chips

Optics in Biology, Medicine, Vision and Color

- Caroline Boudoux
Castor Optics, Canada
Dual-clad Couplers, Circulators and Lanterns: New Couplers for Sensing and Imaging
- Maciej Wojtkowski
Institute of Physical Chemistry, Poland
Spatio-temporal Optical Coherence Imaging of Human Eye
- Muyinatu Lediju Bell
Johns Hopkins University, USA
Listening to the Sound of Light to Guide Surgeries
- Tomasz Kozacki
, POLAND

Information, Acquisition, Processing and Display

- Hong-Seok Lee
Samsung Electronics (SAIT), Korea
Holographic Flat Panel Display
- Juan Liu
Beijing Institute of Technology, China
3D Holographic Display
- Tomoyoshi Shimobaba
Chiba University, Japan
Dedicated Processor for Holography Assisted by Deep Neural Networks

- Andrew White
, AUSTRALIA
- Artem Bakulin
FOM Institute AMOLF, Netherlands
Ultrafast Spectroscopy of Electron-phonon Effects in Hybrid Perovskite Electronic Materials
- Dirk Englund
Massachusetts Institute of Technology, USA
Photonic ML Accelerators
- Dominik Schneble
Stony Brook University, USA
Decay Dynamics of Matter-wave Quantum Emitters in a Band Structure
- Farhan Rana
Cornell, USA
Exciton-trion-polaritons in Two-dimensional Materials; Correlated Many Body States of Matter and Light
- Greg Scholes
Princeton University, USA
Coherence and Ultrafast Dynamics of Molecular Polaritons
- James Cryan
SLAC National Accelerator Laboratory, USA
Attosecond Science at X-ray Free Electron Lasers
- Jeff Thompson
Princeton University, USA
Towards Quantum Networks with Erbium Ions and Integrated Silicon Nanophotonics
- Jennifer Ogilvie
University of Michigan, USA
Shedding New Light on Photosynthetic Systems Using Multidimensional Spectroscopies
- Keith Nelson
MIT, USA
THz Polaritonics: New Horizons in Optics and Spectroscopy
- Laura Sinclair
National Inst of Standards & Technology, USA
Pushing the Boundaries of Optical Time and Frequency Transfer Across Open Air Paths
- Michael Chini
University of Central Florida, USA
Towards Attosecond Science with Industrial-grade Lasers
- Monika Schleier-Smith
Stanford University, USA
Title to be Announced
- Nora Berrah
University of Connecticut, USA

Probing Molecular Dynamics in Real Time from Within with Free Electron Lasers

- R. J. Miller

University of Toronto, Canada

Mapping Atomic Motions with Ultrabright Electrons: Fundamental Space-Time Limits to Imaging Chemistry

- Steve Cundiff

University of Michigan, USA

Comb-based Multidimensional Coherent Spectroscopy

- Takeshi Yasui

Tokushima Univ., Japan

Dual-comb Microscopy

- Virginia Lorenz

Univ. of Illinois, USA

Transverse-mode-entangled Photons in Optical Fiber

- Wendel Hill

Univ. of Maryland, USA

Precision Measurement of the Quantum Vacuum with Petawatt-class Lasers

- Yiwen Chu

ETH Zurich, Switzerland

Creating and Measuring Quantum States of Sound

- Yoshitomo Okawachi

Columbia University, USA

Photonic Integrated Comb Sources

- Young-Jin Kim

KAIST, South Korea

Multi-scale Dimensional Metrology with a Frequency Comb: From Sub-nanometers to Kilometers

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020.- Remote

[All times below are EDT]

SESSION LM2 from 11:00 to 12:30

Session LM2G: QUANTUM INFORMATION & QUANTUM OPTICS

11:00 – 12:30 Herman Batelaan, University of Nebraska, Presider

LM2G – 1 Clustering Algorithm for Predicting Quantum States in a Quantum Computer, *Feng Qian, Daniel J. Gauthier, The Ohio State University, Columbus, Ohio 43210*. I use a clustering algorithm to classify the output quantum state from the quantum Fourier transform circuit to determine the period of input data. I will describe the algorithm and its performance using simulated data.

LM2G – 2 High Fidelity Quantum Networks with Cold Atoms, *Andrew Pocklington, Shankar G Menon, Kevin Singh, Hannes Bernien, Pritzker School of Molecular Engineering, University of Chicago, Chicago, IL 60637*. Quantum networks have the potential to revolutionize many important technologies, from enhanced sensing to distributed quantum computing and secure quantum communication. We present a novel protocol utilizing a four-level scheme on Cesium qubits, and show a systematic approach to engineer high fidelity light matter interfaces based on photonic crystal cavities. Financial support is acknowledged from the University of Chicago.

LM2G – 3 Monte Carlo Simulation of Bell Inequalities, *Justin Willson, Eric Jones, Harold Metcalf, Stony Brook University, Stony Brook, NY 11794*. We studied the Clauser-Horne-Shimony-Holt (CHSH) inequality using numeric simulations of pure and mixed states. The probability of two-particle coincidence detection, maximum violation angles, and investigation of the different results in the value of S ($|S| \leq 2$ classically) for quantum and classical states will be discussed. Supported by the Simons Foundation through URECA.

LM2G – 4 Data Extraction Optimization of Strontium Atomic Interferometry, *Kunchaka Fonseka, Timothy Kovachy, Northwestern University, Evanston, IL 60208*. A Python-based simulation has been developed for the study of cooling and diffusion effects during imaging in atomic interferometry experimentation. Early investigation of the optimal fitting methods and apparatus parameters for data extraction and future applications of atomic interferometry will be discussed.

LM2G – 5 Hanbury Brown-Twiss (HBT) Explorations and Implications in the Digital Age, *Abhishek Cherath, Matthew Belzer, Eric Jones, and Harold Metcalf, Stony Brook University, Stony Brook, NY 11794*. A computational demonstration of the original HBT integral has been completed. We intend to build a replica of the original set up using digital tools instead of a correlation circuit. Future goals include making stellar, digital interferometers as well as a possible, novel approach to measuring gravitational waves. Supported by URECA and ONR.

LM2G – 6 Implementation of spin-to-charge conversion and investigation of charge dynamics in nitrogen-vacancy center defects in diamond, *Yanfei Li, Aedan Gardill, Matt Cambria, Shimon Kolkowitz, University of Wisconsin-Madison, WI, 53715*. We implemented a spin-to-charge conversion (SCC) technique to improve the signal-to-noise ratio of electron spin state readout of nitrogen-vacancy (NV) centers in diamond. We also developed a model to describe the charge dynamics in ensembles of NVs to determine the optimal parameters for the SCC technique. The work was supported by the U.S. Department of Energy, Office of Science.

LM2G – 7 Classical Rules for Qubit Spin-Flip Error Minimization. *Qile Su, Wes Campbell, and Robijn Bruinsma, University of California, Los Angeles, CA 90095*. Composite pulse sequences (CPSs) can suppress errors in the control of single spins. The design of CPSs is often presented with a geometric method based on a quantum treatment. We show how perturbing classical Larmor precession generates the same method, and how one can intuitively modify sequences for additional robustness.

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020.- Remote

SESSION LM2 from 11:00 to 12:30

Session LM2H: OPTICAL SENSING & INSTRUMENTATION

11:00 - 12:30 Eric Borguet, Temple University, Presider

LM2H – 1 High-Harmonic Generation in the Water Window from mid-IR Laser Sources, *Keegan Finger, Klaus Bartschat, Kathryn R. Hamilton, Drake University, Des Moines, IA 50311*. We investigate the harmonic response of neon atoms to mid-IR laser fields (0.8 - 3 μ m) using the *ab-initio* R-Matrix with Time-dependence (RMT) method with a code optimized for high-performance supercomputing. The laser peak intensity and wavelength are varied to find optimal parameters for high-harmonic imaging in the water window. Supported by the NSF.

LM2H – 2 Polarization of water at the charged SrTiO₃/Water interface observed with second harmonic generation, *Truman Metz, Connor Rolleston, Somaiyeh Dadashi, Bijoya Mandal, Eric Borguet, Temple University, 1801 North Broad Street, Philadelphia, PA 19122*. Second harmonic generation has proven to be an effective probe to study interfaces. The SHG signal for the SrTiO₃/Water interface was recorded with varying pH values, in-turn allowing us to observe the alignment of water molecules in the electric field generated by pH induced charges at the interface. Supported by the Temple University Undergraduate Research Program (URP).

LM2H – 3 Hyperthermia of Magnetic Nanoparticles in Aqueous Solutions, *Wei Li, Dr. Maarij Syed, Nathaniel Fried, Rose-Hulman Institute of Technology, Terre Haute, IN 47803*. We explore the hyperthermia effects of magnetic nanoparticles (MNPs) of different sizes and concentrations in aqueous solutions when exposed to a magnetic field. We discuss their potential applications in hyperthermia treatment.

LM2H – 4 Delay Characterization of Cyclone V Field Programmable Gate Arrays (FPGAs), *Peter J. Menart, Caitlin L. Patterson, Liam M. Ramsey, Daniel J. Gauthier, Gregory P. Lafyatis, The Ohio State University, Columbus, OH 43210*. Ring oscillators are used to measure the delay of elements on an FPGA and characterize the variation of delay with respect to location. Knowledge of the variations in delay is crucial when using the FPGA for applications such as photon time-tagging. Supported by OSU Physics Department summer research scholarship.

