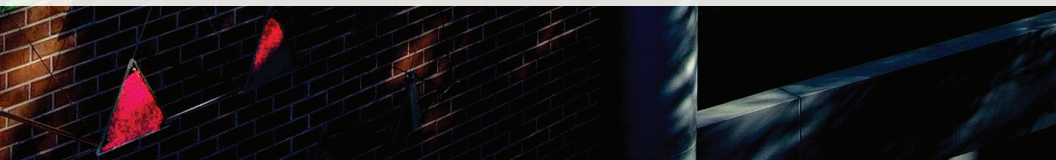
INDUSTRIAL AFFILIATES SYMPOSIUM 2024

February 29 - March 1
Orlando, Florida

UCF | CREOL, The College of Optics and Photonics

UNIVERSITY OF CENTRAL FLORIDA



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Thank You Exhibitors!

Message from the Dean

Welcome to the 2024 CREOL Industrial Affiliates Symposium! We are delighted to host you on UCF's beautiful campus to catch up on the latest research and news from the world of optics and photonics. This year our symposium focuses on Lasers, and we are happy to have Mark Spencer, Director of the Joint Directed Energy Transition Office, and Mike Wardlaw, Program manager at ONR, as our Keynote speakers.

CREOL was the first College of Optics and Photonics in the U.S. and we continue to lead the way in education and research. We are ranked as one of the top public universities in the U.S. for optics on the U.S. News & World Report's Global Universities list. Our faculty are consistently recognized for their dedication to educating the next generation of photonics professionals and researchers who will continue to fill the talent pipeline in Florida and beyond. We have several recent additions to our faculty and we will introduce them during the symposium.

In addition to the incredible speakers you will hear from, I am honored to announce our Alumnus of the Year, Vadim Smirnov '00MS . Vadim is the CTO and Director of Holography and Diffractive Optics at OptiGrate, an IPG Photonics Company.

I encourage you to explore the research poster display during breaks and lunch. There you will see a broad range of our research projects in optics and photonics, presented by our students.

Finally, I would like to sincerely thank all our Industrial Affiliates program members. Their support gives our students amazing opportunities to further their education and gain real-world experience. If your company is not currently a member, please consider joining.

David J. Hagan, Ph.D.
Dean & Director
Pegasus Professor of Optics and Photonics

Schedule of Events

Thursday, February 29

1:00 - 2:30 PM **Research 1** **RM 101AB**	Short Course Beam control for laser systems *Mark Spencer, Director, Joint Directed Energy Transition Office (JDETO)*
2:45 - 4:00 PM **Research 1** **RM 101AB**	Short Course Introduction to Lasers *Peter Delfyett, CREOL, UCF*
4:00 - 5:00 PM **CREOL** **Lobby**	Laboratory Tours
5:00 - 6:00 PM **CREOL** **RM 102/103**	**Special Guest Lecture** Laser Communications in Space *Matthew Reichert, CACI*

Friday, March 1

All of today's events take place in the UCF Fairwinds Alumni Center

8:30 AM	Continental Breakfast and Walk-In Registration
8:50 AM	Welcome to UCF *Michael Johnson, UCF Provost*
9:00 AM	Welcome and Overview of CREOL *David Hagan, Dean & Director*
Session 1: High Power Lasers	**Chair: Martin Richardson**
9:30 AM	**Keynote Presentation** Overview of the Joint Directed Energy Transition Office *Mark Spencer, Director, Joint Directed Energy Transition Office (JDETO)*
10:00 AM	Laser delivery in hollow core fibers *Rodrigo Amezcua Correa, CREOL, UCF*
10:20 AM	Student Talk Propagation of Ultrafast Laser Pulses *LaShae Smith*
10:35 AM	Break/Visit with Exhibitors

Session 2: Industry Focus	**Chair: Barron Mills**
11:00 AM	Industry Update: Optica
11:15 AM	Company Spotlights: KLA, LIA, Lawrence Livermore National Laboratory
11:45 AM	Industry Update: SPIE
12:00 PM	Poster Session/Lunch *(Preceded by group photo)*
1:30 PM	Company Spotlights: Fibertek, Powerlight Technology, MegaWatt Laser
Session 3: Lasers for Sensing and Communcations	**Chair: Patrick LiKamWa**
2:00 PM	**Student of the Year Talk** Dual-Comb Molecular Spectroscopy from Mid-IR to THz *Dmitrii Konnov*
2:25 PM	**Keynote Presentation** Laser-based sensing: An information theoretic perspective Michael Wardlaw, US Navy
2:55 PM	Coherently combined direct diode laser systems *Guifang Li, CREOL, UCF*
3:15 PM	**Student Talk** Low-noise chip scale frequency comb lasers through optical injection locking *Srinivas Varma Pericherla*
3:30 PM	Awards Presentation & Closing Reception

Career Fair

DEVCOM CSISR CENTER

FIBERTEK, INC.

ficontec photonics assembly & testing

JENOPTIK

MORE LIGHT

KLA

mks | Newport

MegaWatt Lasers

NIF&PS

OceanOptics

SAFRAN Optics 1

THORLABS

VIGO PHOTONICS

Society of Optics Students WITH SPIE. OPTICA Formerly OSA mks SAFRAN Optics 1 KLA

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YOU'RE INVITED TO A NIGHT OF FREE FOOD AND NETWORKING!

