UCF | CREOL, The College of Optics and Photonics
UNIVERSITY OF CENTRAL FLORIDA

2025

INDUSTRIAL AFFILIATES SYMPOSIUM

APRIL 17 -19 | ORLANDO, FL

CREOL.UCF.EDU

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THANK YOU

EXHIBITORS!

CORNING

KLA

mks

OceanOptics

SAFRAN

Florida Photonics Cluster

OPTIMAX

SITUS LIGHT

OptiGRATE
An IPG Photonics Company

ILM
INDUSTRIAL LASER MACHINES

VIGO PHOTONICS

- **STEVEN BOHUCZKY**
  aiOptic LLC
- **BRIAN MONACELLI**

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MESSAGE FROM **THE DEAN**

Welcome to the 2025 CREOL Industrial Affiliates Symposium! So far, the year has already exceeded our expectations, as we welcome new partners to our program, celebrate the recent achievements of our faculty, and recognize the continued success of our students.

This year, our Symposium focuses on the growing power of tech hubs in our industry. We're thrilled to welcome our keynote speakers Jun Ye, Scott Diddams, Joseph Shaw, and Volker Sorger. We're also excited to hear industry updates from the respective presidents of SPIE and Optica, Peter de Groot and Jim Kafka, as well as updates from some of our Affiliates. Another session will focus on the important area of photonics technician training.

In addition to the incredible speakers you will hear from, I am honored to announce CREOL's 2025 Distinguished Alumnus of the Year, Zhibing Ge '04MS '07PhD. Zhibing is a Director of Hardware Engineering at Apple Inc., and his technical achievements in our field are matched only by his outstanding commitment to CREOL over the years.

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 are excited to introduce some of the recent additions to our faculty at the Symposium, and I am looking forward to giving an update on CREOL's expansion into new areas of research.

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. Your 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. I would also like to extend a warm welcome to our new Affiliates, including Industrial Laser Machines, Situs Light, Nokia of America, and DataRay.

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

SCHEDULE OF EVENTS

THURSDAY, APRIL 17 - UCF CAMPUS

9 AM - 12 PM	**Senior Design Showcase** *CREOL Lobby*
10 AM - 2PM	**Spring Optics and Photonics Career Fair** *Research 1, Room 101AB*
3:30 - 4:30 PM	**Lab Tours** *CREOL Building*
5 PM - 6 PM	**Special Guest Lecture: Light a Path for Quantum Sensing** *Jun Ye, University of Colorado | CREOL 102/103*
6 PM	**Student / Industrial Affiliate Mixer** *Bar Louie | Plaza on University*

FRIDAY, APRIL 18 - DOUBLETREE BY HILTON ORLANDO EAST

8:15 AM	Continental Breakfast and Walk-In Registration
8:45 AM	**Welcome to UCF** *Michael D. Johnson, Provost and EVP for Academic Affairs*
8:55 AM	**Welcome and Overview of CREOL** *David Hagan, Dean and Director*

Session I - Tech Hubs: Semiconductors and Sensing *Chair: David Hagan*

9:10 AM	**SMART USA: Digital Twins – A Revolution in Advanced Manufacturing and Innovation** *Volker Sorger, University of Florida*
9:40 PM	**Expanding Florida's Semiconductor Ecosystem** *Leland Nordin, University of Central Florida*
10:00 AM	**The Montana Headwaters Tech Hub for Smart Photonic Remote Sensing Systems** *Joseph Shaw, Montana State University*
10:25 AM	**Student of the Year Talk: Non-Gaussian Light Scattering Phenomena and Applications** *Shubham Dawda, University of Central Florida*
10:40 AM	Coffee Break/Networking/Exhibit Tables

SCHEDULE OF EVENTS

Session II - Tech Hubs: Quantum		*Chair: Alex Khanikaev*
11:10 AM	**Engineering Quantum: Building the National Quantum Nanofab** *Scott Diddams, University of Colorado Boulder*	
11:35 AM	**UCF's Quantum Leap Initiative** *Andrea Blanco-Redondo, University of Central Florida*	
11:55 AM	**Lunch Break/Poster Presentations/Exhibit Tables**	
Session III - Industry Updates and Florida Panel		*Chair: Eric Johnson*
1:00 PM	**SPIE Industry Update** *Peter de Groot, SPIE*	
1:15 PM	**Optica Industry Update** *Jim Kafka, Optica*	
1:30 PM	**Panel on Photonics Hubs in Florida** *Scott Diddams, Ty Olmstead, Joseph Shaw, Volker Sorger*	
2:15 PM	**Company Spotlight Presentations** *Edmund Optics, Safran Optics 1, Relativity Networks*	
Session IV - Technicians and Training		*Chair: Jason Eichenholz*
2:45 PM	**The National Landscape of Photonics Technician Training** *Natalia Chekhovskaya, Indian River State College*	
3:10 PM	**Valencia College Technical Training Program** *Brendon Monize, Valencia College*	
Awards Presentation		*Distinguished Alumnus, Faculty Excellence, Optimax Research Grant, Student Poster Award Winners*

SATURDAY, APRIL 19 - 100 TUSKAWILLA ROAD, WINTER SPRINGS

12 PM – 5 PM	**Spring Thing Social**

SENIOR DESIGN
SHOWCASE

THURSDAY 4/17, 9 AM - 12 PM

CREOL LOBBY

SENIOR DESIGN II (OSE4951/EEL4914 COURSES)

Group 1

Greenhouse EnviroNmentAl RatiO: Analyzer of Blue to Red Light, Humidity, Temperature, and CO2: (G.E.N.A.R.O.)