LM2H – 5 Second Harmonic Analysis of the Magneto-Optic Response of Aqueous Magnetic Nanoparticles, *Nathaniel Fried¹, Maarij Syed¹, Codey Patterson², Wei Li¹, 1) Rose-Hulman Institute of Technology, Terre Haute, IN 47803 2) University of Michigan, Ann Arbor, MI 48109*. We study the aggregation dynamics of iron oxide magnetic nanoparticles (MNPs) using an AC Faraday rotation setup. In particular, the second harmonic of the response signal is analyzed since it correlates with the optical scattering of the MNPs. Results suggest a strong correlation with field frequency and particle size.

LM2H – 6 Development of a Computational Model for designing High-Efficiency Fresnel Lens Masks, *Rachel Hecht, Yunping Wang, Raven Dawson, Johnny Hergert, Amy Sullivan, Robert McLeod, University of Colorado Boulder, Boulder, CO 80309*. A computational model has been developed using beam propagation code to improve upon existing mask designs for creating gradient index Fresnel Lenses. The creation of this numerical program, along with an exploration into the relationship of a variety of simulated mask designs, will be discussed in the talk. Supported by NSF.

LM2H – 7 Stability and Characterization of Screen Printed Mesoporous Perovskite Solar Cells with a Carbon Electrode, *Hyunjin Hong, Adam Dvorak, David Tanenbaum, Pomona College, Claremont CA, 91711*. We fabricate and characterize perovskite solar cells with a mesoscopic scaffold of metal oxides and carbon nanomaterials infiltrated with a perovskite precursor solution. We combine imaging and analysis techniques with light soaking to investigate stability and degradation mechanisms over time. Supported by Pomona College grants, the Hirsch and Sontag families.

12:45 - 1:45

Career Insights & Advice

with OSA Honorary Members

William (Bill) Phillips and Elsa Garmire

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020 - Remote

SESSION LM4 from 2:00 to 3:30

Session LM4G: OPTICAL LATTICES & ATOMIC CLOCKS

2:00 - 3:30 Amy Sullivan, University of Colorado, Presider

LM4G – 1 Using photoassociation to control atom population in an optical lattice clock, *Brett Merriman, Haoran Li, Jonathan Dolde, Xin Zheng, Shimon Kolkowitz, Department of Physics, University of Wisconsin – Madison, WI 53706.* Atomic interactions in optical lattice clocks can hinder clock performance, but can be mitigated by deterministically loading at most one atom per lattice site. We analyze how to achieve a filling of zero or one atom per lattice site using the 1S_0 - 3P_1 photoassociation transition of strontium with realistic experimental parameters. Financial support provided by Wisconsin Alumni Research Foundation, NIST, John Templeton Foundation, ARO, and Packard Foundation.

LM4G – 2 Coherent Population Trapping (CPT) Interrogation in Atomic Clocks. *Dahlia Ghoshal¹, Juniper Pollock², Azure Hansen², William McGehee², John Kitching², 1) Columbia University, New York, NY 10027, 2) NIST, Boulder, CO 80305.* Ramsey interrogation is generally considered more robust than continuous-wave (CW) interrogation for CPT clocks. However, power broadening and buffer gas collisions can create regimes in which CW offers better clock stability. We numerically simulate both techniques in a lambda system in rubidium to find their respective optimal regimes. Supported by NIST.

LM4G – 3 Designing a Deep-Sea Atomic Clock for Geological Research and Exploration, *Liam Brennan¹, Leo Hollberg², 1) University of Florida, Gainesville, FL 32611, 2) Stanford University, Stanford, CA 94305.* We designed an underwater Cesium-based Atomic Clock system for use in exploration, navigation, and geological research. This system will operate under high pressures, low temperatures, and utilize only small amounts of power for lengthy durations of time. Supported by Stanford University and The Leadership Alliance.

LM4G – 4 Developing a network of synthetically coupled mechanical oscillators to demonstrate topological effects, *Ritika Anandwade¹, Ellen Carlson², Yaashnaa Singhal¹, Michael Castle¹, Caitlyn Battle-McDonald³, Sai Paladugu¹, Shraddha Agarwal¹, Bryce Gadway¹, 1) University of Illinois at Urbana-Champaign, Urbana, IL 61801, 2) Haverford College, Haverford, PA 19041, 3) Smith College, Northampton, MA 01063.* Energy exchange between harmonic oscillators coupled in a network provides a mechanical analog to explore lattice transport phenomena. Using laser-based position monitoring and external driving by magnetic fields, we implement a new platform of synthetic mechanical network. Oscillators are tuned and coupled through remote feedback-control. We will present preliminary results. This material is based upon work supported by the NSF.

LM4G – 5 Observation and characterization of stochastic resonance in directed propagation of cold atoms, *Kefeng Jiang, Alexander Staron, Ajithamithra Dharmasiri, Anthony Rapp, Samir Bali, Department of Physics, Miami University, Oxford, OH 45056.* We report on the observation and first experimental characterization of stochastic resonance in a modulated optical lattice, i.e., a resonant enhancement in the conversion of random atomic recoils from spontaneous emission into directed motion. We study the dependence of stochastic resonance on modulation depth and lattice well depth. Funded by Army Research Office (ARO).

LM4G – 6 Modeling photoassociation in a multiplexed strontium optical lattice clock, *Haoran Li, Brett Merriman, Jonathan Dolde, Xin Zheng, Shimon Kolkowitz Department of Physics, University of Wisconsin – Madison WI 53706.* We have modeled the process of removing pairs of strontium atoms with a 1S_0 – 3P_1 photoassociation transition until one or zero atom is left on each lattice site. We also constructed a low-noise photodiode that will be used for intensity noise suppression of our lattice laser. Financial support provided by: Wisconsin Alumni Research Foundation, NIST, John Templeton Foundation, ARO, and Packard Foundation.

LM4G – 7 Analytic Calculation of Wannier Functions for Optical Lattice Experiments, *Max L. Prichard, Peter E. Dotti, David M. Weld, University of California, Santa Barbara, Santa Barbara, CA 93106.* We demonstrate the calculation of Maximally Localized Wannier Functions for general 2-D optical lattice experiments by mapping the procedure to an eigenvalue problem. We find this method to be more robust than numerical optimization methods and easily generalizable to higher dimensions and more complicated lattices. Supported by NSF, CAIQUE, and UCSB MRL.

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020 - Remote

SESSION LM4 from 2:00 to 3:30

Session LM4H: NOVEL IMAGING METHODS - I

2:00 - 3:30 Michael Durst, Middlebury College, Presider

LM4H – 1 Using Talbot Interferometry for Coherent Imaging, *Mitchell C. Cutler, Daniel Hodge, Richard L. Sandberg, Eyring Science Center, Brigham Young University, 1 Campus Drive, Provo, Utah 84604.* Talbot Interferometry has been previously used to characterize wavefronts in x-ray free-electron (XFEL) lasers. We demonstrate how this same method can be used to directly measure the phase of objects through coherent imaging. This method eliminates the phase problem, making it much more robust than traditional coherent diffractive imaging. Funding from SLAC National Accelerator Laboratory through the U.S. Department of Energy - Fusion Energy Sciences Program.

LM4H – 2 Effects of Astigmatism on Ptychographic Coherent Diffractive Imaging Reconstructions, *Blake Buckner, Paul Arpin, Department of Physics, California State University, Chico, Chico, CA 95929.* Diffractive Imaging is a technique used in soft x-ray imaging to reconstruct the image of an object from its far-field diffraction pattern. Work in ptychography has shown improved reconstructions with the introduction of random masks. We investigate the effects of astigmatism in the illuminating beam on the quality of reconstructions. Supported by CSU, Chico College of Natural Sciences.

LM4H – 3 Toward Two-Photon Excitation with Supercontinuum Generation, *Ruben Vargas, Michael E. Durst, Middlebury College, Middlebury, VT, 05753.* We investigate supercontinuum generation as a long-wavelength excitation source for two-photon imaging. The split-step Fourier method propagates an ultrashort pulse through a photonic crystal fiber, including the effects of chromatic dispersion, self-phase modulation, and Raman scattering. We compare our numerical simulations in Python to experimental results. Supported by the Palen family through the Elizabeth Miller Palen '40 Fund.

LM4H – 4 Image tracking in Python for analysis of trapped crystal motion, *Adam Mulla, Catherine M. Herne, SUNY New Paltz, New Paltz, NY 12561.* When acted on by a laser, birefringent rhombohedral calcite crystals experience torque due to changes in angular momentum of the light. We use optical tweezers to trap and record crystal motion. We analyze the torque with a motion-tracking program in Python to quantify the rotation. Supported by RSCA.

LM4H – 5 Digital Plasmonic Holography with Iterative Phase Retrieval for Sensing. *Ryan M. Spies¹, Isaac M. Vliem¹, Britta G. Nordberg¹, Grace H. Cole¹, Marit A. Engevik¹, Evan A. Scharnick¹, Alexandre G. Brolo^{2,3}, and Nathan C. Lindquist¹, 1) Bethel Univ. St. Paul, MN 55112, 2) Department of Chemistry, University of Victoria, Victoria, BC, V8P 5C2, Canada, 3) Centre for Advanced Materials and Related Technologies (CAMTEC), University of Victoria, Victoria, BC, V8W 2Y2, Canada.* Digital holographic microscopy is an emerging technique that provides high-resolution imaging without lenses and captures both the amplitude and phase of light waves. Here, digital holographic techniques are combined with leakage radiation microscopy and used for lens-less, in-plane surface imaging with propagating surface plasmon waves. Supported by NSF.