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4100 N ALAFAYA TRAIL #107, ORLANDO, FL 32826
THURSDAY, FEBRUARY 29TH
6:30 - 10:00 PM

Short Course

Beam Control for Laser Systems
Mark Spencer
JDETO

Abstract: This course closely follows the material presented in five chapters of a top-selling textbook entitled: "Beam Control for Laser Systems, 2nd Edition." Note that the course instructor is a coauthor of this textbook, which was published by the Directed Energy Professional Society. The topics covered include:

- Optics fundamentals (Chapter 2)
- Systems engineering (Chapter 3)
- Classical controls (Chapter 5)
- Optical train components (Chapter 11)
- Adaptive optics (Chapter 14)

This course is for those who seek a foundational overview. Scientists and engineers, as well as technical managers will benefit from the topics covered. The material presented is tutorial in nature.

Dr. Mark F. Spencer is the Director of the Joint Directed Energy Transition Office (JDETO) within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)). Mark is also an Adjunct Associate Professor of Optical Sciences and Engineering at the Air Force Institute of Technology (AFIT) within the Department of Engineering Physics. He is an active member of the Directed Energy Professional Society (DEPS), a senior member of Optica (the society advancing optics and photonics worldwide), and a fellow of SPIE (the international society for optics and photonics).

Short Course

Introduction to Lasers

Peter J. Delfyett
University Distinguished Professor
CREOL, The College of Optics and Photonics

Abstract: This presentation will focus on the fundamental concepts of laser science and engineering. It will provide an overview of the operating principles and touch on some of the key applications of laser technology in the commercial, industrial and government sectors. A simple example of a solid-state laser oscillator and amplifier system will be given to show how the fundamental principles tie together to predict the output performance. We will finally review some of the world's best performing lasers and highlight future directions.

Peter Delfyett joined UCF in 1993, and is currently University Distinguished Professor, Pegasus Professor and Trustee Chair Professor of Optics, ECE & Physics. In 2003, Dr. Delfyett founded "Raydiance, Inc." a spin-off company developing high power, ultrafast laser systems, based on his research, for applications in medicine, consumer electronics, defense, material processing, biotechnology, automotive and other key technological markets. He is a Fellow of the APS, AAAS, IEEE, NAI, NSBP, OSA, and SPIE. He is also the recipient of the NSF PECASE Award, the APS Edward Bouchet Award, the Medalist from the Florida Academy of Science, the Townsend Harris Medal, the IEEE Photonics Society's William Streifer Scientific Achievement Award, and the APS Arthur L Schawlow Prize in Laser Science. Most recently, he was elected to the National Academy of Engineering (NAE). He has over 850 scientific publications, conference proceedings and invited presentations, and 45 US patents.

Laboratory Tours

Guided tours of CREOL laboratories will start at **4 pm** in the CREOL lobby.

Time	4:00	4:15	4:30	4:45
Group A	230	A233	260	201
Group B	A106	A326	A336	A338
Group C	260	201	A106	A326
Group D	A336	A338	230	A233
Group E	A233	260	201	A106
Group F	A338	230	A233	260
Group G	A326	A336	A338	230
Group H	201	A106	A326	A336

A106 **ficonTEC Applications Lab**
Marvin-John Gow
https://ficontec.com

201 **Fiber Optics Lab**
Axel Schulzgen
https://fol.creol.ucf.edu

230 **Quantum Photonics**
Andrea Blanco Redondo
https://creol.ucf.edu/qsp

A233 **Emergent Photonic Phenomena**
Miguel Bandres
https://creol.ucf.edu/bandres

260 **AR/VR displays**
Shin Tson Wu
https://lcd.creol.ucf.edu

A326 **Optical Nanoscopy Lab**
Kyu Young Han
https://nanoscopy.creol.ucf.edu

A336 **Multimaterial Optical Fiber Device Lab**
Joshua Kaufman
https://multiofd.creol.ucf.edu

A338 **Astrophotonics**
Stephen S. Eikenberry
https://creol.ucf.edu/astrophotonics

Special Guest Lecture

Laser Communications in Space
Mark Reichert
CACI International, Inc.

Abstract: CREOL alumnus and Optical Engineer at CACI International, Inc., Dr. Matt Reichert, PhD'15, will give a presentation on the state-of-the-art in free space optical communication systems. He will provide a tutorial overview of the fundamentals of laser communications systems and describe some major recent and Next Generation projects including the Deep Space Optical Communication (DSOC) system on NASA's Psyche spacecraft mission, the Orion Artemis II Optical Communications System (O2O), and the International Space Station laser communications modem (ILLUMA-T).