Group 2

Climatic high-altitude navigator Balloon for atmospheric environmental data collection

Group 3

Automatic light turret for far-reaching firing feedback for NERF guns

Group 4

Solder Paste Dispenser

Group 5

Image Surveillance and Protection Yielder

Group 6

Auto-Focusing and Color Identification to Improve Mildly Impaired Vision

SENIOR DESIGN
SHOWCASE

Group 7
Proximity-Based Hazard Detection System for Older Vehicles

Group 8
Color Harmonization Reflecting Optimal Melanin Accuracy

Group 9
Protected Access for Whiskered Subjects

Group 10
Smart Water Bottle for Measuring Ingredient Concentrations in Beverages

Group 11
Controllable Active-Search Trash-Collector (C.A.T.-Bot): A Light-Guided Trash Collection Robot

Group 12
Power-Efficient Infrared Security System (P.E.I.S.S)

Group 13
Photoplethysmography-Based Runner Heart Rate and Oxygen Saturation Monitoring System

SPRING

CAREER FAIR

THURSDAY 4/17, 10 AM - 2 PM

RESEARCH 1 (R1), ROOM 101AB

Avo Photonics

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CORNING

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ficonTEC
micro assembly machines

KLA

Lawrence Livermore National Laboratory

OptiGRATE
An IPG Photonics Company

SAFRAN

Sandia National Laboratories

THORLABS

zygo

LABORATORY
TOURS

THURSDAY 4/17, 3:30 PM

MEET IN THE CREOL LOBBY TO JOIN A GROUP AND GET A MAP

Time	3:30	3:45	4:00	4:15
Group A	220	243	253	260
Group B	243	253	260	202
Group C	253	260	202	145
Group D	260	202	145	220
Group E	202	145	220	243
Group F	145	220	243	253

220 **Quantum Nonlinear Photonics**
Dr. Yannick Salamin

243 **Nonlinear Photonic Systems**
Dr. Midya Parto

253 **Semiconductor Diode Laser Group**
Dr. Yehuda Braiman

260 **AR/VR Displays**
Dr. Shin-Tson Wu

202 **Integrated Photonics**
Dr. Sasan Fathpour

145 **THz – Mid-IR – UV Frequency Combs and Spectroscopy**
Dr. Konstantin Vodopyanov

SPECIAL GUEST
LECTURE

Light a Path for Quantum Sensing

Jun Ye, University of Colorado

THURS 4/17, 5 PM

CREOL 102/203

Abstract: Lasers and quantum science have fueled revolutionary developments in atomic, molecular, and fundamental physics. Scaling up quantum systems to ever increasing sizes promises to revolutionize the performance of atomic clocks and open new discovery opportunities. Quantum technology has brought tens of thousands of atoms to minute-long coherence times, enabling the achievement of best measurement precision and accuracy. The combination of ultrafast optics and precision metrology has brought us new tools such as vacuum ultraviolet frequency combs that are knocking on the door of nuclear physics, giving rise to the recent breakthrough of quantum-state-resolved laser spectroscopy of thorium-229 nuclear transition. The permeation of quantum metrology to all corners of physics sparks new ideas for testing fundamental laws of nature and searching for new physics.

Jun Ye is a Fellow of JILA, a Fellow of NIST, and a member of the National Academy of Sciences. His research focuses on the development of new tools for light-matter interactions and their scientific applications for precision measurement, quantum science, and frequency metrology. He is known for developing highly precise and accurate atomic clocks, first realization of quantum gas of polar molecules, and pioneering work on frequency combs and spectroscopy. He is a highly cited researcher for every year since 2014. He has received numerous honors include five Gold Medals from the US Department of Commerce, Breakthrough Prize in Fundamental Physics, Micius Prize, Herbert Walther Award, Vannevar Bush Fellowship, N.F. Ramsey Prize, and I.I. Rabi Prize.

Society of Optics Students

WITH

SPIE. AND OPTICA Formerly OSA

INVITES YOU TO THE

AFFILIATE/STUDENT MIXER

Bar Louie

AT PLAZA ON UNIVERSITY

4100 NORTH ALAFAYA TRAIL SUITE 167 & 173,
ORLANDO, FL 32826

Thursday, 4/17 6PM

RSVP HERE

SESSION 1

TECH HUBS: SEMICONDUCTORS AND SENSING

SMART USA: Digital Twins – A Revolution in Advanced Manufacturing & Innovation

Volker Sorger, University of Florida

FRI 4/18, 9:10 AM

HILTON DOUBLE TREE

Abstract: The problem - today's semiconductor fabs are costly ($10-$20) billion to build and operate, and it takes years to develop the next-generation processes resulting in $500M+ spent per developed process node. This hurts the bottom-line, economic impact, technology federation (market penetration) via reduced adoption, and national competitiveness. The Solution: Digital Twins (DT) to the rescue – a virtual representation of a physical machine/process/flow/fab/etc. In this talk I introduce the first CHIPS Act USA National Manufacturing Institute which focuses on Semiconductor Manufacturing and Advanced Research with Twins (SMART) its vision, execution plan, and end with DT examples for HVM. The success of DTs for the semiconductor ecosystem is driven by several factors, including a) convening a diverse number of stakeholders to buy-into the DT 'idea'; b) Improve SOTA HVM via; c) reduced chip development and manufacturing costs by 40-45%; d) improve process development cycle times by 35-40% and e) improved yield by 40-45%. Alongside, key to this success is to advance digital twin-enabled curricula and train a new workforce. Finally, I share examples of DTs on advanced VLSI processes, flows, and emerging technologies.