LM4H – 6 Building of an electron dispersion compensator, *Jackson Lederer, Jared Murray, Hua-Chieh Shao, Bret Gergely, Martin Centurion, Herman Batelaan, University of Nebraska-Lincoln, Lincoln, NE 68588.* The project involves development of an apparatus designed to use electric and magnetic fields to focus the spread of electrons with different energy levels in time. The projection is to drop theoretical spread from 10 ns to 1 ns as has been confirmed by computer generated simulations. Supported by NSF.

LM4H – 7 Simulating two dimensional crystals in quadrupole traps. *Apurva Goel, Alexander Kato, Boris Blinov, University of Washington, Seattle, WA 98122.* Molecular dynamics (MD) is a robust tool to investigate the experimental conditions that facilitate different configurations in various trapping potentials. We discuss MD simulations we have devised for 2D ion crystals in ring trap potentials with the goal of optimization and scalability for large qubit systems in quadrupole traps. Supported by UW Royalty Research Fund.

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020 - Remote

SESSION LM5 from 3:45 to 5:05

Session LM5G: ENTANGLED LIGHT & TWISTED LIGHT: APPLICATIONS

3:45 - 5:05 Irina Novikova, College of William and Mary, Presider

LM5G – 1 Ultra-Bright Entangled-Photon Pair Generation from III-V Microresonators, *Quynh Dang, Joshua Castro, Trevor J. Steiner, Lin Chang, Weiqiang Xue, Chenlei Li, Justin Norman, John E. Bowers, and Galan Moody, University of California-Santa Barbara, Santa Barbara, CA 93106.* Entangled-photon pairs are generated with spontaneous four-wave mixing (SFWM) from AlGaAs-on-insulator microring resonators with a Q-factor of over one million. This work demonstrates an ultra-bright, ultra-high-rate photon pair generation. The physics of the SFWM process and the experimental development will be discussed in the talk. Supported by NSF and AFOSR.

LM5G – 2 Optical Tweezer Geometries for Atomic Qubit Array. *Haley Nguyen, Jordan Kemp, Hannes Bernien, University of Chicago and Pritzker School of Molecular Engineering, Chicago, IL 60637.* Arrays of optical tweezers are an enabling technology for Rydberg atom quantum systems. We compare the effectiveness of multiple tweezer geometries for trapping single Cesium and Rubidium atoms, examining attractive and repulsive traps and exploring trap tightening with higher order Laguerre-Gaussian mode beams.

LM5G – 3 Classifying Laguerre-Gaussian (LG) Optical Modes via their Unique Multimode Fiber Output Patterns using a Deep Learning Approach, *Sofia Brown, Savannah Cuozzo, Irina Novikova, College of William and Mary, Williamsburg, VA 23185.* We classify basic LG modes by passing them through a multimode fiber and by using the output speckle images to train the convolutional neural network to identify the topological charge of the optical vortex. We explore fiber stability, image characteristics and training parameter optimization to maximize the recognition accuracies. This research was supported by AFOSR.

LM5G – 4 Storing Twisted Light in Warm Alkali Vapor, *Jianqiao Li, Kefeng Jiang, Kenneth DeRose, and Samir Bali, Department of Physics, Miami University, Oxford, OH 45056.* Laguerre-Gaussian optical modes, or twisted light, carry robust topological stability enabling their conversion into atomic coherence, followed by storage and later retrieval with phase features intact. Experimental and theoretical results are presented to verify both storage efficiency and topological retentivity of twisted light, with an "imposter" beam used for comparison. Supported by ARO and Miami University.

LM5G – 5 Resonance Raman of β -Carotene in Methanol with Structured Vector Light Beams, *Noah A. Hovde, Henry Meyer, Sandra Mamani, and R. R. Alfano, CUNY IUSL at CCNY, Physics Dept, The City College of New York, NY, NY 10031.* Resonance Raman scattering (RRS) lines from β -carotene-methanol solution for different polarizations and wavefronts of vector beams will be presented. The strength of Raman lines from a linearly polarized (LP) beam with OAM $L=0$ will be compared with that of circularly polarized (CP) light with $L=0$ and circular Laguerre-Gauss (LG), radially, and azimuthally polarized beams with $L=1$.

LM5G – 6 Conservation of orbital angular momentum distribution and extremal ellipticity for simple and general astigmatic Gaussian beams. *Duc H. Le¹, A. Pal¹, A. Qadeer¹, M. Kleinert², J. Kleinert³, S. Goel⁴, K. Khare⁴, and M. Bhattacharya¹, 1) Rochester Institute of Technology, Rochester, NY 14623, 2) Willamette University, Salem, OR 97301, 3) Electro Scientific Industries, Portland, OR 97229, 4) Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India.* We demonstrate that the conservation of extremal ellipticity for an astigmatic Gaussian beam propagating in a rotationally invariant medium, initially identified by Lo et al. [Applied Optics 56, 2523 (2017)], is a direct consequence of the conservation of the orbital angular momentum distribution of the beam. Supported by NSF.

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020 - Remote

SESSION LM5 from 3:45 to 5:05

Session LM5H: SPECTROSCOPY

3:45 - 5:05 Catherine Herne, SUNY New Paltz, President

LM5H – 1 Characterizing the Bound States of Strontium Dimers on the $5s^2\ ^1S_0 + 5s5p\ ^1P_1$ Potential. *Priyansh Lunia, Will Huie, Joshua Hill, Thomas Killian, Department of Physics and Astronomy, Rice University, Houston, TX 77005.* We present spectroscopic measurements and theory for the binding energies of strontium dimers on the $5s^2\ ^1S_0 + 5s5p\ ^1P_1$ potential. Leroy-Bernstein parameters and an effective potential describing data for multiple isotopes (including fermionic ^{87}Sr) will be discussed. These results will guide experiments using photoassociation to probe quantum gases of strontium. Supported by Rice University and NSF.

LM5H – 2 Towards Cavity-Enhanced Two-dimensional Infrared (2DIR) Spectroscopy, *Neomi A. Lewis, Myles C. Silfies, Anthony Catanese, Jay Rutledge, Grzegorz Kowzan, Alexander Kramer and Thomas K. Allison, Stony Brook University, Departments of Chemistry and Physics, Stony Brook, NY 11794.* We propose a new scheme for two-dimensional mid-infrared spectroscopy using cavity-enhancement techniques to study hydrogen bond networks. We will use pump and probe beams generated by optical parametric amplifiers. Phase cycling 2DIR spectroscopy is achieved using multiple frequency combs. My project focuses on planning layouts and integrating all necessary components. Supported by NSF, AFOSR and PSEG.

LM5H – 3 Rubidium Isotope Shift Measurement using Noisy Lasers, *Theodore J. Bucci¹, Jonathan Feigert¹, Michael Crescimanno¹, Brandon Chamberlain², Alex Giovannone²,* 1) *Youngstown State University, Youngstown, OH 44515,* 2) *The Ohio State University, Columbus, OH 43210.* We describe theoretically why the typical advanced undergraduate rubidium SAS laboratory works well with free-running laser diodes, demonstrate it experimentally using these lasers tuned to either principal near-infrared transitions, and show an extension of the laboratory using the modulation transfer spectroscopy method.

LM5H – 4 Two-photon Spectroscopy with Rubidium at 778nm, *River Beard, Nathan D. Lemke, Bethel University, Saint Paul, MN 55112.* Spectral line broadening in a $5S - 5D$ two-photon transition in natural rubidium is studied under varied environmental conditions, such as vapor cell temperature, magnetic field, and AC frequency of magnetic field-generating heating elements. Linear and circular polarization states of counter-propagating beams are used separately to interrogate at 778nm. Supported by NASA through the Minnesota Space Grant Consortium.

LM5H – 5 Power Narrowing via Optical Pumping, *Matthew C. Commons, Aaron Weiser, Jonathan Feigert, Michael Crescimanno, Department of Physics, Youngstown State University, Youngstown, OH 44515.* Saturated absorption spectroscopy (SAS) using multiple phase-independent optical fields reveals the effect of optical pumping on the formation of the depth and width of SAS features. We quantitatively compare experimental results of SAS processes in D1-D1 (pump-probe) and D1-D2 optical fields with a strictly population-based theoretical model of power driven resonance narrowing effects in ^{87}Rb .

LM5H – 6 Measurements of the Fine Structure of the Bismuth Negative Ion, *Sarah E. Spielman¹, Remington Ponce¹, John N. Yukich², Charles Cheung³, Marianna S. Safronova³, N. Daniel Gibson¹, and C. Wesley Walter¹,* 1) *Denison University, Granville, OH 43023,* 2) *Davidson College, Davidson, NC 28035* 3) *University of Delaware, Newark, DE 19716.* We have conducted preliminary measurements of the bound excited state of the bismuth anion, $\text{Bi}^- (6p^4\ ^3P_0)$. Using laser photodetachment spectroscopy, we measured the binding energy of the $\text{Bi}^- \ ^3P_0$ state and observed the photoexcitation of the $\text{Bi}^- \ ^3P_0$ state from the $\text{Bi}^- (6p^4\ ^3P_2)$ ground state. Supported by NSF and Denison University.