Matt Reichert received his Ph.D. from CREOL in 2015 in Drs. Hagan and Van Stryland's Nonlinear Optics group, where his doctoral work focused on ultrafast nonlinear optical spectroscopy and two-photon gain in semiconductors. He was a Postdoc in the Department of Electrical Engineering at Princeton University, where he worked on high-dimensional entangled photons for quantum imaging and metrology. Since 2018 he has been an Optical Engineer at CACI, where he works on an array of optic and photonic systems, including high-power optical amplifiers, nonlinear RF-photonic systems, and intersatellite free-space optical communications.

Session 1: High Power Lasers

KEYNOTE PRESENTATION

Overview of the Joint Directed Energy Transition Office

Mark Spencer
Joint Directed Energy Transition Office

Abstract: The Joint Directed Energy Transition Office (JDETO) funds basic research, applied research, and advanced technology development in optics and photonics with academic, industry, and government partners, both domestic and international. This talk will provide an overview of the JDETO with an emphasis on how university partners can collaborate with the joint-international directed energy community.

Dr. Mark F. Spencer is the Director of the Joint Directed Energy Transition Office (JDETO) within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)). Mark is also an Adjunct Associate Professor of Optical Sciences and Engineering at the Air Force Institute of Technology (AFIT) within the Department of Engineering Physics. He is an active member of the Directed Energy Professional Society (DEPS), a senior member of Optica (the society advancing optics and photonics worldwide), and a fellow of SPIE (the international society for optics and photonics).

Session 1: High Power Lasers

Laser Delivery in Hollow Core Fibers
Rodrigo Amezcua-Correa
CREOL

Abstract: Hollow-core fibers, which guide light in air, have opened up exciting possibilities for high-energy and high-power laser delivery, thanks to their exceptionally low nonlinearities and high damage thresholds. Recently, we have shown that multi-kW laser powers can be efficiently transported through these fibers over long distances.
Here, we will discuss the development of hollow-core fibers for laser beam delivery and present our record 2.2 kW narrow linewidth laser transport demonstration. These fibers will lead to a new generation of laser beam delivery systems with applications in precision machining, nonlinear science, and directed energy.

Rodrigo Amezcua joined the College of Optics and Photonics (CREOL) and the Townes Laser Institute in February 2011 as an Assistant Research Professor. He obtained his PhD degree from the Optoelectronics Research Centre (ORC) at the University of Southampton. His Ph.D. was on the development of photonic crystal fibers. After completing his doctoral research, Rodrigo was employed as a post-doctoral researcher with Prof. Jonathan Knight at the University of Bath, UK. At the University of Bath, he developed novel photonic crystal fiber fabrication methods that lead to fibers with significantly improved optical properties. He has extensive experience in the design and fabrication of photonic crystal fibers for several applications; including fiber lasers, supercontinuum generation, nonlinear microscopy and sensing. Before joining CREOL, he worked at Powerlase Photonics, fabricating high-power diode pumped solid-state lasers.

Session 1: High Power Lasers

CREOL Student Talk

Propagation of Ultrafast Laser Pulses
LaShae Smith
Laser Plasma Laboratory, CREOL

Abstract: High-power ultrafast laser pulses can display unique properties when they propagate in nonlinear optical regimes. Filamentation is perhaps the most evident characteristic of these regimes. We describe our recent studies of the filamentation of high intensity femtosecond laser pulses, in studies performed both in the laboratory with state-of-the-art ultrafast laser systems, and in the open field at the TISTEF Laser Range on Merritt Island at Cape Canaveral.

LaShae Nicole Smith graduated from Willamette University in Oregon with a BA in Physics and joined the Laser Plasma Laboratory in 2020. She defended her MS thesis on the long- range propagation of so-called burst mode laser pulses through varying atmospheric conditions in the Spring of 2023. That same year she won a Directed Energy Professional Society Graduate Scholarship, and also interned at the Naval Surface Weapons Center at Dahlgren, Md. Currently she is leading a research team investigating for her Ph.D the effects of atmospheric conditions and air turbulence on the long-range propagation of temporally and spatially structured filamented laser beams using the TISTEF Laser Range on Merritt Island at Cape Canaveral.

Session 2: Company Spotlights

KLA	John Szilagyi Technical Program Manager
LIA THE LASER INSTITUTE	Shawn Oleson General Manager
FIBERTEK, INC.	Evan Hale Laser Scientist
NIF&PS	Zhi Liao NIF&PS Workforce Manager
POWERLIGHT TECHNOLOGIES	Mitch Kirby Knowledge Engineer
MegaWatt Lasers	Chris Hardy Senior Electronics Engineer

Session 2: Industry Focus

The CEOs of the leading global optics and photonics associations provide information and analysis on current and future industry trends and conditions.

