Session 1:  10:00 AM to 11:30 AM   Papers Overviewing Optical Activities at Oregon State University  Session Chairs: Session Chairs: Alan Wang and Tom Plant

10:00  Fast and Furious: Extreme Electron Dynamics in Condensed Matter

Yun-Shik Lee, Oregon State University

We study the electron dynamics in low-dimensional material systems when strong and short electromagnetic pulses drive the electrons into highly non-equilibrium states. High-field charge transport and many-body interactions in condensed matter are of fundamental scientific interest, yet the ultrafast electron dynamics driven by strong electric fields are largely unknown. Understanding and controlling the high-field electron dynamics is indispensable for next-generation high-speed electronic and photonic applications, for which the operating frequency of nanodevices goes beyond 100 GHz and the electric field inside the devices exceeds 100 kV/cm.

10:15 Photophysics of organic semiconductors on the single molecule level

Rebecca Grollman,1 Jeremy Rath,1 Alex Robertson,1 Michael Haley,2 John Anthony,3 Oksana Ostroverkhova1

1Dept. of Physics, Oregon State University, Corvallis, OR, 2Dept. of Chemistry, University of Oregon, Eugene, OR, 3Dept. of Chemistry, University of Kentucky, Lexington, KY

Organic optoelectronic materials have been exploited in a variety of applications in electronics and photonics. They offer advantages over silicon technology, including low-cost processing, fabrication of large-area flexible devices, and tunable properties through functionalization of the molecules. In spite of remarkable progress in the organic device performance, the photophysics of molecular solids is not completely understood. We present studies of molecular-level photophysics and intermolecular interactions in organic semiconductors using single molecule fluorescence spectroscopy. Effects of nanoenvironment on the light-molecule interaction and on the intermolecular charge and energy transfer, depending on the molecular structure and intermolecular spacing, will be discussed.
10:30 Resolving Photocurrent Generation with Femtosecond Precision in Stacked Transition Metal Dichalcogenide Devices

Kyle Vogt¹, Sufei Shi²,³, Feng Wang³, M. W. Graham¹, ¹Department of Physics, Oregon State University, Corvallis, OR 97331, USA, ²Department of Chemical Engineering, Rensselaer Polytechnic Institute, Troy, NY 12180, USA, ³Department of Physics, University of California, Berkeley, CA 94720, USA

The high-conductivity, low cost and relative ease of fabrication have made graphene well-suited to transform nanoscale electronics. Unfortunately, as a gapless semimetal, photo-excited electrons in graphene recombine far faster than electron-hole pairs can be extracted. To make carrier lifetimes in 2D materials more competitive with carrier separation, we demonstrate promising, new electron extraction pathways in graphene-like systems such as transition metal dichalcogenides (TMDs). Unlike graphene, semiconducting 2D TMDs like WSe₂, have long carrier lifetimes, but challenging mobility and exciton dissociation bottlenecks that inhibit photocurrent generation. By combining femtosecond (10⁻¹⁵ s) resolved photocurrent microscopy with ultrafast transient absorption, we have definitively imaged the dominant kinetics bottlenecks that inhibit photocurrent production in devices made from WSe₂ TMD materials. Using these ultrafast space-time maps of the electron-hole dissociation dynamics, we hope to better engineer 2D material heterostructures devices to avoid carrier recombination induced efficiency bottlenecks, and thereby maximize photocurrent yield.

10:45 AM Surface-plasmon-enhanced photoluminescence of quantum dots based on open-ring nanostructure array

Akash Kannegulla, Li-Jing Cheng*, Oregon State University,

Enhanced photoluminescence (PL) of quantum dots (QD) in visible range using plasmonic nanostructures has potential to advance several photonic applications. The enhancement effect is, however, limited by the light coupling efficiency to the nanostructures. Here we demonstrate experimentally a new open-ring nanostructure (ORN) array 100nm engraved into a 200nm thick silver thin film to maximize light absorption and, hence, PL enhancement at a broadband spectral range. The experimental results show the broadband absorption of about 60% with enhanced PL for the QD with emission spectrum overlapping the absorption band of ORN substrate and quantum efficiency increases from 50% to 70%.