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020 - Remote

SESSION LM6 from 5:20 to 6:15

Session LM6G: NOVEL IMAGING METHODS - II

5:20 - 6:15 Nathan Lindquist, Bethel University, Presider

LM6G – 1 Remote Axial Scanning and Light-Field Refocusing in a Temporal Focusing Microscope, *Sydney Hom, Kazuto Nishimori, and Michael E. Durst, Middlebury College, Middlebury, VT 05753.* Using Fourier optics, we simulate numerically the excitation and detection paths in a temporal focusing microscope. We demonstrate how changing the dispersion remotely scans the depth of the focal plane, and that Fourier light-field detection can re-focus these shifted planes computationally. Supported by the DeWitt Research Fund.

LM6G – 2 Polarimetry Studies on Birefringent Materials in Optical Tweezers, *Akza Sam, Faye Lyons, Catherine M. Herne, SUNY New Paltz, New Paltz, NY 12561.* We explore polarimetry as a method to quantify the torque produced when polarized light passes through a birefringent calcite crystal. We obtain images for six states of polarization, and process the images in MATLAB to produce a map which shows the change in polarization. Supported by RSCA.

LM6G – 3 Using Digital Holography to Visualize and Measure Mechanical Deflection and Thermal Expansion, *Daniel C. Jamison and Nathan C. Lindquist, Bethel Univ., St. Paul, MN 55112.* We used digital holography to visualize and measure small deflections of an aluminum beam. By subtracting two holograms of a loaded and unloaded beam, the amount of bend was quantified under different applied forces. By heating the beam, we were also able to visualize thermal expansion. Supported by NSF.

LM6G – 4 Coherent Diffraction Imaging and Sample Characterization, *Landon Schnebly, Richard Sandberg, Brigham Young University, Provo, UT, 84604.* We seek to use x-ray coherent diffraction imaging to study how things break at the nanometer scale. Preliminary sample characterization using electron backscatter diffraction was used to identify interesting sites and retrieve surface level information.

Session LM6H: NOVEL IMAGING METHODS - III

5:20 - 6:15 Klaus Bartschat, Drake University, Presider

LM6H – 1 Comparison of Computational Ghost imaging to Normal Imaging techniques. *Anjaneshwar Ganesan¹, Herman Batelaan¹, Serra Efren², 1) University of Nebraska, Lincoln, NE 68588, 2) Naval Research Laboratory, Monterey, CA 93943.* Using Dr. Shapiro's paper on computational ghost imaging, we are exploring whether the image quality of ghost imaging is equal to or better than normal imaging techniques, with varying exposure of light to the object. The experiments are simulated using Python. Supported by NSF.

LM6H – 2 Measuring Beam Pointing Fluctuations Using a Four-Quadrant Photodiode. *Edward J. Shea and Elizabeth A. Goldschmidt, Univ. of Illinois Urbana-Champaign, Urbana, IL 61801.* Mechanical vibrations from a closed-cycle cryostat and other equipment excite mechanical modes in an optical table, which causes laser beam position fluctuations downstream. We investigate these fluctuations in a new laboratory to isolate and characterize new sources of noise in future experiments. Funding: John A. Gardner Undergraduate Research Award.

LM6H – 3 Sideband Oscillation Phase Analysis of Reconstruction of Atto-second Beating By Two-Photon Transitions (RABBITT) Scans, *David Atri-Schuller¹, Gavin Menning¹, Kathryn R. Hamilton¹, Klaus Bartschat¹, Nicolas Douquet², Divya Bharti³, Anne Harth³ 1) Drake University, Des Moines, IA 50311, 2) Kennesaw State University, Kennesaw, GA 30144, 3) Max-Planck Institute for Nuclear Physics, 69117 Heidelberg, Germany.* We employ multi-sideband RABBITT-like schemes to investigate the dependence of the sideband oscillation phase on the probe field's intensity, frequency, pulse duration, and chirp parameters. Results from *ab-initio* time dependent Schrödinger equation calculations on atomic hydrogen are compared to predictions from lowest-order perturbation theory. Supported by the NSF and the Deutsche Forschungsgemeinschaft.

LM6H – 4 Extracting Phase Information on Continuum-Continuum Couplings, *Gavin Menning¹, David Atri-Schuller¹, Thomas Pauly¹, Kathryn R. Hamilton¹, Klaus Bartschat¹, Nicolas Douquet², Divya Bharti³, Anne Harth³ 1) Drake University, Des Moines, IA 50311, 2) Kennesaw State University, Kennesaw, GA 30144, 3) Max-Planck Institute for Nuclear Physics, 69117 Heidelberg, Germany.* We present a modified RABBITT scheme capable of isolating the continuum-continuum (CC) component of photoionization time delays. Calculations of the CC time delay in argon are carried out using the multi-electron R-Matrix with Time-dependence method (RMT) and will provide support for an ongoing experiment at the Max-Planck Institute in Heidelberg. Supported by the NSF and the Deutsche Forschungsgemeinschaft.

SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXXVI - 14 September 2020 - Remote

SESSION LM7 from 6:30 to 7:15

LM7G – 1 Brad Conrad, Director, Society of Physics Students & Sigma Pi Sigma

“Physicist Random Walk: Careers, Graduate School, & Mental Maintenance”



Symposium organized by Samir Bali and Harold Metcalf

2020 Theme: Virtual Reality + Augmented Reality

Monday, 14 September

10:30 – 12:30

Grand Challenges for AR/VR: Optics, Systems and Perception

Learn about the past, present, and future of AR/VR from three leaders that are advancing the science and technology underpinning wearable displays. This session covers the latest optical designs, new display system concepts, and fundamental vision science.

Moderator

Douglas Lanman, *Facebook Reality Labs, USA*

Speakers

Douglas Lanman, *Facebook Reality Labs, USA*

Gordon Wetzstein, *Stanford University, USA*

Hong Hua, *The University of Arizona, USA*

Martin Banks, *University of California, Berkeley, USA*

12:30 – 13:30

Visionary Speaker

Elizabeth Baron, *Unity Technologies, USA*

Talk: Experiential Immersion — Enhanced Insight from Virtual Experiences

Elizabeth will detail her experience acquiring stereoscopic vision as an adult, and how perception and presence were affected. She will provide insight into the importance of visual cues for scientific discovery and artistic creativity (and the link between art and science), based on her work creating immersive environments and her personal experience.

13:30 – 15:30

Near-Eye Holographic Displays

Digital holography has always appeared to be impractical, in the near term, but preferred as the long-term solution for near-eye displays. This session will review how near-eye holographic displays are rapidly advancing in practicality due to new display system concepts, camera-in-the-loop calibration methods, and accelerated machine learning algorithms.

Moderator

Felix Heide, *Princeton University, USA*

Speakers

Andrew Maimone, *Facebook Reality Labs, USA*

Jae-Hyeung Park, *Inha University, South Korea*

Felix Heide, *Princeton University, USA*

Evan Yifan Peng, *Stanford University, USA*

16:00 – 17:30

Emerging Technologies for AR/VR Displays

Advances in AR/VR displays often come with the discovery and application of new materials and fabrication technologies. This session will feature the latest progress in applying metasurfaces and photonic integrated circuits to near-eye displays.

Moderator

Jelena Notaros, *Massachusetts Institute of Technology, USA*

Speakers

ByoungHo Lee, *Seoul National University, South Korea*

Arka Majumdar, *University of Washington, USA*

Jelena Notaros, *Massachusetts Institute of Technology, USA*

Tuesday, 15 September

09:30 - 10:30

Application Spotlight: VR/AR at NASA

Learn about how augmented and virtual reality displays support astronaut training at NASA.

Moderator

Randy Giles, *OSA, USA*

Speakers

Frank Delgado, *NASA, Johnson Space Center, USA*
Peter Zaal, *NASA Ames Research Center, USA*

10:30 – 11:15

Visionary Speaker

Michael Escuti, *ImagineOptix, USA*

Talk: On the Disruptive Nature of Liquid Crystal Polymer Flat Optics for VR/AR

Many look toward virtual-/augmented-reality (VR/AR) to connect people more genuinely and improve lives, but current optical hardware falls short. Liquid crystal polymer (LCP) optics are set to overcome these barriers. Their novel physics offers disruptive design-freedom for high-contrast control of light, in flat thin-films.

13:30 – 15:30

Liquid Crystal Technologies for Near-Eye Displays

This session explores the latest progress in applying liquid crystal technologies to AR/VR displays, spanning compact, high-performance optical designs and new means for addressing vergence-accommodation conflict using adaptive optics.

Moderator

Yi-Hsin Lin, *National Chiao Tung University, Taiwan*

Speakers

Yi-Hsin Lin, *National Chiao Tung University, Taiwan*
Fenglin (Maple) Peng, *Facebook Reality Labs, USA*
Philip Bos, *Kent State University, USA*

18:00 – 20:00

Innovation Showcase

The Virtual Reality and Augmented Vision theme will close by highlighting select projects led by graduate students and postdocs. The speakers in this session are working at the frontier of the field, spanning topics in occlusion-capable optical see-through displays, polarization volume lenses, and Maxwellian view displays.

Moderator

Douglas Lanman, *Facebook Reality Labs, USA*

Speakers

Brooke Krajancich, *Stanford University, USA*

Kun (Kelly) Yin, *University of Central Florida, CREOL, USA*

Youngjin Jo, *Seoul National University, South Korea*

2020 Special Events

Meet OSA's Journal Editors

Monday, 14 September, 08:00 – 09:30

The OSA Publishing journal editors welcome your questions, ideas and concerns. Join this online event to learn more about journal acceptance criteria, responding to review requests, addressing reviewer feedback and other topics of interest. As part of this session, the Emerging Researcher Best Paper Prize winners for *Optical Materials Express* and *JOSA A*, as well as the 2020 OSA Publishing Outstanding Reviewers, will be recognized. All are welcome!