Kent Rochford
Chief Executive Officer
SPIE

Liz Rogan
Chief Executive Officer
Optica

Session 3: Lasers for Sensing and Communications

2024 CREOL Student of the Year

Dual-Comb Molecular Spectroscopy from Mid-IR to THz

Dmitrii Konnov
CREOL

Abstract: The talk will highlight the recent results on the production of ultra-broadband frequency combs in the mid-IR – THz range and their applications in dual-comb spectroscopy (DCS) with electro-optic sampling (EOS) that feature: sub-Doppler resolution, sensitivity down to part-per-billion level, and up to video-rate acquisition speed.

Dmitrii Konnov is a graduate student in the research group of Dr. Konstantin Vodopyanov at CREOL, UCF. He moved to the US in 2017 from Saint Petersburg, Russia. He received a B.S. in 2015 and M.S. in 2017 in the Saint Petersburg Electrotechnical University. During his graduate school he was working part-time as an ophthalmic technician in a LASIK clinic where he was assisting the surgeon on eye operations and maintaining medical laser equipment. As an undergraduate student in summer 2012, he worked in the US as a lifeguard under the “Work and Travel” program.

Session 3: Lasers for Sensing and Communications

KEYNOTE SPEAKER

Laser-based sensing: An information theoretic perspective

Michael J. Wardlaw
Office of Naval Research

Abstract: Lasers loosely integrated as discrete subsystems, merely transfer information and/or power from one location to another. However, various aspects exhibited by these sources provide additional intrinsic capacities one can exploit. This talk provides an information theoretic perspective that "illuminates" additional possibilities and opportunities available to the academic and industrial laser community.

Michael (Mike) J. Wardlaw received a BSEE w/ Physics minor in 1983 from North Carolina A&T State University (NCA&TSU) specializing in electro-magnetics and electrodynamics. In 1992 he received a MSEE from North Carolina State University (NCSU) in optical signal processing and information theory. In addition to being a Program Officer and Head, Maritime Sensing at the Office of Naval Research (ONR), Mike is also an active researcher and engineering instructor at the Massachusetts Institute of Technology (MIT).

As head of the Advanced Systems Concepts Group and Director of Laser Technology, he significantly increased the Navy's activity in optical signal processing, laser-based sensors, high-energy laser weapons and information theoretic design. He executes a large portfolio that includes Fundamental Research (FR) projects, Future Naval Capabilities (FNC's), and Innovative Naval Prototypes (INP's). Mike is a program officer at ONR and Principle Investigator (PI) for various non-ONR programs. Mike has received numerous Navy citations and awards in addition to being selected as year 2000 National Black Engineer of the Year for Outstanding Technical Contribution in Government. He holds several patents and has been active in the Directed Energy Professional Society (DEPS), the Association of Old Crows (AOC), IEEE, AAAS, Optica and SPIE.

Session 3: Lasers for Sensing and Communications

Coherently combined direct diode laser systems

Guifang Li
CREOL

Abstract: Direct diode technology has the potential to realize efficient, high-brightness and frequency-agile laser sources which enable a wide range of commercial and defense applications, as well as scientific explorations. In this talk, we describe CREOL's efforts in 1) scaling power of single-mode laser diode emitters, 2) phase locking of laser diode arrays and 3) coherent combining of discrete arrays into a single high-brightness beam.

Guifang Li received his Ph.D. degree from The University of Wisconsin at Madison and is Professor of Optics and Electrical & Computer Engineering at UCF. He is the recipient of the NSF CAREER award and the Office of Naval Research Young Investigator award. Dr. Li is a Fellow of IEEE, the Optical Society of America, SPIE and the National Academy of Inventors. He is currently the Editor-in-Chief of Advances in Optics and Photonics.

His research interests include optical communication and networking, optical computing/all-optical signal processing, and spatiotemporal beamforming. He has collaborated widely with academic institutions and industry. He is a co-founder of Optium, the first venture startup in UCF, which went public in 2006 (OPTM) and is now part of Coherent.

Session 3: Lasers for Sensing and Communications

CREOL Student Talk

Low-noise chip scale frequency comb lasers through optical injection locking

Srinivas Varma Pericherla
CREOL

Abstract: Optical frequency combs are found across a vast range of applications from high-speed interconnects, spectroscopy, to low-noise microwave signal generation. In recent times, there has been an exceeding necessity for compact comb sources that are extremely energy efficient, robust, alignment free and are ultra-compact. Integrated Semiconductor lasers offers these benefits making them a viable pathway for bringing frequency combs to CubeSats, UAV's and satellites. Low-noise performance from these integrated comb lasers remain a challenge due to design and material limitations. In this talk, we discuss the development of external injection locking architecture which utilizes filtered multi-tone self-injection locking to improve the performance of existing chip scale lasers based on InP platform. We show 100000x improvement in timing stability, 100x optical linewidth reduction and significant phase noise improvement in the generated microwave signal. These improvements demonstrate a path forward towards low noise integrated comb sources.

