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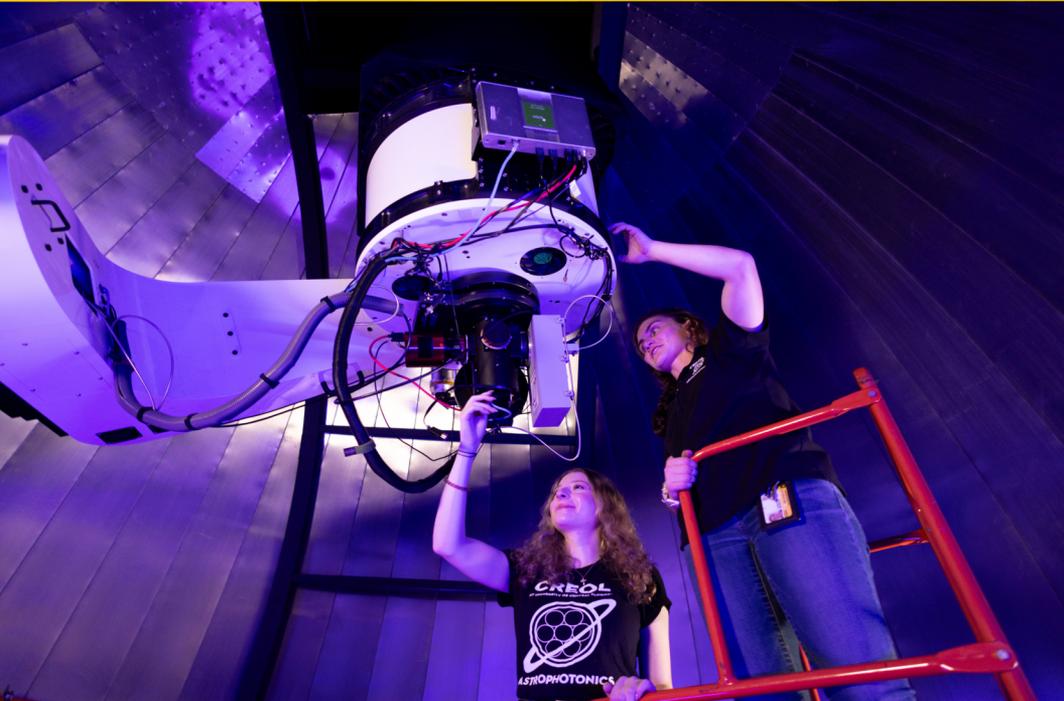
CREOL, The College of
Optics and Photonics

UNIVERSITY OF CENTRAL FLORIDA

20
26

INDUSTRIAL AFFILIATES SYMPOSIUM

MARCH 5-7 | ORLANDO, FL



CREOL.UCF.EDU

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THANK YOU **EXHIBITORS!**



CORNING



CREOL



MESSAGE FROM THE DEAN

Welcome to the 2026 CREOL Industrial Affiliates Symposium! I am honored you can join us on UCF's beautiful campus as we showcase the work being done within CREOL and by our valued partners, promote the Florida photonics industry, and celebrate the continued success of our faculty, researchers, and students.

This year's sessions focus on the growing opportunities in **biomedical photonics and quantum photonics**, and how initiatives here in Florida aim to support their expansion.



We're thrilled to welcome Bruce Tromberg, Director of the National Institute of Biomedical Imaging and Bioengineering at the National Institutes of Health, who will outline the ways optical technologies can accelerate biomedical research. CREOL Professor Artistide Dogariu will detail how advances can lead to noninvasive biomarkers. Our quantum session will feature perspective from Jason Mahon with the Florida Department of Commerce, Paul Parazzoli with IBM Quantum, Noel Goddard with Qunnect, Daniel Pompa with IonQ, and CREOL Professor Andrea Blanco-Redondo. Additionally, Optica President Gisele Bennett and SPIE Director of Technology Outreach John Yoon will deliver industry updates, alongside CREOL alum and Relativity Networks co-founder Jason Eichenholz '95MS '98PhD.

This comes at an exciting time of expansion at CREOL. Our new 2,200-square-foot teaching lab is set to open this spring, and we have launched both a Teacher Ambassador Program and a Student Ambassador Program to connect with local educators and broaden our community outreach efforts. Meanwhile, our faculty continues to expand: I'm excited to introduce recent additions to the College.

I am also honored to announce that Gisele Bennett '87 '89MS has been named CREOL's 2026 Distinguished Alumnus of the Year. Her notable career has blended academic excellence, industry collaboration, and research achievement - a journey that began at the same time CREOL was in its infancy as an institution.

The Symposium is also an opportunity to recognize our students' achievements. New this year: on Friday, students will deliver elevator pitches to explain their research posters, after which I encourage you to view them during our afternoon poster session.

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 APOMA, Arden Photonics, Avalanche Thinking, Bruker, IonQ, and Yokogawa.

A handwritten signature in black ink that reads "David J. Hagan". The signature is fluid and cursive, with a large initial "D" and "H".

David J. Hagan, Ph.D.

Dean & Director

Pegasus Professor of Optics and Photonics

SCHEDULE OF EVENTS

THURSDAY, MARCH 5 - CREOL BUILDING

12 PM - 4 PM

Spring Optics and Photonics Career Fair
Room 102/103

4PM - 5 PM

Lab Tours
Meet in the CREOL Lobby

5 PM - 6 PM

Distinguished Speaker: New Frontier of Quantum Computing
Mikhail Lukin, Harvard University; QuEra Computing, Inc. | CREOL 102

6:15 PM - 8:30 PM

Student - Affiliate Mixer
Bounce House / 12100 Challenger Pkwy.