Moderators:

Kelly Cohen, *The Optical Society, USA*

Alison Taylor, *The Optical Society, USA*

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Laser Science Symposium on Undergraduate Research

Monday, 14 September, 11:00 – 19:15

The Symposium on Undergraduate Research has been a feature of the annual meeting of the Division of Laser Science of the American Physical Society (APS-DLS) for twenty years, and it has showcased the research of more than 500 students during that time. Students' presentations often describe their work during the previous summer. The NSF has played a vital role by providing the research opportunities for many of the students through its REU programs, as well as by direct support of the event. The symposium has been generously supported by the DLS, OSA, NSF, SPS and Univ. MD (JQI), along with corporate sponsors Thorlabs, Photonics Industries and East Coast Optical Technologies. [View schedule.](#)

Organizers:

Samir Bali, *Miami University of Ohio, USA*

Harold Metcalf, *Stony Brook University, USA*

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OSA Fiber Optics Technology & Applications Technical Group Career Round Table

Monday, 14 September, 12:30 – 13:30

Join the OSA Fiber Optics Technology and Applications Technical Groups for this special event featuring entrepreneurs sharing their insights and experiences in a diverse pool of markets in optics and photonics, ranging from bio-oriented applications and fiber lasers to optical communications and photonic component markets. Our panelists, Michelle Stock, Iñigo Artundo and Barbara Buades, will discuss how they conceived of an initial idea and curated it into a feasible business case, secured investments, and de-risked the business. We'll have an exchange of ideas on day-to-day running of a start-up, navigating customer demands, generating value, and final exit strategy. We will learn their point of view on the current trends and challenges in their respective markets and advice for young entrepreneurs on how to kick-off a business.

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Career Insights & Advice with OSA Honorary Members William (Bill) Phillips and Elsa Garmire

Monday, 14 September, 12:45 – 13:45

Don't miss this opportunity to engage with two of OSA's Honorary Members, William D. Phillips, *National Institute of Standards & Technology, USA*, and Elsa Garmire, *Dartmouth College, USA (retired)*, as they share career insights, advice and stories from their careers. The session, moderated by OSA Ambassador Claire McLellan, *Stanford University, USA*, includes a short presentation from both speakers followed by live Q&A.

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Overcoming Imposter Syndrome and Self-Doubt

Monday, 14 September, 14:00 – 15:00

Do you feel like your success can all be explained by luck and hard work? Do you feel constant pressure to achieve and cannot let something go until it is perfect? Imposter syndrome and self-doubt are prevalent across all genders and stages of one's professional career. Learn tools to free up mental space by not carrying the emotional drain of feeling like an imposter and develop compassion for yourself.

This event is open to students and early career professionals only (member or non-member)

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OSA Advancing Mid-Managers Summit- It's Not You, It's Your Brain: Practical Neuroscience for Leadership

Monday, 14 September, 15:00 – 17:30

Pre-registration required

Ever wonder how what goes on inside our brains affects how we interact within our organizations? Oftentimes, leadership tactics that have worked to engage or motivate others simply fall flat with your colleagues or employees. Rest assured – it's not you, it's your brain! Participants in this session will explore the world of the brain and dissect some of the top neuroscience research and models to create practical applications on how to engage, motivate and develop others. You will experience the ways in which the brain drives people toward – or away from – certain situations which, in turn, affects how they process information, learn, lead and engage with others. Through interactive exercises, you will leave this session with:

- The building blocks of neuroscience and neuroleadership
- Ways to apply the models to your specific leadership or leadership development situation

This session is designed for participants with at least 6+ years of professional experience and not for students. Space is limited.

RSVP within the registration portal.

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Vision Science Virtual Coffee Break

Monday, 14 September, 15:30 – 16:00

The leaders of the OSA Color Technical Group, Manuel Spitschan and Francisco Imai, invite you to join them for a virtual coffee break. Grab a cup of coffee, tea or beverage of your choice and join us for a chance to chat with your fellow vision scientists.

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Congressional Fellowship Q&A;: A Unique Career Opportunity for Scientists and Engineers

Monday, 14 September, 16:00 – 17:00

Learn about the Congressional Fellowship program and the fellowship experience from a past Congressional Fellow. Congressional Fellows spend one year in Washington, D.C., USA, working as legislative assistants on the staff of a member of U.S. Congress or Congressional Committee. The Congressional Fellowships are designed to provide a unique public policy learning experience, demonstrate the value of science-government interaction and bring technical backgrounds and external perspectives to the decision-making process in U.S. Congress.

Moderator:

Brandy Dillingham, *The Optical Society, USA*

Panelists:

Chris Schaffer, (2012-2013) *Arthur H. Guenther Congressional Fellow*

Felicia Lucci, (2016-2017) *OSA/MRS Congressional Fellow*

Website to learn more: www.osa.org/congressionalfellows

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OSA Volunteer Engagement - OSA Technical Groups

Monday, 14 September, 17:30 – 18:00

Join other FiO attendees for this this informal networking discussion about OSA Technical Groups. Learn more about the governing structure and activities of OSA Technical Groups. The session will include a brief overview and time for Q&A so come with your questions. You will be able to turn your camera and mic on or off to participate as you choose.

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OIDA Roadmap Roundtable—Part 1: Quantum Communications

Tuesday, 15 September, 08:00 – 10:00

This is the first of two online discussions at OSA's Frontiers in Optics to review the requirements on optical components for applications of quantum technology. This first roundtable will focus on quantum communication, particularly quantum key distribution and quantum computer networking. The aim of the event is to assess and revise, if necessary, the requirements described in the document published this year, *OIDA Quantum Photonics Roadmap—Every Photon Counts*. The event will feature experts invited to offer their perspectives, and attendees will also be encouraged to participate in the interactive discussion.

Speakers:

Warren Grice, *VP R&D, Qubitekk, USA*

Andrew Lord, *Senior Manager of Optical Research, BT, United Kingdom*

Gregoire Ribordy, *CEO, IdQuantique, Switzerland*

Bill Munro, *Group Leader, NTT BRL, Japan*

Paul Kwiat, *Director, Illinois Quantum Information Science & Technology Center, University of Illinois, USA*

Moderator:

Tom Hausken, *Senior Science Advisor, The Optical Society, USA*

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OSA Volunteer Engagement – OSA Ambassadors

Tuesday, 15 September, 08:30 – 09:00

Join with other FiO attendees for this informal discussion on the OSA Ambassador Program. Hear from OSA Ambassadors from different classes as they provide an overview of the program, their experiences and discuss the application process. The session will include a brief overview and time for Q&A, so come with your questions. You will be able to turn your camera and mic on or off to participate as you choose.

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OSA Annual Business Meeting

Tuesday, 15 September, 09:15 – 10:15

Pre-registration required

Learn more about OSA and join the OSA Board of Directors for the society's annual business meeting. An update on the society's activities will be presented and the results of the board of directors election will be announced.

This event is open to OSA Members only.

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Meet the APS Physical Review Editors

Tuesday, 15 September, 10:30 – 12:00

Editor-in-Chief, Michael Thoennessen and several editors for Physical Review journals, including the newly launched PRX Quantum journal, will talk about the current and future perspectives of the Physical Review journals portfolio. The presentation will focus on how Physical Review journals will serve the needs of the optical community. After the brief presentations there will be time for comments, questions and suggestions.

Panelists:

Michael Thoennesen, *Editor in Chief of APS*

Juan Jose Lietor-Santos, *Associate Editor of PR Research*

Katiuscia Cassemiro, *Co-Managing Editor of PRX Quantum and Associate Editor of PRA*

Stojan Rebic, *Co-Managing Editor of PRX Quantum and Associate Editor of PRL*

Ling Miao, *Managing Editor of PRX*

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Navigating the Virtual Job Market

Tuesday, 15 September, 11:00 – 12:00

The in-pandemic and post-pandemic job market has increased demands on job candidates in terms of their performance during virtual interviews. The virtual interview is the first "real" interview step whereby an average of only 6-12 out of every 525 job candidates who submit a resume receive a request for a phone screen, and only 3-5 who are screened move forward to a video interview.

How quickly and how correctly you respond to a virtual interview request can determine whether or not the interview will go well. Likewise, the questions you ask at the end of these interviews and the very last sentence you say can determine whether or not you will move forward to get a job offer. Thus, from beginning to end, your contact with an employer about a video interview is a crucial process that all technical job candidates must understand. Moreover, the technical candidate must understand *how* to speak with the interviewer, who most often is a non-technical hiring manager and front-line gatekeeper tasked with screening out technical candidates who come across as "arrogant, awkward, or defensive", or who come across as a "student" or a "people pleaser".

Data from interviews with hundreds of technology, engineering, optical and biotechnology employers will be discussed, including which 10 questions are most commonly asked during virtual interviews.