Srinivas is currently a PhD student in Dr. Delfyett's Ultra-fast photonics group. He received his B. Tech degree from K L University, INDIA in 2018 and M.Sc. degree in Electrical Engineering from UCF in 2020. His research interest includes development of low-noise frequency comb sources, microwave photonics and semiconductor laser systems. Srinivas has authored and co-authored 7 journal articles and 11 conference proceedings.

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CREOL, UCF

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Explore The College of Optics and Photonics

- ✓ Lab tours
- ✓ Optics demonstrations
- ✓ Meet with professors, graduates, and students

Mar 29th, 1-5 PM

FREE PIZZA AND SNACKS!

Research Posters

Poster 1: Contact Angle Measurement of Hydrophobic Metal Surfaces Fabricated by Ultrafast Laser Processing

Gabryella Baldaci, Xinpeng Du, Xiaoming Yu

The contact angle between a surface and a liquid droplet defines the wettability of the material. We use a custom-made camera-based device to measure the contact angle of metal surfaces processed by an ultrafast laser. Angles as high as 150° are measured indicating superhydrophilicity.

Poster 2: New Modes of Laser Resonators: The Boyer-Wolf Gaussian Beams

David Guacaneme, Konrad Tschernig, Oussama Mhibik, Ivan Divliansky, Miguel A. Bandres

Stable laser resonators support three families of transverse modes: the Hermite, Laguerre, and Ince Gaussian modes. Here, we experimentally observe a new family of laser modes: the Boyer-Wolf Gaussian modes. These modes serve as a new foundational element of structured light and open the door to new applications in laser micromachining, particle micromanipulation, and optical communications.

Poster 3: Dual Frequency Comb Spectroscopy from 1 THz to 1 PHz

Dmitrii Konnov, Andrey Muraviev, Konstantin Vodopyanov

As a driving source, we use 2.4 µm dual-comb Cr:ZnS laser platform. We generate high harmonics spanning from NIR to UV in a multi-grating PPLN crystal. Also, we perform frequency down-conversion in GaSe/ZGP crystals with spectra in Mid-IR – THz regions that are detected with electro-optic sampling.

Poster 4: Prism Coupling Refractometry: Improving IR Metrology

Andrew Howe, Dr. Kathleen Richardson, Dr. Romain Gaume

New optical designs have necessitated the use of refractive index data that is accurate to the third and fourth decimal points. The accuracy, precision, and repeatability of t Prism Coupling, however have not been revisited recently in the literature. The improvements explored are both hardware based and the incorporation of a novel approach to fitting this data. Their resulting error budget defined by this strategy provides an increase in the stated precision of the measurement taking the first step towards making the method a standard metrology technique suitable for the shop floor.

Poster 5: Observation of Three-Dimensional Branched Flow of Light
Bradford Geiger, Konrad Tschernig, Miguel A. Bandres

When waves propagate through a weak disordered potential with smooth variations, they form channels of enhanced intensity which divide as they travel to create a pattern resembling the branches of a tree. Here, we present the first observation of three-dimensional branched flow in any physical system.

Poster 6: Nonlinear Dynamics in Antiresonant Hollow-Core Fiber
James Drake, Joseph Wahlen, Cesar Lopez-Zelaya, Shree Ram Thapa, Rodrigo Amezcua-Correa, Darren Hudson

We are developing a versatile testbed for nonlinear optics in antiresonant hollow-core fiber. Our in-house fabricated fiber has sufficiently low loss to enable the study of nonlinear dynamics over tens of meters of propagation. Experimental results are supplemented by custom Python code to simulate nonlinear pulse propagation in dispersive fiber.

Poster 7: Study of Optical Nonlinearity with Single-shot Waveform Measurement
Dipendra Khatri, Chris Lantigua, Tran-Chau Troung, Yangyang Liu, Troie D. Journigan, S. Novia Berriel, Parag Banerjee, Michael Chini

Electronic excitations in matter responds to the sub-cycle optical field variation rather than the pulse envelope, resulting in sub-cycle optical nonlinearity. Here, we employ single-shot waveform measurement to investigate sub-cycle nonlinearity in a ZnO film.

Poster 8: CW Laser Damage Test Facility
Zeus Gannon, Soumya Sarang, Nicholas Vail, Melisa Siver, Joshua Bryan, Justin Cook, Haley Kerrigan, Nathan Bodnar, Martin Richardson

Testing the optical damage thresholds of laser components requires a system built for the task. The laser system must be dependable, and fully characterized at many different power levels. At the Laser Plasma Laboratory, a 1 um laser system has been constructed that can reach fluences of 1 MW/cm2.