Volker J. Sorger is the Rhines Endowed Professor for Semiconductor Photonics in the Department of Electrical and Computer Engineering at the University of Florida and Assistant Director for Business Development of the Florida Semiconductor Institute. Dr. Sorger also serves as the Deputy Chief Digital Officer for the first CHIPS Act USA Manufacturing Institute on Semiconductor Manufacturing and Advanced Research with Twins (SMART). In these roles, Dr. Sorger coordinates microchip and semiconductor activities for the state of Florida, nationwide, and transatlantic partnerships building R&D and manufacturing ecosystems and private-public partnerships. Technical thrusts include, 3DHI, advanced packaging, AI accelerators, photonic-electronic integrated circuits, and chip prototyping and digital twins. For his work, Dr. Sorger received multiple awards including the SPIE Maria Goeppert-Mayer Award, top 16 educators in the nation, the Presidential PECASE Award, the AFOSR YIP, the Emil Wulf Prize, and the National Academy of Sciences award of the year. Dr. Sorger was the Editor-in-Chief for the journal of Nanophotonics and served on the board of SPIE and Optica. He is a Fellow of IEEE, SPIE, IAAM, and The Optical Society. He holds 25 U.S. patents with licenses to corporations and ventures.

SESSION 1

TECH HUBS: SEMICONDUCTORS AND SENSING

Expanding Central Florida's Semiconductor Ecosystem

Leland Nordin, University of Central Florida

FRI 4/18, 9:40 AM

HILTON DOUBLE TREE

Abstract: We will explore Central Florida's semiconductor ecosystem, focusing on UCF's efforts to strengthen the semiconductor workforce, build strategic partnerships with Florida's semiconductor industry, and support national initiatives.

Leland Nordin is an Assistant Professor with a joint appointment in the Materials Science and Engineering Department and the College of Optics and Photonics (CREOL). He earned a bachelor's degree in physics from Grinnell College, followed by master's and doctoral degrees in electrical and computer engineering from The University of Texas at Austin.

At UT Austin, he received several honors, including the Ben Streetman Prize for Outstanding Research in Electronic and Photonic Materials and Devices, the Margarida Jacome Dissertation Prize, and the UT Austin Graduate School University Continuing Graduate Fellowship. He then completed a prestigious postdoctoral research fellowship at Stanford University's Geballe Laboratory for Advanced Materials.

Since joining UCF in 2023, he has been awarded an Army Research Office Early Career Program (ECP) award, an Air Force Office of Scientific Research Young Investigator Program (YIP) award, and, most recently, UCF's Reach for the Stars Award.

SESSION 1

TECH HUBS: SEMICONDUCTORS AND SENSING

The Montana Headwaters Tech Hub for Smart Photonic Remote Sensing Systems

Joseph Shaw, Montana State University

FRI 4/18, 10:00 AM

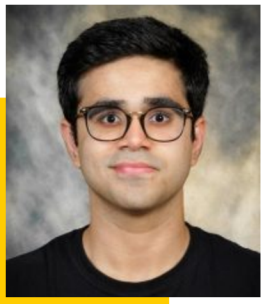
HILTON DOUBLE TREE

Abstract: The Headwaters Tech Hub was funded by the U.S. Economic Development Administration in 2024 to promote growth in the Montana photonics ecosystem, particularly for smart photonic remote sensing systems. This is enabling growth of photonics in both industry and academia across Montana, building from a cluster of more than 40 companies surrounding Montana State University (MSU) in Bozeman, Montana. Many of these companies were founded by MSU Ph.D. graduates who chose to start a company instead of moving away. This trend was enhanced through the formation of the MSU Optical Technology Center and later the Montana Photonics and Quantum Alliance. The talk will briefly outline the growth of the Montana photonics community and show examples of smart sensor systems that includes hyperspectral imagers and lidar systems with embedded computers and intelligent algorithms.

Dr. Joseph Shaw is the Director of the Optical Technology Center and Distinguished Professor of Photonics and Electrical Engineering at Montana State University (MSU) in Bozeman, Montana. He earned a Ph.D. in Optical Sciences at the University of Arizona and worked for 12 years at the National Oceanic and Atmospheric Administration (NOAA), where he developed optical remote sensing instruments, before joining the MSU faculty in 2001. Dr. Shaw is a Fellow of both SPIE and Optica.