FRIDAY, MARCH 8 - FAIRWINDS ALUMNI CENTER

8:30 AM

Welcome to UCF
Winston Schoenfeld, Vice President for Research and Innovation

CREOL Overview and Updates
David Hagan, Dean and Director

Biomedical Optics

9:15 AM

Optical Technologies: New Opportunities for Accelerating Innovation in Biomedical Research
Bruce Tromberg, National Institutes of Health

Biophotonics: From Effective Diagnostics to Untraditional Biomarkers
Aristide Dogariu, CREOL Professor

10:15 AM

Coffee Break / Networking / Company Exhibits

Industry Focus

10:45 AM

Optica Industry Update
Gisele Bennett, Optica

Relativity Networks Presentation
Jason Eichenholz, Relativity Networks

Company Spotlight Presentations

11:30 AM

SPIE Industry Update
John Yoon, SPIE

12:00 PM

Student Poster Elevator Pitch Competition: Part 1

12:15 PM

Lunch Break / Networking / Company Exhibits

1:15 PM

Student Poster Elevator Pitch Competition: Part 2

1:30 PM

Student of the Year Talk: Observation of Topological Flat-Band States in Photonic Lattices
Swati Bhargava

Florida Alliance for Quantum Technology (FAQT)

1:45 PM

FAQT Overview
Jason Mahon, Florida Department of Commerce

CREOL's Quantum Leap Initiative
Andrea Blanco-Redondo, CREOL Professor

Unlocking the Value of Quantum Computing
Paul Parazzoli, IBM

Pioneering Quantum Infrastructure
Noel Goddard, Qunnect

Constructing the Quantum Platform
Daniel Pompa, IonQ

3:15 PM

Awards Presentation

3:30 PM

Ending Reception + Poster Session

SATURDAY, MARCH 7 - LAKE CLAIRE RECREATIONAL AREA

12 PM - 4 PM

Spring Thing Picnic

SPRING CAREER FAIR

 THURSDAY 3/5, 12 PM - 4 PM

 CREOL ROOM 102/103

 Lawrence Livermore
National Laboratory

THORLABS



KLA+

CORNING



LABORATORY TOURS

 **THURSDAY 3/5 AT 4:00PM**

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

145 **Frequency Combs from UV to THz**
Dr. Konstantin Vodopyanov

157 **Micro-Photonics Laboratory (MPL) –
Maritime Sensing**
Dr. Eric Johnson

220 **Shaping Quantum Light in an Optical
Parametric Oscillator**
Dr. Yannick Salamin

265 **Nascent Quantum Nanomaterials**
Dr. Alexander Khanikaev

Lobby **AR/VR displays**
Dr. Shin Tson Wu

Time	4:00	4:15	4:30
Group A	145	157	265
Group B	157	265	220
Group C	265	220	145
Group D	220	145	157



DISTINGUISHED SPEAKER



New Frontier of Quantum Computing

Mikhail Lukin, Harvard University; QuEra Computing, Inc.

 THURS
3/5, 5 PM

 CREOL
102/203

Abstract: A broad effort is currently underway to develop quantum computers that can outperform classical counterparts for certain computational, simulation or sensing tasks. The practical realization of such systems and exploration of their potential capabilities and limitations are central themes in the new field of quantum science and engineering. A central challenge in quantum computing is error suppression, which requires quantum error correction for large-scale processing. However, the overhead involved in creating error-corrected “logical” qubits—where information is redundantly encoded across multiple physical qubits—presents a significant obstacle to scalable quantum computing. In this talk, we will discuss recent advances in the programmable, coherent manipulation of quantum systems using neutral atom arrays excited into Rydberg states by resonant optical fields

Speaker: Mikhail Lukin received his Ph.D. degree from Texas A&M University in 1998. He has been a Professor of Physics at Harvard since 2004, where he is currently the Joshua and Beth Friedman University Professor and a co-Director of the Harvard Quantum Initiative in Science and Engineering. He is also a co-founder, board member, and Chief Scientist of QuEra Computing, Inc. He is a fellow of the American Physical Society (APS), a fellow of the Optical Society of America (OSA), a fellow of the American Association for the Advancement of Science (AAAS) and a member of the National Academy of Sciences. His research is in the areas of quantum optics and quantum information science, aimed at controlling strongly interacting atomic, optical and solid-state systems, studying quantum dynamics of many-body systems and exploring novel applications in quantum computing, simulations, quantum communication and metrology.

OPTICA

Student Chapter

SPIE

Student Chapter

INVITES YOU TO THE
**AFFILIATE/STUDENT
MIXER**



Bounce House

AT ALAFAYA AND CHALLENGER

12100 Challenger Pkwy, Orlando, FL 32826

Thursday, March 5

6:15 PM - 8:30 PM

SPONSORED BY



BIOMEDICAL OPTICS



Optical Technologies: New opportunities for accelerating innovation in biomedical research

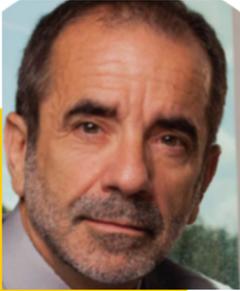
Bruce Tromberg, Director, National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

🕒 FRI 3/6,
9:15 AM

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Dr. Bruce Tromberg is the Director of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) at NIH where he oversees research programs focused on developing, translating, and commercializing engineering, physical science, and computational technologies in biology and medicine. He leads NIBIB's Rapid Acceleration of Diagnostics Technology (RADx Tech) initiative to increase SARS-COV-2 testing capacity & performance. Prior to joining NIH in January 2019, Dr. Tromberg was a professor of biomedical engineering and surgery at the University of California, Irvine (UCI). Dr. Tromberg specializes in the development of optics and photonics technologies for biomedical imaging and therapy. He has co-authored more than 450 publications and holds 29 patents.

BIOMEDICAL OPTICS



Biophotonics: from effective diagnostics to untraditional biomarkers

Aristide Dogariu, UCF Trustee Chair / Pegasus Professor of Optics and Photonics at CREOL



FRI 3/6,
9:45 AM



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Abstract: Light is a convenient carrier of information and an efficient regulator of biological processes. We will demonstrate how, by taking advantage of statistical properties of light, one can reveal cellular-level structural properties in a continuous and non-invasive manner. We will also show how cellular electrodynamics and new paradigms in photobiology could lead to truly noninvasive biomarkers for physiological processes.

Aristide Dogariu is a University Trustee Chair and Pegasus Professor at CREOL, the College of Optics and Photonics, University of Central Florida. His research interests include optical physics, electrodynamics, wave propagation, and complex media. Professor Dogariu is a Fellow of the Optical Society of America, the Physical Society of America and he is the recipient of the International Society for Optics and Photonics' G. G. Stokes Award.