This event is open to students and early career professionals only (member or non-member)

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Plenary - Nergis Mavalvala

Tuesday, 15 September, 12:30 – 13:30

USA

Professor, Massachusetts Institute of Technology, USA

Nergis Mavalvala, Marble Professor of Astrophysics at the Massachusetts Institute of Technology and a 2010 recipient of a MacArthur "genius" award, is a physicist whose research focuses on the detection of gravitational waves. She is a longstanding member of the scientific team that announced the first direct detection of gravitational waves from colliding black holes by the Laser Interferometer Gravitational-wave Observatory. Mavalvala has also conducted pioneering experiments on generation and application of squeezed states of light, and on laser cooling and trapping of macroscopic objects to enable observation of quantum phenomena in human-scale systems. Mavalvala received a BA from Wellesley College and a PhD from MIT. She was a postdoctoral fellow and research scientist at the California Institute of Technology before joining the Physics faculty at MIT in 2002.

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Awards + Honors Presentation

Tuesday, 15 September, 12:30 – 13:30

Please join OSA, The OSA Foundation and APS as we celebrate award winners and honorees during the Plenary Session featuring Nergis Mavalvava, *Massachusetts Insitute of Technology, USA*. This special session includes the presentation of the 2020 Arthur L. Schawlow Prize in Laser Science to Shaul Mukamel.

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OSA Advancing Mid-Managers Summit- Chart Your Course: Professional Development, Branding and Networking

Tuesday, 15 September, 15:00 – 17:00

Pre-registration required

Would you like want to become more proactive and effective in your own professional development and make better use of your scarcest resource: your time? Attend this workshop to learn:

- How to bring intent into your professional development and chart a course to meet your specific objectives
- The importance of a personal brand and how to develop one that will guide your efforts
- Five key steps in becoming a more effective networker

You will come away from this session with a new understanding of what it means to be a networker extraordinaire and the foundations of a personal development, brand and networking plan you can start putting into practice right away.

This session is designed for participants with at least 6+ years of professional experience and not for students. Space is limited.

RSVP within the registration portal.

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OSA Therapeutic Laser Applications Technical Group Special Talk

Tuesday, 15 September, 15:30 – 16:00

Join the OSA Therapeutic Laser Applications Technical Group for a special talk from Bernhard Baumann, Medical University of Vienna, on volumetric imaging of the eye and brain by optical coherence tomography. Baumann's talk will discuss optical coherence tomography (OCT), a non-invasive technique for biomedical imaging using low-coherent light, which enables the acquisition of volumetric data in real-time and with micrometer scale resolution. Current developments of OCT technology as well as applications for imaging the eye and brain will be presented and will be followed by a moderated question and answer session.

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OSA Volunteer Engagement - OSA Social Media

Tuesday, 15 September, 15:30 – 16:00

Join other FiO attendees for this informal networking discussion on getting the most out of your social media efforts, particularly on Twitter. Suzanne Ffolkes, OSA Chief Communications Officer and James Merrick, OSA Director of Communications, will be available to share opportunities to engage with OSA and tips for connecting with the global optics and photonics community. The session will include a brief overview and time for Q&A so come with your questions. You will be able to turn your camera and mic on or off to participate as you choose.

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DLS Annual Business Meeting

Tuesday, 15 September, 16:00 – 17:00

All members and interested parties are invited to attend the annual business meeting of the APS Division of Laser Science (DLS). The DLS officers will report on the activities of the past year and on plans for the future. Questions will be taken from the virtual audience. This is an

opportunity to help define the operations of the DLS and the Laser Science Conference. In addition, the winner of the Carl E. Anderson Dissertation Award will be announced.

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Undergraduate Labs on Quantum Key Distribution via Polarization Entanglement

Tuesday, 15 September, 17:30 – 18:30

The OSA Polarization Technical Group invites professors, lab technicians and undergraduate students to join them for this special talk from Prof. Enrique J. Galvez of Colgate University. Prof. Galvez's talk will explain some lab experiments on quantum key distribution using polarization entanglement of down converted photons, which could be done in undergraduate courses on quantum mechanics. The talk will be followed by a question and answer session.

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OSA Volunteer Engagement – OSA Awards and Medals

Tuesday, 15 September, 17:30 – 18:00

Join other FiO attendees for this informal discussion about the OSA Awards and Medals program. Former Chair of the Frederic Ives Medal/Jarus W. Quinn Prize Selection Committee, Dr. Nan Marie Jokerst, Duke University, USA, past award nominator Dr. P. Scott Carney, University of Rochester, USA and OSA Director of Awards and Special Programs, Meredith Smith will be available to discuss the program, how members can get involved and the role of the selection committee, as well as share a bit about the nomination process. The session will include a brief overview and time for Q&A so come with your questions. You will be able to turn your camera and mic on or off to participate as you choose.

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OSA Integrated Photonics Technical Group Career Round Table

Tuesday, 15 September, 20:00 – 21:00

Pre-registration required

You are invited to join our technical group for a career roundtable discussion for integrated photonics related companies. You will have the chance to hear from experts in areas including quantum photonics, LIDAR, telecommunications and nanofabrication and then speak with them in a small group setting. Our panelists include Michael Watts,

Founder/CEO, Analog Photonics; Chris Monroe, Founder/Chief Scientist, IONQ; Michael Hochberg, CTO, Optical Subsystems at Nokia; Chad Husko, Founder, Iris Light; Mian Zhang, Co-Founder/CEO, Hyperlight Corp.; and Steven Miller, Co-Founder/CTO, Voyant Photonics.

Space at this event is limited; to inquire about reserving a spot at the event please contact tgactivities@osa.org.

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Chairs' Special Session I: Optics and Photonics Technologies to Combat COVID-19

Wednesday, 16 September, 10:45 – 11:30

Optical scientists and medical experts have been racing to deploy existing technologies and to develop new approaches to diagnosis and treatment of COVID-19 patients. A parallel effort is underway to understand the biology and epidemiology of the SARS-CoV-2 pathogen. This session will summarize the way photonics technologies are being used for screening, diagnosis, monitoring progression, measuring immunity and providing instruments for personal protection equipment (PPE) decontamination. Additionally, there will be discussion on a special OSA Foundation project to support OSA student chapters and their local hospitals to build and deploy PPE decontamination chambers which use intense UV-C irradiation.

Speaker:

Tom Baer, Executive Director, Stanford Photonics Research Center, USA

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OSA Volunteer Engagement - OSA Industry

Wednesday, 16 September, 11:30 – 12:00

Join other FiO attendees for this informal networking discussion about engagement opportunities within OIDA, OSA's industry arm. Learn more about the governing structure and additional volunteer opportunities with OIDA. Simin Cai, OIDA Council Chair and President & CEO of Go!Foton, Amy Eskilson, President & CEO of Inrad Optics as well as OIDA staff, will be on hand to answer your questions. The session will include a brief overview and time for Q&A so come with your questions. You will be able to turn your camera and mic on or off to participate as you choose and the questions that will be explored include:

1. What is the overall mission of OIDA?

2. How does the governance of OIDA work? (requirements, responsibilities and time commitment)

3. How to be more engaged with OIDA programs and events? (planning committee, speaking roles and attendance at Lunch & Learn event)

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Plenary - Federico Capasso

Wednesday, 16 September, 12:30 – 13:30

USA

Robert Wallace Professor of Applied Physics, Harvard University, USA

About the Speaker

Federico Capasso is the Robert Wallace Professor of Applied Physics at Harvard University, which he joined in 2003 after a 27-years career at Bell Labs from postdoc to Physical Research VP. He pioneered bandgap engineering of heterostructure materials and devices, including the quantum cascade laser, metasurface based flat optics, MEMS based on the Casimir effect and measured for the first time the repulsive Casimir force. He is a member of NAS, NAE and the American Academy of Arts and Sciences (AAAS). His awards include the Balzan Prize for Applied Photonics, the King Faisal Prize, the APS Arthur Schawlow Prize, the AAAS Rumford Prize, the IEEE Edison Medal, The Optical Society Robert Wood Prize, the Materials Research Society Medal and the Witherill medal of the Franklin Institute.

Talk: Structuring Light with Flat Optics

Metasurfaces can generate arbitrary vector beams. I will discuss recent work on spin to total orbital angular momentum (OAM) converters including high OAM lasing, flat devices that enable light's spin and OAM to evolve, simultaneously, from one state to another along the propagation direction and polarizing elements that virtually rotate their orientation as a function of the propagation distance.

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Awards + Honors Presentation

Wednesday, 16 September, 12:30 – 13:30

Please join OSA as we celebrate 2020 OSA Fellows, award winners and honorees during the Plenary Session featuring Federico Capasso, *Harvard University, USA*. This special session includes the presentation of the 2020 Frederic Ives Medal / Jarus W. Quinn Prize to Ursula Keller and recognizes OSA 2019 Honorary Member Elsa Garmire.

OSA Fiber Modeling and Fabrication Technical Group Special Talk

Wednesday, 16 September, 15:30 – 16:00

Join the OSA Fiber Modeling and Fabrication Technical Group for a special talk from Dr. Fan Yang, Ecole Polytechnique Fédérale de Lausanne (EPFL), on intense Brillouin amplification in gas using hollow-core fibers. Dr. Yang will present a novel strong Brillouin amplification in gas using hollow-core fibers. Using this approach, Dr. Yang will then discuss a low-threshold gas Brillouin laser and a high-performance distributed temperature sensor, intrinsically free of strain cross-sensitivity. Following the talk we will have a moderated question and answer session.

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OSA Applications of Visual Science Technical Group Coffee Break

Wednesday, 16 September, 15:30 – 16:00

Join the leaders of the Applications of Visual Science Technical Group, Enrique Josua Fernandez and Karen Hampson, over coffee to learn more about the group and share your ideas for future activities. This informal conversation will also be a great opportunity to connect with fellow attendees who share an interest in your field.