CREOL

STUDENT OF THE YEAR TALK



Non-Gaussian Light Scattering Phenomena and Applications

Shubham Dawda, University of Central Florida

FRI 4/18, 10:25 AM

HILTON DOUBLE TREE

Abstract: Reality is rarely deterministic and usually fluctuates. We try to make sense of the fluctuations arising from the interaction of light with disordered media to learn about the media, the fluctuations, or sometimes both! We employ light scattering based methodologies to perform simple yet powerful measurements that provide robust statistical information, even in noisy environments. Furthermore, our understanding of disordered media has also enabled us to develop materials with tunable disorder, optimizing their scattering efficiency for various applications.

Shubham Dawda is a theoretical experimentalist pursuing his PhD in Optics under the guidance of Professor Aristide Dogariu at CREOL. He received his Bachelor's in Electrical Engineering with a focus in Photonics from Virginia Tech in 2020. His work involves developing methodologies for both characterizing and controlling complex media in noisy environments. Moving forward, he intends to continue working in the field of Biomedical Optics and hopes to translate simple yet robust scattering based technologies to the clinic.

SESSION 2
TECH HUBS: QUANTUM

Engineering Quantum: Building the National Quantum Nanofab

Scott Diddams, University of Colorado Boulder

FRI 4/18, 11:10 AM

HILTON DOUBLE TREE

Abstract: New quantum technologies are poised to transform fields of broad societal impact in computing, sensing, and communications. However, there is a significant gap between fundamental laboratory demonstrations and the fabrication of quantum devices that can be built into instrumentation such as computers, clocks, navigation tools, and optical networks. Simply put, we do not yet know how to build the manufacturable quantum devices of the future, and particularly those that will harness quantum particles like atoms and photons. These quantum building blocks are fundamentally small and new fabrication techniques at the nanoscale will be critical to realize the desired advances in these fields. In this talk, I will describe the National Quantum Nanofab (NQN) at the University of Colorado Boulder which will address this shortcoming by developing advanced nanofabrication approaches required to build, control, and connect quantum devices with their supporting infrastructure.

Scott Diddams holds the Robert H. Davis Endowed Chair at the University of Colorado Boulder, where he is also Professor of Electrical Engineering and Physics. He carries out experimental research in the fields of precision spectroscopy and quantum metrology, nonlinear optics, microwave photonics and ultrafast lasers. Diddams received the Ph.D. degree from the University of New Mexico in 1996. From 1996 through 2000, he did postdoctroral work at JILA, NIST and the University of Colorado. Subsequently, Diddams was a Research Physicist, Group Leader, and Fellow at NIST (the National Institute of Standards and Technology). In 2022 he transitioned to his present position where he also assumed the role of Faculty Director of the Quantum Engineering Initiative in the College of Engineering and Applied Science. As a postdoc Diddams built the first optical frequency combs in the lab of Nobel laureate John Hall, and throughout his career, he has pioneered the use of these tools for optical clocks, tests of fundamental physics, novel spectroscopy, and astronomy. His research has been documented in more than 750 peer-reviewed publications, conference papers, and invited talks.

SESSION 2
TECH HUBS: QUANTUM

UCF's Quantum Leap Initiative

Andrea Blanco-Redondo, University of Central Florida

FRI 4/18, 11:35 AM

HILTON DOUBLE TREE

Abstract: In this talk I will cover our UCF Quantum Leap Initiative to bring together a multidisciplinary team of experts working on different aspects of quantum information, science, and engineering (QISE) with unifying research, education, and workforce development goals. I will illustrate these efforts by briefly describing concrete ongoing research and education efforts.

Andrea Blanco-Redondo is the FPCE Endowed Professor of Optics and Photonics at CREOL, The College of Optics and Photonics, at the University of Central Florida. Her Quantum Silicon Photonics group focuses on novel concepts on nonlinear and topological quantum nanophotonics. Prior to this, she was the Head of Silicon Photonics Research at Nokia Bell Labs in New Jersey, USA, and Senior Fellow at the School of Physics University of Sydney, Australia. From 2007 to 2015 she was a photonics researcher and project manager with the Aerospace and Telecom departments of the industrial research center Tecnalia in Spain. She got her M.Sc. in Telecommunications Engineering with the University of Valladolid (2007) and her Ph.D. Eng. with the University of the Basque Country (2014).

She is an Optica Fellow and a former Optica Director at Large. She is a co-Chair of the SPIE Photonics West OPTO Symposium and holds several other Chair and Editor roles. She received the 2018 OSA Ambassador distinction, the 2016 Geoff Opat Award of the Australian Optical Society to the top Australian Early Career Researcher, and one of the two 2014 Ada Byron Award to the top Women in Technology in Spain.

SESSION 3
INDUSTRY UPDATES AND FLORIDA PANEL

FRI 4/18, 11:55 AM

HILTON DOUBLE TREE

Lunch Presentations

Please use the lunch hour to view research posters presented by our students, stop by the exhibit tables to see what our Affiliates are up to, and network with your peers!

We want your feedback! During lunch, please take a short survey here

FRI 4/18, 1:00 PM

HILTON DOUBLE TREE

Industry Update Presentations

SPIE Industry Update

Peter de Groot, President

SPIE.