INDUSTRY FOCUS

🕒 FRI 3/6:
SESSION
STARTS
AT 10:45
AM

📍 FAIRWINDS
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Industry Update Presentations



Optica Industry Update

*Gisele Bennett, President, Optica
and 2026 CREOL Distinguished
Alumnus Award Honoree*

OPTICA



SPIE Industry Update

*John Yoon, Director of Technology
Outreach, SPIE*

SPIE.

INDUSTRY FOCUS



Light, Speed, and Scale: How Hollow Core Fiber Solves the AI Infrastructure Crisis

*Jason Eichenholz, Founder and CEO,
Relativity Networks*

Abstract: While the AI revolution demands exponential compute capacity, outdated infrastructure has created a critical bottleneck: a latency and power crisis that limits where data centers can be built. The solution lies in physics. By replacing glass with air, Relativity's Hollow Core Fiber (HCF) moves data nearly 50% faster. This breakthrough allows hyperscalers to expand into power-abundant geographic zones without sacrificing performance, finally unlocking the infrastructure required to power the AI-driven future.

Jason Eichenholz is a serial entrepreneur, executive, philanthropist, and recognized pioneer in laser and photonics optics-enabled innovation. With a Ph.D. in Optical Sciences and Engineering from CREOL, the College of Optics and Photonics at the University of Central Florida, Jason has spent over three decades at the forefront of transformative technologies. As the co-founder and former Chief Technology Officer of Luminar Technologies, Jason helped redefine autonomous vehicle safety with lidar technology. Under his leadership, Luminar became a publicly traded company on Nasdaq, raising approximately \$1 billion in funding. Jason's expertise in turning groundbreaking research into scalable solutions is now driving Relativity Networks' mission to revolutionize fiber optics with Hollow Core Fiber technology.

 FRI 3/6

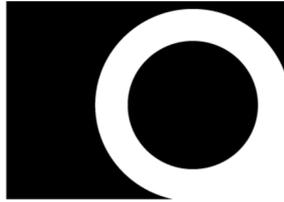
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INDUSTRY FOCUS

 FRI 3/6

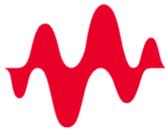
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Company Spotlight Presentations



Optikos®

The Optical
Engineering Experts®



KEYSIGHT

CREOL STUDENT OF THE YEAR TALK



Observation of Topological Flat-Band States in Photonic Lattices

Swati Bhargava, CREOL Doctoral Student



FRI 3/6,
1:30 PM



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Abstract: We report the observation of topological flat-band states in photonic lattices fabricated using femtosecond laser writing. Topological photonic lattices are optical structures that remain insulating in the bulk while supporting robust, unidirectional edge states immune to backscattering. By embedding a flat-band within the topological bandgap, we introduce compact localized modes that can trap light, enhance light-matter interactions, enable diffraction-free transport and crucially interact with topological edge states. Using helical modulation of waveguides in a Lieb lattice, we realize a photonic Floquet topological insulator where both effects coexist. These results reveal a new interplay between topology and flat-band physics, with promising applications in quantum information processing, imaging, lasing, and optical computing.

Swati Bhargava has conducted research in various areas of optics and photonics during her time at CREOL. She has been advised by Professor Miguel Bandres. Before attending CREOL, she received her Bachelor's degree in Communication and Computer Engineering at the LNM Institute of Information Technology, a Master's Degree in Photonic Networks Engineering from Aston University, and a Master's Degree in Optics from the University of Rochester. Her research focuses on the design, simulation, fabrication, and characterization of photonic lattices, encompassing a range of structures from photonic lanterns to topological arrays.

FLORIDA QUANTUM INITIATIVE (FAQT)



FAQT Overview

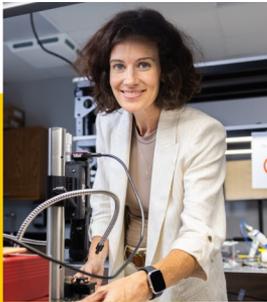
Jason Mahon, Deputy Secretary of Economic Development & Chief Manufacturing Officer, Florida Department of Commerce

FAQT Vision: The State of Florida should be a leader in the field of quantum computing, developing the workforce necessary to attract quantum-related industry and fostering new startups that will be leaders in quantum technology. By investing in a new Florida Quantum Initiative (FQI), the State of Florida can achieve this goal by integrating and building upon existing expertise and infrastructure from across FL universities. The FQI will create a unique and strong national hub that catalyzes and accelerates new job creation and industry growth in Florida. The time to invest is now, while quantum technologies are just beginning to reach commercialization and the research and educational infrastructure has already been established. A major investment now will pay out many times over as FL becomes a leader in the quantum economy.

 FRI 3/6,
1:45 PM

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FLORIDA QUANTUM INITIATIVE (FAQT)



CREOL's Quantum Leap Initiative

Andrea Blanco-Redondo, FPCE Endowed Professor of Optics and Photonics at CREOL



FRI 3/6,
2:00 PM



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Abstract: CREOL's Quantum Leap Initiative brings together a multidisciplinary team of experts working on diverse aspects of quantum technologies – from integrated quantum photonics to quantum transmission through advanced hollow-core fibers, all the way through quantum metasurfaces and optomechanical transduction techniques – with the unifying research goal of developing solutions for interoperability across platforms and scales and a strong determination to build a competitive workforce in quantum information science and technology (QIST). In this talk we will give an overview of the initiative and highlight our most recent projects and research breakthroughs.

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 producing fundamental advances and applications in quantum integrated photonics, nonlinear optics, and topological photonics. Prior to her arrival to CREOL in 2023, she was the *Head of Silicon Photonics Research* at Nokia Bell Labs in New Jersey, USA, from 2019 to 2023, and a *Senior Fellow* at the School of Physics University of Sydney, Australia, from 2015 to 2019. 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 runner-up for the 2014 Ada Byron Award to the top Women in Technology in Spain.