Poster 9: High Power In-Band Thulium Development
Nicholas Vail, Justin Cook, Alex Sincore, Soumya Sarang, Nathan Bodnar, Martin Richardson

Abstract: The Laser Plasma Laboratory is advancing high-power thulium fiber lasers to fulfill the need for eye-safe operation at 2-micron wavelengths.

Investigation of in-band pumping and novel fiber designs aims to surpass the current 1 kW power barrier for thulium fiber lasers, holding promise for applications in directed energy systems.

Poster 10: Narrow Linewidth, Tunable Ytterbium-Fiber Laser
Joshua Bryan, Justin Cook, Martin Richardson

Abstract: We report on the construction of an ytterbium-fiber laser, tunable from 1060-1090 nm with a 20 GHz linewidth, and ASE suppression > 60 dB across the tuning range; designed to seed an amplifier for thermal blooming experimentation.

Poster 11: Fiber Splicing Techniques and Recipe Development
Melissa Siver, Soumya Sarang, Nicholas Vail, Zeus Gannon, Martin Richardson

Abstract: Successful high power fiber laser development requires difficult and precise fiber handling techniques. Information on these techniques is frequently obscured or overlooked in scientific literature, and is presented here for the benefit of the greater scientific community. Special attention is paid to the prominent topic of thermal failure prevention techniques.

Poster 12: Long-Range Ultrashort Pulse Propagation in the NIR and LWIR
LaShae Smith, Owen Thome, Alex Malyk, Mark Whitledge, Danielle Reyes, Martin Richardson

We present ultrashort pulse laser (USPL) systems in the near and long wave infrared for long range propagation studies. Outdoor propagation of NIR USPLs over km scale distances has been an active area of research at UCF for 6+ years. In addition, a picosecond CO2 laser system is now being activated that will allow for a comparison to LWIR USPL propagation.

Poster 13: Imagery-based turbulence methods
Matthew Salfer-Hobbs, Thomas Miletich, Anthony Eppley, Robert Crabbs, Robert Bernath, Martin Richardson

This poster focuses on the application of several image-based techniques for measuring optical turbulence. University of Central Florida researchers have prototyped and tested multiple iterations of a turbulence imaging system. This effort culminated in the development of a software suite that implements multiple image processing techniques for estimating the refractive index structure parameter. These methods include blob detection, centroid tracking, optical flow, and image subtraction. The methods were validated on the TISTEF 1 kilometer range and included comparisons to an MZA DELTA system.

Poster 14: High Power, High Repetition Rate Fiber Laser Development

Ryan Ellis, Nicholas Vail, Joshua Bryan, Melissa Siver, Joshua DaSilva, Nathan Bodnar, Martin Richardson

Pulsed fiber lasers with both high average power and high peak power have a variety of research and industrial applications, but the nonlinear effects in fiber presents engineering challenges for power scaling. Extra large mode area (XLMA) fiber amplifiers increase the effective area of the fiber core, thus reducing the strength of these nonlinear effects. An XLMA based fiber laser is presented and the results of testing the average power handling capabilities of such a system.

Poster 15: Filament Propagation Diagnostics

Alexander Malyk, Owen Thome, LaShae Smith, Mark Whitledge Danielle Reyes, Martin Richardson

Ultra-short laser pulses have the ability to form filaments, or high intensity plasma channels that can propagate long distances with small spot sizes and high intensities. These high intensities make diagnostics difficult due to optical damage. For the first time, a helium gas cell enables filament intensity profiling at distance and with minimal alignment.

Poster 16: Laser Testing and Atmospheric Monitoring Capabilities at TISTEF

Thomas Miletich, Mathew Salfer-Hobbs, Anthony Eppley, Robert Crabbs, Robert Bernath, Martin Richardson

The Townes Institute Science and Technology Experimentation Facility (TISTEF) is an outdoor laser field testing facility located at Kennedy Space Center and operated by the University of Central Florida. TISTEF features the ability to test lasers on ranges from 1 – 13.5 kilometers, JLDSS accreditation for conducting non-destructive lasing to space assets, and a full suite of instrumentation for characterizing the atmosphere and laser performance.

Poster 17: Opto-Electronic Oscillator driven Electro-Optic Modulated Optical Frequency Comb

Lawrence Trask, Srinivas Varma Pericherla, Peter J. Delfyett

Widely spaced (>10 GHz) optical frequency combs (OFCs) serve a myriad of applications in astrophotonics, WDM communications, and microwave signal generation. Electro-optic modulated (EOM) combs offer wide comb spacing but struggle as OFCs. We demonstrate a self-starting and self-referenced EOM OFC.

Poster 18: Light Transmission through a Hollow Core Fiber Bundle

Md Abu Sufian, Erwan Baleine, Jeffrey Geldmeier, Ameen Alhalemi, Jose Enrique Antonio-Lopez, Rodrigo Amezcua Correa, Axel Schülzgen

This paper reports on the design, fabrication and performance of a fiber bundle with seven hollow cores arranged in a hexagonal pattern. Each core exhibits several transmission windows in the visible to near infrared region. The lowest loss is estimated to be 2.5dB/m at 600nm.