Optica Industry Update

Jim Kafka, President

OPTICA

SESSION 3

INDUSTRY UPDATES AND FLORIDA PANEL

FRI 4/18, 1:30 PM

HILTON DOUBLE TREE

Unleashing the Florida Photonics Industry: Establishing a Photonics Hub in Florida

Join our panelists for a discussion on how other regions have developed strong photonics-based industry hubs, and explore opportunities for industry-academic partnerships that the Florida photonics industry might pursue in the next decade.

MODERATOR

Leland Nordin
University of Central Florida

PANEL

Ty Olmstead
CTO, Ocean Optics and President, Florida Photonics Cluster

Volker Sorger
Deputy Chief Digital Officer, SMART USA Institute

Scott Diddams
National Quantum Nanofab Facility

Joseph Shaw
Montana Headwaters Tech Hub

Jim McNally
CEO, StratTHNK Associates and Treasurer, SPIE

SESSION 3
INDUSTRY UPDATES AND FLORIDA PANEL

FRI 4/18, 2:15 PM

HILTON DOUBLE TREE

Company Spotlight Presentations

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Randall Hinton
Marketplace BD Manager

SAFRAN

Curtis Sargent
Talent and Outreach Specialist
Robert Gappinger
Principal Optical Engineer

RELATIVITY NETWORKS

Jason Eichenholz
Founder and CEO

SESSION 4
TECHNICIANS AND TRAINING

The National Landscape of Photonics Technician Training

Natalia Chekhovskaya, Indian River State College

FRI 4/18, 2:45 PM

HILTON DOUBLE TREE

Abstract: Photonics technicians play a critical role in the rapidly growing field of optics and photonics, supporting industries such as telecommunications, healthcare, manufacturing, and defense. These professionals must possess a strong foundation and hands-on skills in optics, laser technology, fiber optics, and precision instrumentation to assemble, test, and maintain photonics systems. As demand for photonics applications expands, so does the need for highly skilled technicians who can bridge the gap between engineering concepts, practical implementation, commercialization, and production.

During this session, the following topics will be discussed:

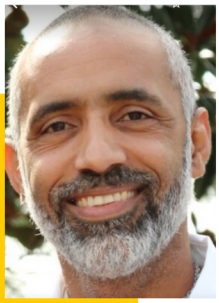
- The national landscape of college photonics programs offered by two-year colleges and their specializations;
- LASER-TEC Open Educational Resource Library available for industry and academia to support photonics technician education;
- Strategies to sustain photonics college programs after the Center's sunset in August 2025.

LASER-TEC is a National Science Foundation Advanced Technological Education Resource Center, missioned to provide resources to grow a sustainable photonics technical pipeline.

Natalia Chekhovskaya holds a master's degree in physics. Currently, she serves as an Associate Director and Co-Principal Investigator of LASER-TEC.

Natalia leads multifaceted programs supporting the development and expansion of the technical workforce in lasers and fiber optics across the United States. LASER-TEC assists over 40 two-year colleges with strengthening existing and opening new optics, photonics, lasers, and fiber optics academic programs.

SESSION 4
TECHNICIANS AND TRAINING



Valencia College Technical Training Program

Brendon Monize, Valencia College

FRI 4/18, 3:10 PM

HILTON DOUBLE TREE

Brendon Monize is the program manager for FJGG AST programs on the Osceola Campus at Valencia College. He brings his passion for teaching and inspiring students to our AST programs every day. Brendon was born in South America and migrated to the United States more than 30 years ago. Brendon's passion for his students stems from his long-standing belief that education prepares us for a better future, and he strives to impart his passion upon his students in every aspect of their time at Valencia. Brendon holds a bachelor's degree in business administration and a master's degree in organizational and project management. He is also an ASE Certified Heavy Diesel Mechanic and a 22-year veteran Industrial Maintenance Technician and CNC Machinist. Brendon has spent more than twenty-five years in the industrial world, working in various roles and excelling both as a Management Professional and an Industrial Technician. Brendon brings his real-life work experience to managing the classroom and strives to prepare every student for a successful career in the Industrial World.

CONGRATULATIONS!

2025 Distinguished Alumni Award Winner

Zhibing Ge, ‘04MS ‘07PhD

Zhibing Ge ‘04MS ‘07PhD was mentored by Professor Shin-Tson Wu during his time at CREOL, and the two of them published a technical book together, “Transflective Liquid Crystal Displays.”

Ge now works as a Director of Hardware Engineering for Apple Inc. He’s published one technical book, 10 conference papers, more than 38 scientific journal articles (with 3,800+ citations), and holds more than 150 U.S. Patents.

Alongside Dr. Wu, Ge’s donation created the Ge and Wu Scholarship fund, which aims to award first-generation college students with financial support as they pursue their education at CREOL. Ge also serves as a Senior Member of the Society for Information Display and as an Associate Editor for the Journal of the Society for Information Display.

OPTIMAX®

Research Grant Award

Each year, CREOL Industrial Affiliate Optimax supports our outstanding faculty by awarding a $20,000 equipment grant. This underscores their commitment to supporting the materials and manufacturing for custom optical components.

We will announce the winner of this year’s grant at the Awards Presentation at the end of the Symposium program.