FLORIDA QUANTUM INITIATIVE (FAQT)



Unlocking the Value of Quantum Computing

Paul Parazzoli, Public Sector Business Development, IBM Quantum

 FRI 3/6,
2:15 PM

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Abstract: Global public and private investment in quantum technology now exceeds \$55 billion. With the focus shifting from technical feasibility to economic competitiveness, nations and industries are positioning themselves to capture a projected trillion-dollar market impact, particularly in high-value sectors such as logistics, pharmaceuticals, and materials manufacturing.

However, realizing this value requires addressing problems in these fields through coordinated advances in both hardware and algorithms. This presentation outlines the global investment landscape and reviews IBM's hardware roadmap. We will discuss the metrics defining "useful" quantum computing today and examine how early adopters are building the ecosystems to secure a long-term economic advantage.

Dr. Paul Parazzoli is the Public Sector Business Development Lead at IBM Quantum, where he establishes strategic collaborations, guides policy, and supports programs to advance quantum computing initiatives. He has served as a research scientist at Sandia National Laboratories, focusing on quantum information sciences for national security applications. Dr. Parazzoli holds a PhD in physics from the University of Colorado/JILA and a B.S. in physics from the University of Washington. He holds two patents and has authored sixteen technical publications.

FLORIDA QUANTUM INITIATIVE (FAQT)



Building Quantum Networks to Connect Innovators

Noel Goddard, CEO, Qunnect, Inc.

 FRI 3/6,
2:30 PM

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Abstract: Qunnect began as a state University spinout, founded by graduate students and their professor. It is now the leading supplier of full stack systems to transform deployed telecom fiber into quantum networks to distribute high rate, high quality entanglement. I will speak about Qunnect's technology, our startup's journey, and our role in supporting innovation ecosystems.

Noel Goddard joined Qunnect's management team in 2020. Prior to this role, she was a seed investor with the Accelerate NY Seed Fund, where she built a portfolio of companies across deep technology and life science sectors in Downstate NY. Noel is a serial entrepreneur, having founded/led two biotech startup companies. Before joining the startup community, Noel was an assistant professor of physics at Hunter College, CUNY. She completed her postdoctoral research as a Fellow at Harvard University and her PhD at Rockefeller University.

FLORIDA QUANTUM INITIATIVE (FAQT)



Constructing the Quantum Platform

Daniel Pompa, Quantum Field Engineer, IonQ

 FRI 3/6,
2:45 PM

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Abstract: Technologies based on quantum physics principles are developing rapidly. IonQ seeks to enable the full gamut of these technologies from quantum computing to quantum networking and quantum sensing. This talk will briefly overview this broader vision.

Daniel Pompa connects discovery with practical application quantum computing, networking, and sensing. At IonQ, he leverages the broader ecosystem to develop and test future quantum technologies. His background includes driving partnerships and QML initiatives at Quantinuum and Cambridge Quantum Computing, as well as engineering AI/ML solutions for Raytheon Technologies. His current research centers on quantum algorithms, emphasizing applied topology for data analysis.

AWARDS PRESENTATION



FRI 3/6,
3:15 PM



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Distinguished Alumnus Award



Optica President **Gisele Bennett '87 '89 MS** was one of the first graduates who worked in the then-called “Center for Research in Electro-Optics and Lasers”.



**READ
MORE**

Student of the Year Award



Swati Bhargava's presentation “Observation of Topological Flat-Band States in Photonic Lattices” won first place at the competition.



Runners-Up:

- **Pooja Kulkarni**, “Broadband integrated photonic devices on thin film lithium niobate”
- **Hosna Tajvidi Safa**, “Ultracompact, on-axis LCoS Illumination system with local dimming for waveguide-based AR displays”



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.

Student Poster Elevator Pitch Awards

Students will be recognized for their poster elevator pitch speeches.

Faculty Excellence Awards

CREOL faculty members will be recognized for their achievements and contributions to the College and UCF.

STUDENT POSTERS

Poster 1 - Progress towards commercializing infrared, gradient refractive index elements

Christopher Kosan, Lam Tran, Myungkoo Kang, Kathleen Richardson

For optical elements to be introduced into the marketplace, they must be highly reproducible during mass production. Glass-ceramic and GRIN materials are particularly desirable because they reduce the size, weight, manufacturing complexity, and image aberrations. The Ge-As-Pb-Se (GAP-Se) glass system is a chalcogenide transparent in the MWIR and LWIR. Lead (Pb) catalyzes the formation of high index, lead selenide (PbSe) crystals. Spatial control of PbSe across a part would be a significant step towards arbitrary, GRIN optics. Progress in the synthesis and processing of commercially-relevant GAP-Se melts is presented. New capabilities for characterization of index homogeneity and dispersion are introduced.

Poster 2 - Low Coherence Dynamic Light Scattering: Investigating the effect of sensor-head on measured intensity fluctuations

Aseel Halwani, Shubham Dawda, Yonglin Huang, Mahdi Eshaghi, Saikat Saha, Aristide Dogariu

Low coherence dynamic light scattering is an optical fiber-based sensing technique for characterizing dynamic scattering media abundantly found in biomedicine, chemistry, and beyond. Due to the statistical nature of the measurement, it is susceptible to a statistical noise stemming from averaging over an insufficiently large ensemble which makes the measurable non-ergodic. Here, we employ a GRIN-lens to enlarge the statistical ensemble in LC-DLS measurements. We demonstrate that using a GRIN-lens reduces the statistical noise in measured intensities which permits reducing the measurement time down to 10 seconds, with direct consequences for real-time applications such as monitoring the coagulability of blood during surgery.

Poster 3 - Measuring Refractive Index Homogeneity using an M-Wave IR 339 Interferometer

Jake Klucinec, Hanna Ross, Chris Kosan, Rashi Sharma, Andrew Howe, and Kathleen Richardson

CREOL's Glass Processing and Characterization Laboratory recently acquired a M-Wave 3.39 μm IR interferometer to evaluate exploratory glasses, glass-ceramics, and optical ceramics, complimenting an extensive suite of IR metrology tools in our group. The Twyman-Green system, with coupons produced by our AmeriCOM partners, enables measurement of refractive index homogeneity (both peak-to-valley (PV) and root mean squared (RMS)) across (up to) a 4" aperture. As demand for IR glasses increases and scale-up of lab-developed material continues the need for commercial-scale metrology our ability to assess the quality of IR materials for our team and commercial partners continues to expand.