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OIDA Roadmap Roundtable—Part 2: Quantum Sensing

Wednesday, 16 September, 17:00 – 19:00

This is the second of two online discussions at OSA's Frontiers in Optics to review the requirements on optical components for applications of quantum technology. This second roundtable will focus on quantum sensors, such as optical clocks, gravimeters and magnetometers. The aim of the event is to assess and revise, if necessary, the requirements described in the document published this year, *OIDA Quantum Photonics Roadmap—Every Photon Counts*. The event will feature experts invited to offer their perspectives, and attendees will also be encouraged to participate in the interactive discussion.

Speakers:

Michael Fanto, *Senior Research Physicist, USAF/AFRL, USA*

Orri Jonsson, *Cold Quanta, Sales & Marketing Manager, USA*

Brent Young, *President and Co-Founder, AOSense, USA*

Ole Kock, *Technical Authority, Teledyne e2V, United Kingdom*

Paul Juodawlkis, *Assistant Group Leader, MIT, USA*

Chad Hoyt, *Principal Research & Development Engineer & Scientist, Honeywell International Inc., USA*

Moderator:

Tom Hausken, *Senior Science Advisor, The Optical Society, USA*

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Friends of Dorothy: LGBTQ+ & Allies Meet & Greet

Wednesday, 16 September, 17:30 – 18:30

Grab your coffee, soda or beverage of your choice and join others attending FIO + LS for an informal virtual get-together to discuss being LGBTQ+ in STEM and how we can work together to create a more inclusive community.

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Chairs' Special Session II: Optics and Photonics Community Contributions to Combat COVID-19 Panel Discussion

Wednesday, 16 September, 18:00 – 19:00

During the global pandemic of 2020, some members of the Optics and Photonics community have turned talents toward mitigating the harm caused by COVID-19. Panelists will describe contributions toward detecting, understanding transmission and reducing the spread of this virus.

Moderator: Kristan Corwin, *NIST, USA*

Panelists:

Laura Lechuga, *Catalan Institute of Nanoscience and Nanotechnology, Spain*

Chris Myatt, *MBio Diagnostics, Inc., USA*

Jong Mo Seo, *Seoul National University, South Korea*

Krister Shalm, *National Institute of Standards and Technology, USA*

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OSA Quantum Optical Science and Technology Technical Group 20x20 Talks

Wednesday, 16 September, 18:30 – 19:30

This special session, hosted by the OSA Quantum Optical Science and Technology Technical Group, offers a unique platform for individuals to present their research in a creative and concise fashion that differs from the usual oral or poster session. Join us as selected

participants from the technical group showcase their research in a presentation of 20 images. Our presenters will talk along to the images in their presentation as each slide advances automatically after just 20 seconds.

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OSA NonImaging Optical Design Technical Group Special Talk

Thursday, 17 September, 09:00 – 10:00

Join the OSA NonImaging Optical Design Technical Group for a special talk with Ravitej Uppu of the Niels Bohr Institute on "Scaling Up Quantum-Dot-Based Photonic Qubits". The presentation will discuss the capability of quantum-dots in realizing robust and high-efficiency single-photon sources and benchmark their performance in near-term quantum technologies. A moderated question and answer session will follow the presentation.

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OSA Nanophotonics Technical Group Paired Networking Session I

Thursday, 17 September, 09:30 – 10:00

Pre-registration required

The OSA Nanophotonics Technical Group will host special networking sessions that aim to pair young researchers with more experienced individuals in the nanophotonics community.

Pre-registration is required: Mentors and mentees interested in participating in will need to register in advance by completing [this form](#) to be paired with one another. Our pairs will then have two opportunities to meet virtually on Thursday, 17 September, at 9:30 EDT and 15:30 EDT.

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Vision Science Virtual Coffee Break

Thursday, 17 September, 09:30 – 10:00

The leaders of the OSA Color Technical Group, Manuel Spitschan and Francisco Imai, invite you to join them for a virtual coffee break. Grab a cup of coffee, tea or beverage of your choice and join us for a chance to chat with your fellow vision scientists.

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OSA Volunteer Engagement - OSA Meetings

Thursday, 17 September, 13:00 – 13:30

Join other FiO attendees for this this informal networking discussion about OSA meeting committees. Learn more about the roles, responsibilities and time commitment needed to serve on a meeting committee. The session will include a brief overview and time for Q&A so come with your questions. You will be able to turn your camera and mic on or off to participate as you choose.

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OSA Nanophotonics Technical Group Paired Networking Session II

Thursday, 17 September, 15:30 – 16:00

Pre-registration required

The OSA Nanophotonics Technical Group will host special networking sessions that aim to pair young researchers with more experienced individuals in the nanophotonics community.

Pre-registration is required: Mentors and mentees interested in participating in will need to register in advance by completing [this form](#) to be paired with one another. Our pairs will then have two opportunities to meet virtually on Thursday, 17 September, at 9:30 EDT and 15:30 EDT.

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OSA Imaging Optical Design Technical Group Special Talk

Thursday, 17 September, 17:15 – 18:15

Join the OSA Imaging Optical Design Technical Group for a special talk with Lyuba Amitonova of Vrije Universiteit Amsterdam on "Breaking the Abbe and Nyquist Barriers in Far-Field Optical Microscopy". Our featured presenter will give a talk on their research, which will be followed by a moderated question and answer session.

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Agenda of Sessions — Monday, 14 September

Technical Sessions are hyperlinked. Click the session title to access the appropriate virtual room.

	FiO	FiO	FiO	FiO	FiO	LS	Quantum 2.0	Quantum 2.0
08:00–09:30	Meet OSA's Journal Editors							
08:00–10:00	FM1A • Optical Design	FM1B • Metamaterials	FM1C • High Field Physics	FM1D • Modes in Fiber Optic Communications	FM1E • Plasmonics I	LM1F • Systems for Quantum Communication		
10:00–10:30	Break						QM1A • Keynote on Quantum Computing and session on Platforms for Quantum Computing I	
10:30–12:30	Luminate Finals 2020						Keynote Speaker: Marissa Giustina, Google AI Quantum, USA (09:45–11:45)	
10:30–12:30	FM2A • Machine Learning and Optimization	FM2B • Grand Challenges for AR/VR: Optics, Systems, and Perception	FM2C • Structured Materials and Structured Light	FM2D • High Capacity Communications Techniques and Devices	FM2E • 2D Materials	LM2F • LS Dissertation Award Presentations	Break (11:45–12:00)	
11:00–19:15	Laser Science Symposium on Undergraduate Research							
12:30–13:30	FM3A • Visionary Talk Elizabeth Baron, <i>Unity Technologies, USA</i> OSA Fiber Optics Technology & Applications Technical Group Career Round Table						QM2A • Platforms for Quantum Computing II (12:00–13:30)	
12:45–13:45	Career Insights & Advice with OSA Honorary Members William (Bill) Phillips and Elsa Garmire							
13:30–15:30	FM4A • Quantum Photonics	FM4B • Near-eye Holographic Displays	FM4C • Light Matter Interaction	FM4D • Novel Optical Fibers	FM4E • Plasmonics II	LM4F • Laser Design and Characterization	Break (13:30–13:45)	
14:00–15:00	Overcoming Imposter Syndrome and Self-Doubt						JM4A • Quantum Computing and Simulation with Atoms and Ions (Joint Quantum and LS) (13:45–15:15)	QM4B • Photonics I (13:45–15:15)
15:00–17:30	OSA Advancing Mid-Managers Summit - It's Not You, It's Your Brain: Practical Neuroscience for Leadership <i>Pre-registration Required</i>							
15:30–16:00	Vision Science Virtual Coffee Break						Break (15:15–15:45)	
15:30–16:00	Break						QM5A • Quantum Computing and Simulation with Ions (15:45–16:45)	QM5B • Photonics II (15:45–16:45)
16:00–17:00	Congressional Fellowship Q&A: A Unique Career Opportunity for Scientists and Engineers						Break (16:45–17:15)	
16:00–17:30	FM5A • Quantum Optics with Atoms and Nanophotonics	FM5B • Emerging Technologies for AR/VR Displays	FM5C • Devices and Systems for Vision and Color	FM5D • General Information Display Technology	FM5E • Optical Fabrication	LM5F • Novel Frequency Comb Architectures	QM6A • Computing and Simulation I (17:15–18:15)	QM6B • Photonics III (17:15–18:15)
17:30–18:00	Break							
17:30–18:00	OSA Volunteer Engagement - OSA Technical Groups							
18:00–19:00	JM6A • Joint Poster Session IA (18:00–18:30)							
18:00–19:00	JM6B • Joint Poster Session IB (18:30–19:00)							
19:00–21:00	FM7A • Quantum Communications	FM7B • Optical Waveguides and Endoscopy	FM7C • Light Carrying Orbital Angular Momentum	FM7D • Computational/Transformation Optics and Optics in Computing	FM7E • Metasurfaces	LM7F • Frequency Combs for Metrology		

Agenda of Sessions — Tuesday, 15 September

Technical Sessions are hyperlinked. Click the session title to access the appropriate virtual room.