STUDENT
POSTERS

Poster 1 - Programmable Integrated Topological Photonics

Amin Hashemi, Elizabeth Louis Pereira, Hongwei Li, Jose L. Lado, Andrea Blanco-Redondo

Using a programmable integrated photonic chip, we experimentally generate robust topological modes solely through optical loss engineering. This approach not only enables exploration of non-Hermitian topological phases but also holds promise for practical applications, including topological lasers, sensors, quantum emitters, and next-generation topological quantum photonic technologies

Poster 2 - Fourier Plane Filtering for Cross Grating Microscopy of Live Cells

Bethany Hellman, Kyu Young Han, Leland Nordin

We combine cross-grating microscopy (CGM) with an attenuation filter in the reimaged Fourier plane to improve signal contrast for subcellular organelles and noninvasive live cell imaging. We then test a spatial light modulator (SLM) and various transmission filters for improvements in cell imaging, and test oblique illumination in conjunction with Fourier filtering.

Poster 3 - Characterization of Three-Section Mode-Locked Semiconductor Lasers for Optical Frequency Comb Generation and Control for Space Applications

Di Huang, Peter Delfyett

We present a three-section mode-locked laser diode operating under passive and hybrid configurations. Using a ‘fixed-point-frequency’ analysis provides information on the laser’s ability to tune its output comb position & comb spacing. Multi-tone injection locking provides information on the dynamics of the tunability and shows tuning speeds sufficient for orbital satellite communications.

Poster 4 - A Parametric Model to Optimize Ultrafast Laser Fabrication of Hydrophobic Metal Surfaces

Punith Chikkahalli Lokesh, Gabryella Baldaci, Xinpeng Du, Fang Xue, Xiaoming Yu

This work develops a parametric model using laser processing parameters to analyze hydrophobic metal surfaces fabricated by an ultrafast laser. It establishes fluence relationships and defines fluence (FoMF) and thermal (FoMT) figures of merit. Findings show FoMT is essential for explaining contact-angle variations observed in the experiment.

Poster 5 - Simple Fiber Optic Solutions for Clean, Uniform Microscopy Illumination

Abdullah Husain, Stephanos Yerolatsitis, Swati Bhargava, Rodrigo Amezcua Correa, Miguel Bandres Kyu Young Han

This work presents two simple fiber optic solutions for achieving uniform, artifact-free microscopy illumination. First, we use photonic lanterns to generate high-quality TIRF excitation, demonstrated with super-resolved fluorescence imaging of microtubules. Second, a specially designed multi-mode 'flat-top' fiber delivers uniform, speckle-free illumination, demonstrated through imaging of a USAF resolution target.

STUDENT
POSTERS

Poster 6 - Beyond SPR: Quantitative single-molecule biosensing for antibody-antibody interactions

Katelyn Canedo, Jiah Kim, Daniel Park, Abdullah Husain, Kyu Young Han

Studying antibody-antibody interactions is key to improving multiplexed immunofluorescent imaging. Through single-molecule fluorescence microscopy, binding kinetics of various secondary antibodies were measured in well-passivated flow chambers. These results, validated via SPR, revealed critical differences in binding behavior to offer new insights into optimizing fluorescent multiplexing protocols.

Poster 7 - Multicolor 2.5D fluorescent microscopy for fast volumetric imaging with high sensitivity

Le Mei Wang, Jiah Kim, Kyu Young Han

We present a new technique for 3D subcellular imaging that significantly reduces image acquisition time without compromising resolution or photon detection efficiency. This approach allows fast volumetric imaging while preserving spatial resolution, overcoming limitations caused by the slow z-axis scanning of traditional piezo stage-based systems.

Poster 8 - Topological multimode entanglement on silicon photonics superlattices

Mohammadjavad Zakeri, Andrea Blanco- Redondo

Topological photonics enables disorder-resilient quantum states. We theoretically and experimentally demonstrate multimode spatial biphoton entanglement in silicon nanophotonic superlattices with multiple topological modes per unit cell. Using silicon's inherent nonlinearity, we show purely topological modes exhibit superior robustness against disorder compared to structures containing trivial modes.

Poster 9 - Efficient Modeling of Tapered Photonic Structures

Swati Bhargava, Konrad Tschernig, Vinzenz Zimmermann, Daniel Cruz-Delgado, Stephen Eikenberry, Sergio Leon-Saval, Rodrigo Amezcua-Correa, Miguel A. Bandres

Tapered optical structures are integral to modern photonics. To model these devices, we introduce a numerical technique that keeps the refractive index profile constant during the simulation. Our method improves accuracy and efficiency tenfold. This tapered reference frame enables major advancements in the design and optimization of optical devices across various applications.

Poster 10 - Non-Abelian Gauge Fields in Photonic Metasurfaces

Foster Sabatino, Alexander B. Khanikaev

Gauge fields are crucial for the understanding of physics at its most fundamental level. Moreover, they can appear in various electronic, optical, or mechanical systems. By changing the geometry of a metasurface based off photonic graphene a non-commutative or non-Abelian gauge field can arise.

STUDENT
POSTERS

Poster 11 - Metasurface-refractive hybrid lens physical optics modeling

Ko-Han Shih, C. Kyle Renshaw

We demonstrate a framework to model vectorial wave propagation in metasurface-refractive hybrid lenses. A physical optics approach based on polarization raytracing and Gaussian decomposition method is utilized to propagate wavefront through refractive optics with polarization and ray path diffraction considered.