Poster 4 - Flexible Quantum Dot Light-Emitting Diodes for Antimicrobial Photodynamic Therapy

Manuel A. Triana, Yanfang Feng, Shruti Jayaprakash Saiji, Yiteng Tang, Raymond J. Lanzafame, Natalie Kay Eidenschink, Shakir Khan, Tayyaba Hasan, Yajie Dong

Antimicrobial resistance (AMR) is an emerging global health threat, fueled by the widespread use and misuse of antibiotics in healthcare and agriculture. Antimicrobial photodynamic therapy (aPDT) is a promising strategy that combines light, oxygen, and photosensitizers to generate reactive molecular species that disrupt bacterial structures and antibiotic-resistance mechanisms, enabling multitargeted killing. Here we present optimized flexible quantum dot light-emitting diodes (F-QLEDs) for aPDT against multidrug-resistant (MDR) bacteria. Through optical, thermal, and stability management, the devices provide tunable red emission, safe temperatures, and long shelf life, achieving a ~ 9 -log reduction of *Staphylococcus aureus* and ~ 2 -3 log reduction of *Pseudomonas aeruginosa* compared to controls.

STUDENT POSTERS

Poster 5 - Observation of Topological Flat-Band States in Photonic Lattices

Swati Bhargava, Vinzenz Zimmermann, Tobias Biesenthal, Lukas Maczewsky, Matthias Heinrich, Alexander Szameit, Miguel A. Bandres

We report the observation of topological flat-band states in photonic lattices fabricated by femtosecond laser writing. Using helical modulation of waveguides in a Lieb lattice, we implement a photonic Floquet topological insulator that supports both robust, unidirectional edge states immune to backscattering and non-diffractive, localized flat-band states. These flat-band modes form compact localized states that trap light and can enhance light-matter interactions, enable diffraction-free transport, and couple to topological edge channels. The simultaneous presence of topological and flat-band features highlights a new interplay between topology and flat-band physics, with potential applications in quantum information, imaging, lasing, and optical computing.

Poster 6 - Lorentz-Invariant Space-Time Wave-Packets

Vinzenz Zimmermann and Miguel A. Bandres

The field of structured light recently underwent considerable expansion through the introduction of so-called space-time wave packets that propagate in linear media without diffracting or dispersing (nSTWP). Here we identify a new family of nSTWP that remain invariant under transverse Lorentz-boosts. These pulses will prove beneficial for the design of robust wave packets in space-based communications, atomic optics and the encoding of information in dynamic environments. Our results foster a deeper fundamental understanding of nSTWP across the electromagnetic spectrum, from radio to optical frequencies, and extend directly to acoustics.

Poster 7 - Quantum Critical Kerr Sensing with a Biased Degenerate Optical Parametric Oscillator

Julian Orozco Herrera, Rom Simovitch, and Yannick Salamin

Critical quantum sensing uses the strong response of a system near a phase transition to amplify small parameter changes. Here we propose and simulate a biased degenerate optical parametric oscillator (DOPO) to sense Kerr ($\chi^{(3)}$) nonlinearity. A weak coherent bias makes the cavity prefer one of two macroscopic phase states, while Kerr-induced phase shifts change the measured branch probability $P(b)$. We quantify sensitivity with classical Fisher information, which tells how well the measurement outcomes determine the parameter. We test vacuum, squeezed-vacuum, and anti-squeezed inputs and observe exponential precision scaling with Kerr strength, with squeezed vacuum performing best.

Poster 8 - Playing Quantum Chess with Programmable Quantum Light

Debasmita Banerjee, Sahil Pontula, Michael Rizk, Thu Thanh Minh Do, Jeremy Goodenough, Yannick Salamin

Nonlinear optics enables the generation and control of quantum correlations across many optical modes, forming the basis of quantum information and precision metrology. We demonstrate programmable engineering of multimode quantum correlations in a dissipation engineered nonlinear cavity supporting cascaded sum and difference frequency generation. An idler mediated network couples multiple frequency combs, enabling long-range inter and intra comb correlations. By shaping mode dependent dissipation and pump/seed power profiles and using Bayesian optimization, we deterministically restructure the correlation matrix. The optimized states exhibit multiple modes with >4 dB squeezing and over 20 dB enhancement in squeezing volume, enabling on-demand tailored multimode entanglement. These multimode entangled states can be used as cluster states with chess-like rules to achieve plethora of quantum applications such as Quantum computing, Quantum error correction, Quantum secured network.

STUDENT POSTERS

Poster 9 - New Modalities of Pulsed Laser Ablation of Materials for Defense Applications

Owen Thome, LaShae Smith, Peter Crisileo, Christopher Ryan, Haley Kerrigan, and Martin Richardson

Laser filamentation offers a delivery method for high intensity light to significant distances without the need for large scale focusing optics. However, effects such as intensity clamping and multiple filamentation limit the total fluence available for use in applications such as material ablation. One method to overcome this limitation is temporally structuring femtosecond pulses across nanosecond duration bursts, which allows multiple filaments to interact with the same point on the target surface, increasing the ablated volume and, in some materials, the overall ablation efficiency. These bursts provide a promising method to overcome limitations of filamentation for standoff laser ablation.

Poster 10 - Non-linear and dispersive dynamics of ultrafast megawatt pulses in hollow-core fiber: Air vs vacuum

Gabriel Skowronek, Ryan Hechmer, James Drake, Mark Whitledge, Timothy Bate, Enrique Antonio-Lopez, Andrea Blanco-Redondo, Rodrigo Amezcua Correa, and Darren Hudson

We present a systematic field and spectral characterization of 220 fs, 1030nm, megawatt intensity pulses as they propagate through a 9-meter single-mode anti-resonant hollow-core fiber filled with either 1 atm or 0.1 atm of air. Using ultrashort pulse measurement techniques, we resolve the temporal and spectral evolution from retrieved field and phase information at 1 MW, 2 MW, 5 MW and 15 MW. We confirm our results with direct measurements of the spectrum and using numerical simulations, we explore the peak power limit at which light-glass interactions take place before contributing to fiber damage and significant pulse distortion.