Poster 19: Design and Fabrication of Ultra-Narrow Linewidth Holographic Filters

Daniel Lumpkin, Oussama Mhibik, Leonid Glebov, Ivan Divliansky

Ultra-narrow notch filters used for spectral control have many applications across multiple disciplines. We propose and demonstrate a way to make such filters by encoding a π-phase shift in a volume Bragg grating. This approach creates a monolithic, wavelength-sensitive Fabry-Perot filter which can have high transmission band with spectral width down to 1 pm.

Poster 20: Design Considerations and Fabrication of Rotated Chirped Bragg Gratings

Shaghayegh Yaraghi, Oussama Mhibik, Murat Yessenov, Leonid Glebov, Ivan Divliansky

Rotated chirped volume Bragg gratings(r-CVBGs) have recently emerged as a unique optical element with use in a diverse and wide range of applications including compact spectrometers, pulse phase modulation, and others. They offer noteworthy advantages including compactness, robustness, and high-power handling capabilities. The recording of r-CVBGs in photo-thermo-refractive-glass(PTR) utilizing holographic techniques brings flexibility to the design of the grating while requiring careful and precise recording system alignment. The comprehensive design and fabrication process of r-CVBGs provides insights for the future development of these promising optical components.

Poster 21: Manufacturing Qualification of Underwater Fiber Optic Cable Assemblies

Christopher Kosan, Joshua Kaufman, Felix Tan

High-strength, small-diameter, low-loss optical fiber cable assemblies were fabricated using extrusion-based, thread-coating techniques. Manufacturing lines were designed, constructed, and qualified to produce these cable assemblies. The realized cable enables an otherwise fragile fiber optic to be rapidly paid out and operate in deep underwater environments with minimum tradeoffs in performance.

POSTER 22: Flat-top optical fibers as scramblers for EPRV measurements

Genevieve Markees, Stephen Eikenberry, Rodrigo Amezcua-Correa, Miguel Bandres, Daniel Cruz-Delgado, Sergio Leon-Saval, Jose Enrique Antonio-Lopez, Stephanos Yerolatsitis, Caleb Dobias

Fiber mode scrambling remains integral for fiber-fed EPRV (extreme precision radial velocity) measurements. “Flat-top” fibers increase modal illumination stability using deliberately introduced internal mode scrambling features. We present measurements of flat-top fiber throughput and scrambling gain, as well as the expected benefits from incorporating such a fiber into EPRV spectrographs.

SPRING THING

LAST YEAR TO BE
Hosted by MJ & Cheryl Soileau

100 Tuskawilla Road, Winter Springs, FL 32708

When:

Saturday, March 2, 2024 - Noon'til the Evening Gator Commute
Better get there early to get Gator...usually it is all gone by 1 PM

Picnic Clothes or 'Good ole boy' Stuff!

Who is invited:

CREOL, The College of Optics Faculty, staff, students and families;
Affiliates, Partners, and Friends

Menu:

Cajun Cuisine cooked in grand style by master Cajun Chefs: Gator, Chicken (tastes just like gator), Cochon De Lait (suckling pig) Miscellaneous good stuff (and some healthy)
Note: Menu Subject to change at whim of Cooks

Activities:

Eating, Drinking, and Making Merry! Gator Stalkin on Lake Jesup, Fishing (B.Y.O.G.), Eagle watching, Volleyball, Simulated Steer Roping, A Real Florida "Cracker" Demonstration,

Other Games for Children of All Ages.

Cost:

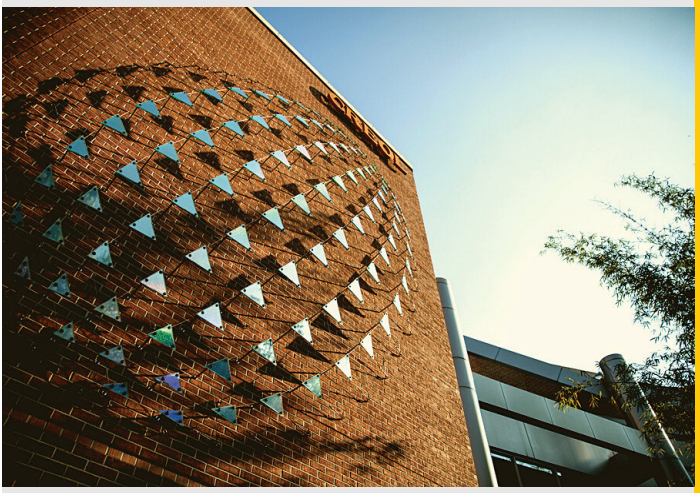
Just an "RSVP" to:
Call: 407-823-6800 | Email: creol@creol.ucf.edu
Online: www.creol.ucf.edu and head to the
Industrial Affiliates Day Page.