Poster 12 - Zeeman Splitting in Monolayer Transition Metal Dichalcogenides

Egor Kurganov, Daria Kafeeva, Dmitry Yasnov, Filipp Komissarenko, Alexander Khanikaev

Transition metal dichalcogenides, a class of 2D semiconductors, exhibit valley-selective circularly polarized light absorption and emission due to spin-valley locking. This property holds great promise for applications in topological photonics, spintronics, and optoelectronics. In this work, we analyze the tunability of this effect under the influence of a magnetic field.

Poster 13 - Stimulated Emission Depletion Microscope Setup and Alignment

Xiaotong Wang, Kyu Young Han

Stimulated emission depletion (STED) microscopy overcomes the diffraction limit in fluorescence imaging but requires precise optical setup. We report the setup of a STED microscope using an ultrafast pulsed laser. This setup provides a stable foundation for future development of high-throughput super-resolution imaging techniques.

Poster 14 - Tunable hyperspectral filter based on rotated chirped volume Bragg gratings

David Guacaneme, Shaghayegh Yaraghi , Swati Bhargava, Ameen Alhalemi, Daniel Cruz-Delgado, Rodrigo Amezcua Correa, Ivan Divliansky, Miguel A. Bandres

We introduce a tunable spectral filter based on rotated-chirped volume Bragg gratings (r-CVBG) which offers a continuous tunable center wavelength along with tunable full-width at half maximum (FWHM) bandwidth, steep spectral edge, high out-of-band rejection ratio, high-quality filtered images, and high damage threshold compared to other methods. This highly compact and passive device has applications ranging from spectroscopy, multimode solitons, and separating various channels in hyperspectral imaging for disease diagnosis.

Poster 15 - Single Objective Light Sheet Lithography

Xuan Luo, Bethany Hellman, Kyu Young Han, Mrigaraj Goswami, Chaitanya Ullal

Single Objective Light Sheet Lithography (SOLS) offers a compact and efficient method for 3D microfabrication using a single objective for both illumination and imaging. We apply SOLS to two gel systems: one achieves multilayer patterning; the other simplifies gel preparation for single-layer arbitrary structures with high fidelity.

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Poster 16 - Ultrabroadband integrated photonic filters on thin-film lithium niobate

Pooja S.Kulkarni, Parash Thapalia, Sasan Fathpour

We propose a compact passive photonic spectral filter on TFLN with an exceptionally high bandwidth of over 850 nm, rendering it suitable for a diverse host of applications. This design utilizes adiabatic and slot structure waveguides which simplify fabrication steps and enhance performance, ensuring efficient and versatile integrated photonic filtering.

Poster 17 - Experimental comparison of active imaging modes for long-range target imaging in multiple reflective bands

Eunmo Kang, Oles Fylypiv, Jeremy Mares, Clay Chester, Joshua Follansbee, Ron Driggers, C. Kyle Renshaw

Achieving sufficient photon flux to observe long-range targets clearly against background and sensor noise is critical. In this study, we perform CNR analysis on targets captured by passive and active imaging in the NIR, SWIR, and eSWIR bands. Experimental data are compared with radiometric models and simulations using the Night Vision Integrated Performance Model (NV-IPM).

Poster 18 - Integrated Microwave-to-Optical Converters on Thin-Film Lithium Niobate

Farzaneh A. Juneghani, Gregory S. Kanter, Milad G. Vazimali, Kim F. Lee, Ectis Velazquez Jr., Xun Gong , Sasan Fathpour

Thin-film lithium niobate (TFLN) is established as a versatile platform for photonic integrated circuits. In this work, we integrate photonic devices with microwave antennas on TFLN for direct microwave-to-optical converters. Specifically, slot and bow-tie antennas are seamlessly integrated with optical waveguides for microwave sensing at 28 and 89 GHz.

Poster 19 - Chemical Imaging and Spectroscopy on the Nanoscale

Oscar Sang, Ryan Mead, Rebecca Brians, Adrianna Brown, Alfons Schulte

Scattering near-field optical microscopy (SNOM) employs light scattered from the tip of an atomic force microscope as an extremely localized probe of materials below the diffraction limit. Employing infrared excitation in the fingerprint region we present spectrally resolved maps with sub 50 nanometer resolution of polymer blends and biological model systems.

Poster 20 - Compact Panoramic Beam Steering Modules for Optical Wireless Communications on Small UAS

Changkee Hong, Kyle Renshaw

Optical wireless communication (OWC) provides high-bandwidth, line-of-sight, low-detectability links but requires precise beam steering, which is challenging for small unmanned aerial systems (sUAS) due to size, weight, power, and cost (SWaP+C) constraints. We develop and compare compact panoramic steering systems designed for sUAS, showing their potential for airborne OWC systems.

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Poster 21 - Active sensing with vortex speckles.

Cristian Hernando Acevedo, Kang-Min Lee, Aristide Dogariu

Sensing through complex media is important due to its potential applications for medicine. To obtain information about a hidden target in a scattering environment can be used the correlation methods, which are considered as scanning-, reference-, and guide–star–free. We use vortex speckles to sense the image or position of the target.