11:00 AM Title: Integrating free-space optical communication links with existing WiFi (WiFO) networks

Authors: Spencer Liverman, Qiwei Wang, Yu-Jung Chu, Arun Natarajan, Thinh Nguyen, Alan X. Wang, Oregon State University

Recently, free-space optical (FSO) systems have generated great interest due to their large bandwidth potential and a line-of-sight physical layer of protection. We propose WiFO, a novel hybrid system, FSO downlink and WiFi uplink, which will integrate currently available WiFi infrastructure with inexpensive infrared light emitting diodes. This system takes full advantage of the mobility inherent in WiFi networks while increasing the downlink bandwidth available to each end user.
11:15 AM Nano-to-Mesoscale Modeling and Process Innovation in Intense-Pulsed-Light Sintering

Author: Rajiv Malhotra

Intense Pulsed Light Sintering (IPL) uses pulsed xenon lamp light, with a wide spectrum primarily in the visible range, for large-area, rapid sintering of metal and semiconductor nanoparticles on a variety of substrates. In this talk, we will review work done at Oregon State University on modeling and understanding the coupled optical-thermal-mass transfer phenomenon in IPL from nano-to-meso length scales, and the implications of this coupling on IPL. We will also talk about recent process innovations that extend the ability of IPL towards smaller and cheaper desktop processes for additive manufacturing.

11:30 AM to 1 PM   No host lunch at OSU student union

1 PM to 2 PM   OSU Lab Tours: Coordinated by Alan Wang, Tom Plant and Spencer Liverman, Oregon State University

2 PM to 3:15 PM:   Papers Overviewing Optical Activities at the University of Oregon, Session Chairs: Roger Smith and Maira Amezcua, University of Oregon

2:00 New approaches for monitoring the motion of nanomechanical systems

Benjamin J. Alemán, University of Oregon

An initiative to understand the interface of quantum and classical physics and to explore applications of going small has led to the physical miniaturization of mechanical systems toward the nanometer scale. This miniaturization has driven properties such as energy-dissipation and sensitivity in nanomechanical systems to unprecedented levels, enabling real-time atomic-resolution mass spectrometry, the detection of charge and spin down to the single-electron level, force sensing in the limit of a single nuclear spin, and mechanical quantum mechanics. Despite the successes and benefits of going small, however, dimensional downsizing weakens the signals used to detect the motion of these systems, an outcome that is made worse by attenuation at high frequencies and in dissipative viscous media, so that readout measurements can become altogether impossible. In this talk, I will present my group’s efforts to use low-dimensional materials, plasmonics, and microfluidics to develop nanomechanical systems with high-bandwidth readout and high-sensitivity mechanical resonators that operate in fluids.

2:15 High passive-stability diode-laser design for use in atomic-physics experiments

Eryn C. Cook*, Paul J. Martin, Tobias L. Brown-Heft, Jeffrey C. Garman, and Daniel A. Steck, University of Oregon

This talk presents the design and performance characterization of an external-cavity diode-laser system optimized for high stability, low passive spectral linewidth, low cost, and ease of in-house assembly. The design is fully documented and freely available and has been adopted by several groups in the atomic
2:30 Intrinsic Spin-Orbit Interaction in Optical Fiber

Dashiell L. P. Vitullo(1), Cody C. Leary(2), Patrick Gregg(3), Roger A. Smith(1), Dileep V. Reddy(1), Siddharth Ramachandran(3), M. G. Raymer(1)

1) Department of Physics and Center for Optical, Molecular, and Quantum Science, University of Oregon, Eugene, OR 97403, USA
2) Department of Physics, The College of Wooster, Wooster, Ohio 44691, USA
3) Department of Electrical and Computer Engineering and Photonics Center, Boston University, Boston, MA 02215, USA

Interaction between spin and intrinsic orbital angular momentum of light in the transverse spatial modes of optical fibers gives rise to a fine structure for the modal phase velocities. We report direct experimental measurement of this structure in a straight fiber and discuss its relationship to stable spatial mode transmission.

2:45 Worldline numerics for Electromagnetic Casimir Energies

Jonathan Mackrory, Daniel A. Steck, University of Oregon

Casimir forces arise from fluctuations in the quantized electromagnetic field. I will discuss a new method for computing Casimir forces based on simulating path integrals.