Poster 11 - Non-Destructive Quantum Tomography Utilizing Correlations in a non-Degenerate OPOs

Rom Simovitch, Julian Orozco Herrera, Seou Choi, Michael Rizk, Luc Therrien, and Yannick Salamin

The characterization of quantum states of light is central to quantum optical technologies, yet standard tomographic methods rely on invasive measurements that irreversibly destroy the state. We propose a non-destructive quantum tomography scheme based on mode correlations in a non-degenerate optical parametric oscillator. In our approach, an unknown quantum state interacts with a vacuum-level idler mode in an asymmetrically resonant cavity, imprinting its statistics onto a strongly resonant signal mode without direct measurement of the state itself. By coherently biasing the idler, we controllably displace the quantum state and measure its marginal phase-space distributions. Repetition over bias phases permits full quantum state reconstruction, with high fidelity.

Poster 12 - Nanosecond Pulsed Diamond Raman Laser

Ryan Ellis, Nathan Bodnar, Martin Richardson

Raman lasers can extend the wavelength range of traditional laser gain media by leveraging the nonlinear effect of Stimulated Raman Scattering. Among Raman-active materials, diamond is one of the most promising due to its high thermal conductivity, large Raman shift, and high Raman gain. When pumped by mature, high-power laser sources at 1.064 μm , these properties enable efficient wavelength conversion while maintaining high beam quality and thermal stability. This approach allows power scaling output wavelengths of 1.24 μm , and 1.48 μm , the latter falling within the eye-safe spectral region, making diamond Raman lasers attractive for sensing and LIDAR applications.

STUDENT POSTERS

Poster 13 - Using scanning near-field optical microscopy (SNOM) to study biological nanoparticles (exosomes)

Oscar Sang, Hannah Ambrosius, Qun Huo, Alfons Schulte

Scanning 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 polymers and biological systems. Exosomes are biological nanoparticles released from cells and are potential disease biomarkers. Using SNOM, we observed significant differences in shape, size, and amide I/amide II infrared absorption band between healthy and cancerous exosomes isolated from human plasma. Exosomes with diameters as small as 20 nm were detected from this study.

Poster 14 - Thermal Blooming in the Atmosphere

Joshua Bryan, Nicholas Vail, Zeus Gannon, Matthew Salfer-Hobbs, and Martin Richardson

Thermal blooming is a nonlinear effect caused by heating along the path of a high intensity laser due to absorption of the laser's energy by the propagation media. To investigate this an experimental campaign was conducted on the 1 km propagation range at the Townes Institute Scientific Test and Experimentation Facility between June 23 and July 1, 2025. A narrow-linewidth, tunable thulium fiber laser was used to target atmospheric molecular absorption lines during propagation to induce thermal blooming. After propagating to distances of 250, 500, 750, and 1000 m, the beam profile was recorded using a FLIR camera.

Poster 15 - Strain induced enhancement of density of states in mid-IR silicon metasurfaces

Rudin Kraja, Filip Komissarenko, Daria Kafeeva, Daria Smirnova, Alexander Khanikaev

Strain induced pseudomagnetic field in photonic systems has been used as a mechanism to confine, control, and manipulate light in metamaterials without external magnetic fields. We predict the existence of nearly flat, spin-polarized photonic edge modes above light cone in the presence of strain and experimentally observe them using mid-infrared real and Fourier space imaging setup. We also demonstrate extreme enhancements in the density of states near midgap of a metasurface with a C6 - symmetric effective magnetic vector potential, allowing for enhancement of light-matter interactions and nonlinear effects due to low group velocities and high degeneracy of these resonances.

Poster 16 - High power Thulium fiber lasers operating at 2 μm wavelength

Nicholas Vail, Joshua Bryan, Zeus Gannon, Ryan Elis, Elizar Tsymlyakov, Brandon Jordan, Peter Crisileo, Christopher Ryan, Nathan Bodnar, Martin Richardson

Thulium-doped fiber lasers have received increased attention in recent years for applications such as materials processing, LIDAR, directed energy, and spectroscopy. Due to the 2 μm wavelength region being intrinsically retina-safe, thulium is being explored as a high-power alternative to ytterbium-doped fiber lasers. Pumping thulium using a technique called in-band pumping shows the potential to reach multi-kWs of power in the 2 μm region. Here we will report on the high-power operation of thulium-doped fiber laser systems.

STUDENT POSTERS

Poster 17 - On-Chip Optical Field Sampling with Attosecond Resolution

Sepideh Khanmohammadi, Denis Aglagul, Jacob Duffy, Hannah Burkhart, Saad Mehmood, Emily Frederick, Christian Heide

Can we directly measure how light oscillates? Time-resolved sampling of electric fields has revolutionized our ability to probe and control ultrafast phenomena in materials and next-generation optoelectronic devices. Here, we apply a plasmonic on-chip sampling technique that enables direct, field-resolved measurements of electromagnetic waveforms with attosecond temporal resolution. This technique is based on extreme local-field enhancement in bow-tie antennas, which allows us to sample waveforms as weak as femtojoules. Using this technique, we will investigate light-harvesting processes, including charge generation, migration, and coupling, and explore coherent light-matter interactions across a variety of quantum materials.

Poster 18 - Tunable-duration Ultrafast 3- μm Fiber Laser for Precision Skin Surgery

Saikat Saha, Joshua Palacios, and Darren Hudson

Ultrafast fiber lasers are increasingly important in medical applications, particularly skin surgery, where laser sources near 3 μm enable water-selective ablation with minimal thermal damage. However, existing mid-infrared surgical lasers are typically bulky, inefficient, and offer limited control over pulse duration. We present a compact, fiber-integrated ultrafast 3- μm system with tunable pulse duration. Femtosecond 1.5- μm pulses are amplified using an erbium-fiber chirped-pulse-amplification system to peak powers of ~ 0.3 MW and converted to the mid-infrared via stimulated Raman scattering in methane-filled hollow-core fiber. This architecture provides a scalable, efficient, and low-cost alternative to conventional solid-state mid-IR surgical lasers.