Poster 22 - Solid-State Laser Stabilization using Phase-Shifted Volume Bragg Gratings

Daniel Lumpkin, David Guacaneme, Oussama Mhibik, Vadim Smirnov, Ivan Divliansky

Phase-shifted Bragg gratings act as narrow-band transmission filters. When holographically encoded into a volume, they create a wavelength-tunable optic that can be used for stabilization of solid-state lasers. Longitudinally chirped, π-phase-shifted gratings with transmission bandwidths down to 1.5GHz have been fabricated and used lock lasers down to single-mode operation

Poster 23 - Free-form optical resonators based on topological photonic metasurfaces

Yuma Kawaguchi, Daria Smirnova, Filipp Komissarenko, Daria Kafeeva, Svetlana Kiriushechkina, Anton Vakulenko, Andrea Alu, Jeffery Allen, Monica Allen, Alexander B. Khanikaev

Here, we theoretically and experimentally demonstrate a new class of optical resonators based on topological photonic metasurfaces. The resonant states of such resonators are defined by the geometrical phase and independent of the resonators' shape and length and bound to a specific frequency, which we confirmed using infrared spectroscopy.

Poster 24 - Direct design a hybrid MWIR achromatic doublet based on Dispersive Sweatt model

Weiyu Chen, Kyle Renshaw

We introduce a Dispersive Sweatt Model (DSM) capable of accurately capturing dispersion effects in meta-atoms by integrating contributions from material properties, geometric factors, and diffraction. Using DSM, we design and demonstrate a hybrid refractive-metasurface lens system optimized for mid-wave infrared (MWIR) wavelengths, showing excellent agreement with rigorous wave-optics simulations. We also analyze the limitations of DSM and discuss associated phase-mismatch constraints.

Poster 25 - Filament Propagation at Low Pressures

LaShae Smith, Owen Thome, Jessica Pena, Danielle Reyes, Martin Richardson

Laser filaments consist of an elongated plasma channel and a high intensity beam that can propagate diffraction-limited over several times the Rayleigh distance, making them ideal for long-range applications. Several filament applications require propagation to or at high altitudes where the air pressure is a fraction of what it is at sea level. Here, we carefully select the preconditions to ensure nonlinear propagation and characterize the filament formation and propagation at varying pressures.

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Poster 26 - The New Mobile Ultrafast High Energy Laser Facility

LaShae Smith, Owen Thome, Robert Bernath, Martin Richardson

Kilometer scale propagation experiments are conducted at TISTEF to characterize filament formation and propagation through real world conditions. These studies are conducted using a Ti:Sapphire laser system with E = 500 mJ, λ = 800 nm, τ = 100fs, and Trep = 10 Hz. This laser is currently being brough online in a new 36' truly mobile trailer. The new trailer will allow for additional propagation ranges, such as over-water, and distances up to 13 km to be studied.

Poster 27 - Non-Resonant Fabry-Pérot Cavity via Progressive Orbital Angular Momentum Conversion

Shaghayegh Yaraghi, Oussama Mhibik, Murat Yessenov, Ayman Abouraddy, Ivan Divliansky

We present a Fabry-Pérot cavity incorporating a holographic phase mask that transforms an incoming broadband Gaussian beam into a superposition of Laguerre-Gaussian modes. The ladder-up conversion and orthogonality of these modes disrupts the conventional FP resonances, eliminating their well known spectral features and therefore preserving the input spectrum.

Poster 28 - High Power Nanosecond Pulsed Fiber Laser Utilizing XLMA Fiber

Ryan Ellis, Nathan Bodnar, Martin Richardson

Power scaling of pulsed fiber lasers is limited by nonlinear effects due to high peak power within the core. Using XLMA fiber allows for higher output powers by reducing nonlinear effects. Pulse shaping and the use of specialty mode-mixing fiber at the input of the XLMA will be discussed.

Poster 29 - Drone based Near-Infrared Imaging System for Remote Search of Targets in Difficult Terrain

Li Zhang, Changkee Hong, Thomas P. Watson, C. Kyle Renshaw

We design, prototype and test NIR sensor systems for the FWC to detect camouflaged Burmese pythons in South Florida. Our final system, deployed on a drone, offers remote control and automatic mission through customized software operatable day and night. Pulsed illumination reduces motion blur, improving wildlife detection in dense vegetation.

Poster 30 - TMD flakes thickness measurement using microspectroscopy

Dmitry Yasnov, Daria Kafeeva, Filipp Komissarenko, Alexander Khanikaev

One of the popular methods of obtaining 2D TMD samples is mechanical exfoliation, where one gets several flakes with unknown thicknesses to work with. Here we show a method of quick thin film thickness measurement based on microspectroscopy applied to different types of TMD flakes.

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DWIGHT KIMBERLIN AND FAMILY

Thanks to a generous $25,000 donation from Industrial Laser Machines (ILM) CEO Dwight Kimberlin, a new graduate fellowship aims to support CREOL students pursuing advanced degrees in optics and photonics.

As a member of CREOL's Industrial Affiliates program, ILM's partnership embodies the innovative spirt of collaboration that UCF has set the standard for.

ART AND LYNN WILSON

UCF's Day of Giving was a success for CREOL - in no small part thanks to Art Wilson '77 and Lynn Wilson's gift! This will start an endowed scholarship to support electrical engineering students taking photonics courses.

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