3:00 to 3:30 Break

3:30 to 4:45 Industry Papers: Eric Udd and Ingrid Udd, Session Chairs, Columbia Gorge Research, LLC

3:30 PM Structured Light Generation Utilizing Acylindric Lenses

Authors: Doug Ericksen; Mike Winz; Wallace Latimer, Coherent Inc.

Applications in machine vision and flow cytometry require laser beams with highly uniform focused line patterns. Structured light lasers transform the familiar laser spot into a wide range of structured light patterns. One approach to transforming a Gaussian beam into a uniform linear power distribution is based on acylindric or “Powell” lenses. This presentation will review the Powell lens design and applications.

3:45 PM Beyond the Thermopile: High Speed Sensors and Meters for Laser Power Measurement

Author: Jimson Lounsbury, Coherent Inc.
4:00 PM  **High Speed Sensors to Monitor Energetic Materials**

Authors: Ingrid Udd and Eric Udd, Columbia Gorge Research, LLC, Fairview, Oregon

Very high speed fiber grating sensors may be used to monitor shock wave position and speed, as well as pressure and temperature. This presentation will overview this technology and some of its applications.

4:15 PM  **An Overview of SBIR and STTR Programs Conducted by Blue Road Research and Columbia Gorge Research**

Authors: Eric Udd and Ingrid Udd, Columbia Gorge Research, LLC, Fairview, Oregon

Eric Udd, after graduate school at Princeton, worked at McDonnell Douglas Astronautics Company in Huntington Beach, California from 1977 to 1993. He establishing a fiber optic sensor group working primarily on interferometric and fiber grating based technology primarily for aerospace and defense with one major excursion into oil and gas. In 1993 he established Blue Road Research, Inc. (acquired by Standard MEMS in 2000) and in 2006 Columbia Gorge Research, LLC. This paper overviews some of the SBIR and STTR projects undertaken from 1993 to the present and linkages to partner companies and universities.

4:45 PM Post Workshop Networking/Suggestions for 2017 Workshop

**Notes from Eric Udd, Columbia Gorge Research, LLC/President OSA Columbia Section**

This is the first OSA Columbia Section Optics Workshop and it will substitute for our normal Spring meeting in downtown Portland. Stoel Rives is moving from their present downtown location into new facilities and we anticipate having regular meetings there again starting in Fall 2016.

I had originally intended to organize this type of workshop in 2017, but instead moved up the schedule. The response and support from Alan Wang, Tom Plant and Spencer Liverman of Oregon State University has been outstanding. They are the hosts of this first workshop and the chairs. I would also like to thank Roger Smith and Maira Amezca of the University of Oregon for their help in organizing their session. In 2017 the plan is to move the workshop in Spring to the University of Oregon. Nominally I think the 3rd Workshop in Spring 2018 should be at PSU/OHSU, although we still need to find contacts/hosts for that event.

I would like to thank all the authors and contributors to Spring 2016 Optics workshop. My understanding is the Room 1003 in Kelly Engineering can hold 66 people which I believe will be adequate based on the number of authors and the “rule of thumb” of 2 to 1 attendance versus authors for most conferences of this type.

Parking suggestions from OSU will follow and perhaps a request for RSVP for planning purposes.

My hope is that this workshop and the ones that follow will stimulate cooperation between universities and industries in the Columbia Section for the benefit of all of us.
Hope to see many of you at Oregon State on May 14th!

There is no fee for this event and it is open to the optics community. If you know someone who should be on our mailing list and or become a member of OSA Columbia Section (at the moment also no fee) please email Robert Teel at Stoel Rives rob.teel@stoel.com

Below are directions for Kelly and Parking from Alan Wang.

- Head south on I-5 S
- Take exit 228 for Oregon 34 toward Lebanon/Corvallis for 0.3 mi
- Use the right 2 lanes to turn right onto OR-34 W for 10.0 mi
- Continue straight onto NW Harrison Blvd for 1.0 mi
- Turn left onto NW 25th St for 0.2 mi
- Continue straight onto SW Park Terrace Pl for 459 ft
- Arrive at Kelley Engineering Center, 2500 NW Monroe Ave, Corvallis, OR 97331