What to Bring:

Lawn Chairs, some bug spray stuff, and the right attitude!

CREOL, The College of Optics and Photonics

INDUSTRIAL AFFILIATES



Partnership is a strategic goal at the University of Central Florida and a way of life at CREOL. Our partnerships with companies and research organizations have allowed CREOL to become a world leader in optics and photonics education and research.

Established in 1987, the Center for Research in Education in Optics and Lasers (CREOL) was designated a college in 2004 - the **first** of its kind in the United States.

UCF is the only university in the state of Florida with an undergraduate degree in photonic science and engineering, and one of only six ABET-accredited programs in the U.S. In addition to traditional graduate degrees, CREOL offers an online master's designed for working professionals.

There are many opportunities to network and collaborate with the 70 members of CREOL's Industrial Affiliates program. The members span the globe and include public, private, and government entities.

"Having unique access to the student talent pipeline at CREOL is invaluable. Thanks to the hands-on experience they gain, CREOL graduates are prepared to contribute on day one.

Ty Olmstead
Vice President, Ocean Insight

CREOL BY THE NUMBERS

#4

Best Public University in U.S. for Optics among Global Universities

73

Industrial Affiliates Members

13

Patents Awarded 2022-23 Academic Year

$19M

Research Funding 2022-23 Academic Year

BEST GLOBAL UNIVERSITIES U.S.News & WORLD REPORT 2022-2023
RECOGNIZED FOR Academic Research and Reputation

BEST COLLEGES U.S.News & WORLD REPORT MOST INNOVATIVE 2022-2023

**Among public universities in the U.S.*

CREOL, The College of Optics and Photonics

INDUSTRIAL AFFILIATES

creol.ucf.edu/industry-collaboration/industrial-affiliates-membership/

Membership Benefits

- Company name plaque displayed in CREOL lobby
- Company name, logo, and website link on CREOL website
- Listed in CREOL Annual Report
- Social media thank you post
- Membership certificate for display in your facility
- Invitation to attend Industrial Affiliates Symposium
- Special recognition at annual Industrial Affiliates Symposium
- Exhibition table at Industrial Affiliates Symposium
- Invitation to attend CREOL Career Fairs
- Post your job openings on CREOL's website
- Copy of CREOL student resume books
- Receive CREOL's e-newsletter
- Notification of CREOL events
- Priority access to CREOL's nanofabrication facilities
- Invitation to support the Senior Design Program
- Presentation to CREOL faculty and students
- Facilitated introductions to any of CREOL's six student organizations and their leadership teams
- Networking opportunities with other Industrial Affiliates members

Membership Levels

- **Medallion Member:** $10,000+ annual donation
- **Corporate Member:** $5,000 annual donation
- **Senior Member:** Corporation/Organization of 200 employees or less + $3,000 annual donation
- **Affiliate Member:** Corporation/Organization of 100 employees or less + $1,500 annual donation
- **Associate Member:** Corporation/Organization of 50 employees or less + $750 annual donation

Industrial Affiliates Members

AFL
Amazon Lab126
Analog Modules
Andor Technology
Applicote Associates LLC
Arizona Optical Metrology
ASML US
Aspericon Inc.
Avo Photonics
BAE Systems
BEAM Co.
Breault Research
CMS Laser
Coherent/II-VI
Corning Inc.
Critical Frequency Design
CST of America
DataRay Inc.
Edmund Optics
Elbit Systems of America
eVision LLC
EXFO Optical Products
FARO Technologies
Finetech
Gentec-EO
Google
HORIBA Jobin Yvon, Inc.
Hubner Photonics
IPG Photonics
J.A. Woollam Co.
JENOPTIK Optical Systems Inc.
KBR
L3Harris Corporation
LAS-CAD GmbH
Laser Institute of America
Lawrence Livermore Nat'l Laboratory
LG Electronics
LGS Innovations
LightPath Technologies
Lockheed Martin
LUMENTUM
Luminar Technologies Inc.
Meta Reality Labs
MKS (Newport, Ophir, Spectra-Physics)
NKT Photonics Inc.
nLight
Northrop Grumman
Ocean Insight
Optica
Optigrate
Optimax Systems Inc.
OptoSigma Corporation
Optronic Laboratories Inc.
Plasma-Therm
Plasmonics
Q-Peak Inc.
Raytheon Technologies
ScannerMax
SPIE
Synopsys
Tektronix
TeraDiode
Thorlabs
TwinStar Optics
ULVAC Technologies Inc.
Vescent Photonics
VIGO Photonics
Yokogawa
Zemax
Zygo Corporation

For membership information, contact Barron Mills at barron@creol.ucf.edu

Learn more about CREOL's Industrial Affiliates program at creol.ucf.edu or scan:

CREOL, The College of Optics and Photonics

UCF

www.creol.ucf.edu

CREATING THE FUTURE

of

OPTICS & PHOTONICS

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