Poster 19 - Generation of RF emission by intense laser beams

Zeus Gannon, Nicholas Vail, Joshua Bryan, Elizar Tsymlyakov, Brandon Jordan, Ryan Ellis, Owen Thome, LaShae Smith, Peter Crisileo, Christopher Ryan, Haley Kerrigan, Nathan Bodnar, and Martin Richardson

When high intensity light, such as laser filamentation, interacts with a metallic surface radio frequency (RF) emissions can be observed. The structure of these RF emissions can vary based on the modality of laser beam interacting with the surface. A large single pulse of energy creates a broad spectral response. However, bursts of pulses can produce a concentration of spectral energy at the intra-burst frequency. The quantity of pulses further modifies this effect by narrowing the spectral response.

Poster 20 - Quantum Control at Petahertz Frequencies

Denis Aglagul, Jacob Duffy, Sepideh Khanmohammadi, Saad Mehmood, Emily Frederick, Hannah Burkhart, Christian Heide

Can we build room-temperature quantum electronics and control them at petahertz frequencies? Current quantum technologies require long coherence times, necessitating localized states and low temperatures. Here, we demonstrate that by combining novel materials with ultrafast laser fields, we can control quantum states within materials at room temperature before decoherence occurs. This coherent control allows us to split and recombine electrons, resembling an electron interferometer. This lightwave control and electronic interferometry provides the blueprint for the next generation spectroscopy and ultrafast quantum devices.

STUDENT POSTERS

Poster 21 - Topological Photonic Metasurfaces for Light Manipulation

Daria Kafeeva, Filipp Komissarenko, Yuma Kawaguchi, Dmitry Yasnov, Ceren Babayigit, Alexander Khanikaev

This research centers on using artificial gauge fields, implemented by designing the lattice geometry of photonic crystals, to control the geometrical phase. Metasurfaces are realized in silicon patterned at the nanoscale via e-beam lithography. A theoretical model was developed in Comsol Multiphysics to predict field distribution of a topological cavity mode. We employed mid-IR spectroscopy to image modes of cavities in both real- and Fourier-space. Results demonstrate the resonance frequency invariant with respect to the resonator's macroscopic shape and length. This robustness against geometry makes this a new and highly promising class of resonator for applications requiring ultra-stable spectral tuning.

Poster 22 - Process-Aware Design of Silicon Metalenses for Mid-Wave Infrared Imaging

Weiyu Chen, C. Kyle Renshaw

Dielectric metalenses promise compact mid-wave infrared (MWIR) imaging, but reactive ion etching (RIE) lag causes depth nonuniformity that undermines phase control. We measure depth-versus-radius trends for silicon nanopillar and nanohole meta-atoms using cross-sectional SEM and incorporate them into fabrication-aware phase libraries. Ignoring depth variation reduces simulated focusing efficiency from 99% to below 70%. By pre-compensating phase errors in the layout, our process-aware design restores efficiency to over 99%, enabling scalable, high-performance MWIR silicon metalenses.

Poster 23 - Self-Referenced Frequency-Diverse Beamlets for Multiscale Underwater Optical Turbulence Characterization

Matthew F. Reid, Arash Shiri, J. Keith Miller, Aristide Dogariu and Eric G. Johnson

We present a self-referenced, frequency-diverse heterodyne beamlet architecture for underwater optical turbulence characterization. Multiple mutually coherent, laterally separated beamlets co-propagate through turbulence and are detected on a single photodetector, producing a set of heterodyne beat tones that uniquely encode beamlet-pair separations. This intrinsic RF channelization enables simultaneous multiscale and directional turbulence sensing without scanning, imaging-based beam tracking, or an external local oscillator. Experiments in a Rayleigh-Benard convection tank demonstrate scale-resolved estimation of turbulence strength, anisotropy, and temporal dynamics across weak-to-strong fluctuation regimes, establishing the approach as a compact and scalable platform for underwater turbulence measurements.

Poster 24 - Programmable Photonic Integrated Circuits Powered by Non-volatile Photonic Memories

Deepak S. Prakash, Ankesh Todi, Midya Parto

Programmable photonic integrated circuits (PPICs) co-packaged with electronics can provide massive connectivity within neuromorphic systems by leveraging high bandwidths and low propagation losses. Existing PPICs commonly use electro-optic modulators and micro heaters to induce phase shifts. However, it can severely limit energy efficiency and hinder the scalability. Photonic memories are emerging technologies that can offer a viable solution to such challenges. We investigate novel photonic memory devices based on CMOS-compatible nitride material platforms that can operate with high energy efficiency and compare it to other architectures in terms of switching energy, speed, bit precision, retention time and temperature stability.

STUDENT POSTERS

Poster 25 - Detection of Molecular Isotopes with Double Resonance Absorption Spectroscopy

Max Schneiderman, Danielle Reyes, Robert Bernath, Henry O. Everitt, Martin Richardson

There is a need for the capability to discriminate trace gases at a distance in atmosphere. Most modern spectroscopic techniques have deficiencies due to things like pressure broadening of molecular spectra or spectral artifacts due to pollutants, among others. Double resonance spectroscopy (DRS) is a method that does not lose measurement specificity due to these adverse phenomena and is even specific enough to discriminate different isotopes of the same molecule. This promising technique has been studied in the low-pressure regime and molecular collision parameters are being confirmed in order to forecast DRS behavior in upcoming experiments at atmospheric pressure.

Poster 26 - Robust temperature sensor based on rotated chirped Bragg gratings

Diana Kashurnikova, David Guacaneme, Shaghayegh Yaraghi, and Ivan Divliansky

Rotated chirp Volume Bragg gratings are new diffractive optical elements that have a varying period of the grating while diffracting the light at exactly 90 degrees. We investigate the use of rotated chirp Volume Bragg gratings for temperature sensing applications. The preliminary result show that such sensing approach could be used for temperature ranges of several hundred degrees while maintaining good resolution. We propose a compact and robust design of a temperature detecting system with an integrated light source and detector.