	FiO	FiO	FiO	FiO	FiO	LS	Quantum 2.0	Quantum 2.0	
08:00–10:00	OIDA Roadmap Roundtable — Part 1: Quantum Communications								
08:00–09:00	JTu1A • Joint Poster Session IIA (08:00–08:30)								
	JTu1B • Joint Poster Session IIB (08:30–09:00)								
08:30–09:00	OSA Volunteer Engagement - OSA Ambassadors								
09:00–10:30	FTu2A • Accommodation and Occlusion	FTu2B • Machine Learning and Tomography	FTu2C • Laser Processing and Light-matter Interaction	FTu2D • Optical Processes in Solids	FTu2E • Detection and Photovoltaics	LTu2F • Advanced Comb Applications			
09:15–10:15	OSA Annual Business Meeting <i>Pre-registration required</i>						QTu3A • Sensing Applications and Color Centers I		
10:30–11:15	FTu3A • Visionary Talk Michael Escuti, <i>ImagineOptix, USA</i>						Keynote Speaker: Gregoire Ribordy, <i>ID Quantique, USA</i> (10:00–11:15)		
10:30–12:00	Meet the APS Physical Review Editors								
11:00–12:00	Navigating the Virtual Job Market							Break (11:15–11:30)	
11:15–11:30	Break								
11:30–12:15	LTu4A • Visionary Talk: Frequency Comb Spectroscopy: Stop or Go?						QTu4A • Sensing Applications and Color Centers II		
12:15–12:30	Break						(11:30–12:30)		
12:30–13:30	FTu5A • Plenary Talk Nergis Mavalvala, <i>Massachusetts Institute of Technology, USA</i>								
13:30–15:30	FTu6A • Liquid Crystal Technologies for Near-eye Displays	FTu6B • Nano, Micro-fabrication	FTu6C • Ultrafast Optics I	FTu6D • Photonic Quantum Computing and Simulation	FTu6E • Sources and Coupling	LTu6F • Ultrafast Dynamics of Polariton Interactions	QTu6A • Sensing Applications and Color Centers III		
							(13:45–15:15)		
15:00–17:00	OSA Advancing Mid-Managers Summit - Chart Your Course: Professional, Development, Branding and Networking <i>Pre-registration required</i>							Break (15:15–15:45)	
15:30–16:00	OSA Therapeutic Laser Applications Technical Group Special Talk						QTu7A • Panel: Workforce Development in Quantum Science and Technology		
	OSA Volunteer Engagement - OSA Social Media						(15:45–16:45)		
16:00–17:00	DLS Annual Business Meeting								
16:00–17:30	JTu7A • Joint Postdeadline Session						QTu8A • Quantum Poster Session I-A		
							(16:45–17:40)		
17:30–18:00	OSA Volunteer Engagement – OSA Awards and Medals						QTu8B • Quantum Poster Session I-B		
							(17:40–18:30)		
17:30–18:30	Undergraduate Labs on Quantum Key Distribution via Polarization Entanglement								
18:00–20:00	FTu8A • Innovation Showcase	FTu8B • Novel Devices and Applications	FTu8C • Nonlinear Optics	FTu8D • Machine Learning and Optimization Methods for Quantum Information	FTu8E • Novel Photonics Demonstrations	LTu8F • Biophysical and Electronic Dynamics			
20:00–21:00	OSA Integrated Photonics Technical Group Career Round Table <i>Limited space; contact tgactivities@osa.org for further information</i>								

Agenda of Sessions — Wednesday, 16 September

Technical Sessions are hyperlinked. Click the session title to access the appropriate virtual room.

	FiO	FiO	FiO	FiO	FiO	FiO	LS	Quantum 2.0	Quantum 2.0
08:00–10:00	FW1A • Coherence and Vector Beams	FW1B • Nanophotonics	FW1C • Quantum Emitters I	FW1D • Quantum and Non-linear Optics	FW1E • Acoustic, Spectroscopic and Optofluidic Methods	FW1F • 3D and Light-field Optics in Information Acquisition and Display Applications	LW1G • Ultrafast Dynamics of Solid State and Solar Materials		
10:00–10:45	Break							QW1A • Keynote on Quantum Systems and Session on Computing and Simulation II Keynote Speaker: Ignacio Cirac, Max Planck Inst. of Quantum Optics, Germany (10:00–11:15)	
10:45–11:30	Chairs Special Session I: Optics and Photonics Technologies to Combat COVID-19							Break (11:15–11:30)	
11:30–12:00	OSA Volunteer Engagement - OSA Industry								
11:30–12:15	LW2A • Visionary Talk: Ultrafast Spectroscopy and Imaging of Molecules with X-ray and Quantum Light Shaul Mukamel, University of California, Irvine, USA							QW2A • Space Applications (11:30–12:30)	
12:15–12:30	Break								
12:30–13:30	JW3A • Plenary Talk: Structuring Light with Flat Optics Federico Capasso, Harvard University, USA								
13:30–15:30	FW4A • Optical Activity and Orbital Angular Momentum	FW4B • Optical Physics	FW4C • Quantum Emitters II	FW4D • Microresonators	FW4E • Coherence and Interferometric Methods		LW4F • Ultrafast Science with Free Electron Lasers	QW4A • Clocks and Interferometry (13:45–15:15) Meet the Speaker: Ignacio Cirac, Max Planck Inst. of Quantum Optics, Germany (15:15–15:45)	
15:30–16:00	OSA Fiber Modeling and Fabrication Technical Group Special Talk OSA Applications of Visual Science Technical Group Coffee Break							QW5A • Interferometry and Communication (15:45–16:45)	QW5B • Computing and Simulation III (15:45–16:45)
16:00–17:30	FW5A • Information Acquisition and Processing I	FW5B • Quantum Optics I	FW5C • Optomechanics	FW5D • Large Scale Photonic Integration I	FW5E • Non-linear and Ophthalmic Imaging	FW5F • Wavefront Shaping and Lidar	LW5G • High Field and Relativistic Optics	QW6A • Quantum Poster Session II-A (16:45–17:40)	
17:00–19:00	OIDA Roadmap Roundtable — Part 2: Quantum Sensing							QW6B • Quantum Poster Session II-B (17:40–18:30)	
17:30–18:30	Friends of Dorothy: LGBTQ+ & Allies Meet & Greet								
18:00–19:00	JW6A • Poster Session IIIA (18:00–18:30)								
	JW6B • Poster Session IIIB (18:30–19:00)								
18:00–19:00	Chairs Special Session II: Optics and Photonics Community Contributions to Combat COVID-19 Panel Discussion								
18:30–19:30	OSA Quantum Optical Science and Technology Technical Group 20x20 Talks								
19:00–21:00	FW7A • Information Acquisition and Processing II	FW7B • Optical Comb	FW7C • Entanglement and Sensing	FW7D • Information Processing On-chip	FW7E • Microscopic Imaging and Superresolution	FW7F • Advances in Quantum Electronics	LW7G • Ultrafast and High-field Laser Science		

Agenda of Sessions — Thursday, 17 September

Technical Sessions are hyperlinked. Click the session title to access the appropriate virtual room.

	FiO	FiO	FiO	FiO	FiO	FiO	LS	Quantum 2.0	Quantum 2.0
08:00–09:30	FTh1A • Wavefront Shaping and Holography	FTh1B • Ultrafast Optics II	FTh1C • Large Scale Photonic Integration II	FTh1D • Biomarkers Detection and Plasmonics	FTh1E • Nonlinear Effects and Processing in Fibers				
09:00–10:00	OSA Nonimaging Optical Design Technical Group Special Talk								
09:30–10:00	OSA Nanophotonics Technical Group Paired Networking Session I <i>Pre-registration required</i> Vision Science Virtual Coffee Break								
10:00–11:30	FTh2A • Picometer-scale Metrology	FTh2B • Ultrafast Optics III	FTh2C • Sensing and Emission	FTh2D • Biosensors and Photochemical Interactions	FTh2E • Devices and Subsystems for Optical Communications	FTh2F • Computer-generated Holography and Digital Holography	LTh2G • Quantum Optomechanics	QTh2A • Communication and Simulation	
11:30–12:15	JTh3A • Joint Visionary Talk: Programmable Quantum Systems for Simulations, Computation and Networking <i>Mikhail Lukin, Harvard University, USA</i>								
12:15–12:30	Break								
12:30–13:30	JTh4A • Poster Session IVA (12:30–13:00)							QTh4A • Transduction and Communication	
	JTh4B • Poster Session IVB (13:00–13:30)								
13:00–13:30	OSA Volunteer Engagement - OSA Meetings							Break (13:30–13:45)	
13:30–15:30	FTh5A • Optical Metrology	FTh5B • Quantum Optics II	FTh5C • Plasmonics and Metamaterials	FTh5D • Nanophotonics and Nanoplasmonics	FTh5E • Free-space Optical and Radio-over-fiber Communications	LTh5F • Attosecond Science and Novel Ultrafast Techniques (ends at 15:00)	LTh5G • Platforms with Multiple Quantum Emitters	QTh5A • Communication and Photonics (13:45–15:15)	QTh5B • Metrology (13:45–15:15)
15:30–16:00	OSA Nanophotonics Technical Group Paired Networking Session II <i>Pre-registration required</i>							Meet the Speaker: Mikhail Lukin, <i>Harvard University, USA</i> (15:15–15:45)	
15:45–16:45								QTh6A • Computing and Simulation IV (15:45–16:45)	QTh6B • Hybrid Systems (15:45–16:45)
16:45–17:40								QTh7A • Quantum Poster Session III- A (16:45–17:40)	
17:15–18:15	OSA Imaging Optical Design Technical Group Special Talk							QTh7B • Quantum Poster Session III- B (17:40–18:30)	