Poster 27 - Scalable, Cost-effective Ceramic Scintillators for X-ray Radiography

D. Moon, W. M. Bowman, S. J. Lass, R. M. Gaume

Transparent Ce:GAGG ($\text{Gd}_3(\text{Al,Ga})_5\text{O}_{12}:\text{Ce}$) ceramics were fabricated by a cost-effective reactive-sintering route using commercial oxides, enabling scalable scintillator panels for X-ray radiography. We show that slight shifts in stoichiometry/powder ratio drive the composition out of the garnet single-phase field, forming secondary phases and porosity that increase scattering. With optimized powder handling, pressureless sintering, hot-isostatic pressing, and post-annealing, the ceramics exhibit macroscopic transparency and transmission approaching the Fresnel limit, consistent with low scattering and weak Ce self-absorption. This approach targets lower-cost detectors for high-throughput security and radiography systems.

Poster 28 - Visual Geolocation Based on Landscape Detection in LWIR

Li Zhang, Jeremy Mares, C. Kyle Renshaw

Geolocation in absence of GPS signal is key to providing reliable location estimation for navigation. Vision is a robust information source containing movements and location cues. Feature-based visual odometry and satellite-matching geolocation are used to estimate movement or location with accuracy dependent on environmental complexity or extensive training. We propose using landscape objects such as towers or mountains to support geolocation. They are seen frequently and have known geolocations that can correct accumulating drifts. They have similar appearances worldwide that simplify training. We present GPS denied navigation corrected by LWIR tower images, yielding ultra-low error rate over long-distance driving data.

STUDENT POSTERS

Poster 29 - Robust temperature sensor based on rotated chirped Bragg gratings

Daniel Lumpkin, Lam Mach, Ruslan Vasilyeu, Vadim Smirnov, Ivan Divliansky

High quality narrowband transmission filters based on phase-shifted gratings have been holographically encoded into PTR glass. The technique has been expanded to include multiple phase shifts in the same recording. This creates multiple transmission resonances within the reflection band of the grating, enabling more complex filter designs. In the case of chirped volume Bragg gratings (CBGs) the longitudinal spatial coordinates are mapped to wavelength coordinates. Exploiting sample geometry enables the filter to be tunable based on read position. A tunable element with such a design has the potential to drastically simplify frequency mixing setups.

IT'S BACK!!!!

SPRING THING



DETAILS



SAT, MARCH 7
12 PM - 4 PM



LAKE CLAIRE
RECREATIONAL AREA

WEAR PICNIC CLOTHES
BRING LAWN CHAIRS, BUG REPELLENT, AND
THE RIGHT ATTITUDE!



CATERED BY DUSTIN'S BBQ
PLUS
A CREOL DESSERT CONTEST!



GAMES, ENTERTAINMENT,
EATING, DRINKING, AND
FUN!

FREE EVENT OPEN TO CREOL FACULTY, STAFF, STUDENTS
& FAMILY, AFFILIATES, PARTNERS, AND FRIENDS



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Membership Benefits

- Establishing a close association with CREOL
- Exposure to the latest research and development
- Priority external access to CREOL's nanofabrication facilities
- Availability of sophisticated measurement and test facilities
- Early notice of students approaching graduation
- Ability to post your job openings on our website (exclusive benefit for IA members)
- Close interactions with our faculty, each of whom are leaders in their fields
- Opportunity to make presentations about your company and products to faculty and students
- Opportunity to participate in our External Advisory Board
- Notification of seminars and other events at the College
- Opportunity for free presentation space at our annual Industrial Affiliates Symposium (subject to availability)
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- Invitation to attend CREOL Career Fairs
- Invitation to support the Senior Design Program
- Facilitated introductions to CREOL's student organizations
- Listed in CREOL Annual Report

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Corporations and organizations with **more than 200 employees**
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- **To become a member or renew your membership, contact Jane Stump at jane.stump@ucf.edu**

“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 Optics

#3

Best Public University in U.S. for Optics

\$107M

Research Funding
2020-2025 Academic Years

54

Degrees Awarded
2024-2025 Academic Year

14

Patents Awarded
2024-2025 Academic Year

TOP 10

Most Innovative Public U.S. Universities
(U.S. news & World Report)



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



YOU CAN MAKE A DIFFERENCE

TEACHER AMBASSADOR PROGRAM



Raising awareness about career opportunities in optics and photonics is critical to fuel the talent pipeline – and that’s why CREOL launched a Teacher Ambassador Program. By providing Florida high school science teachers with lesson plans and activities they can take back to their classrooms, we introduce photonics to the next generation, incorporate it into the high school curriculum, raise awareness of our programs, and engage the local community. Supporting this initiative funds teachers to attend our biannual Ambassador workshops.

“I need more knowledge about it so I can promote it,” Hagerty High School physics teacher Amany Bekheit says. “I didn’t imagine how much lasers are involved in many fields.”

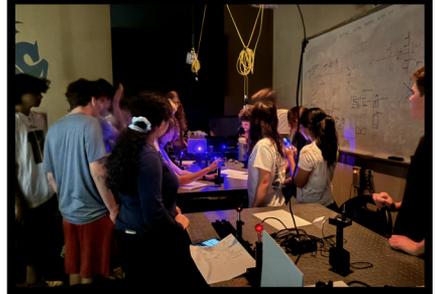
“They’re learning a great deal about photonics,” CREOL Undergraduate Program Associate Director Mike McKee says. “More importantly, they have some great activities to use with their students, so they can see the impact of photonics in their daily lives.”

LASER & PHOTONICS SUMMER CAMP

Our Summer Camp introduces high school students from around the world to optics and photonics, through interactive labs, demonstrations, and lectures. Your gift can support the local teachers who help us staff and host the camp, or sponsor a student's camp tuition and supplies, like Chloe Phung – who, thanks to a scholarship, could travel all the way from Ho Chih Minh City in Vietnam to learn about CREOL.

“I had the chance to learn many things, to know more about optics and lenses, and lasers,” Phung says.

\$500 funds an in-need student to allow them to attend the week-long camp.



HOW TO SUPPORT CREOL



Scan the QR code to support our Teacher Ambassador Program and/or summer camp. Thank you for helping us inspire the next generation in our field!



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