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Photo Credits
Front Cover: Dr. Eric Van Stryland conducting instruction in one of his doctoral courses  
Back Cover: Newly opened Phase II addition to the CREOL building.
Message from the Dean

CREOL, The College of Optics and Photonics, is one of the world’s foremost institutions for research and education in optics and photonics. It started in 1987 as the Center for Research and Education in Optics and Lasers (CREOL) and became a graduate College in 2004, the first such college in the US. An undergraduate program offering a BS degree in Photonic Science and Engineering was established in 2013. The College is home to the Florida Photonics Center of Excellence (FPCE), the Townes Laser Institute, and the Institute for the Frontier of Attosecond Science and Technology (iFAST).

The college has been an exciting place for students to have an outstanding educational experience and to engage in research in a broad spectrum of programs covering materials, devices, and systems, using technologies including lasers, optical fibers, optoelectronics and integrated photonics, nonlinear and quantum optics, as well as imaging, sensing and display. These technologies have applications in manufacturing, communication, biology and medicine, energy and lighting, and defense. Advanced topics such as nanophotonics, attosecond optics, plasmonics, and biophotonics are embraced as areas of strength. World-renowned for their scholarly contributions to fundamental and applied optics and photonics, the faculty have published a total of 36 books and more than 4,400 journal papers with more than 100,000 citations. Many are recipients of prestigious national and international awards.

CREOL was initially founded to promote growth in optics and related fields in Central Florida and has maintained this tradition over the years. We provide the well-trained workforce that keeps the industry growing and we partner with the Florida Photonics Cluster to coordinate this industry’s efforts and needs. We also receive support from the Florida High Tech Corridor Council and Enterprise Florida. The CREOL Industrial Affiliates Program has attracted 200 different industrial members since its founding. The faculty have produced 319 patents, and spun off 28 photonics-based companies involving a wide variety of technologies.

Highlights of 2019 include the recruitment of Dr. Miguel Bandres whose appointment as Assistant Professor began in January 2019. Dr. Bandres received his Ph.D. from the California Institute of Technology and was a postdoctoral fellow at the Technion in Israel. His research interests include novel optical beams and topological photonics.

Sadly, 2019 witnessed the passing of Emeritus Professor Boris Zeldovich at the age of 74. Zeldovich made outstanding contributions in research and education in optics and photonics and was a great asset to the College for more than two decades. The BS program, which received accreditation from ABET in 2017, continues to grow. In AY 2018-19, a total of 165 undergraduate students were enrolled in the program. Graduate enrollment was 134, and 6 Ph.D. degrees and 25 M.S. degrees were awarded. Graduate students continue to receive national scholarships, fellowships, travel grants, and best papers/poster awards.

In 2019, Kathleen Richardson received the Arthur L. Friedberg award and the Alfred R. Cooper Lecturer Award. At the College level, Demetrios Christodoulides received the Teaching Incentive Award. The Excellence in Undergraduate Teaching award was given to Sean Pang. Axel Schulzagen and Guifang Li received the Research Incentive Award. The Excellence in Graduate Teaching award went to Peter Delfyett and the Excellence in Research Award to Aristide Dogariu. ST Wu won the UCF Luminary Award.

This year, the research conducted by the CREOL faculty, students, and scientists was disseminated nationally and internationally in one book chapter, 210 journal papers, including 18 papers in Nature journals, 2 in Science and 7 in Optica. In FY 2019 research and educational programs were funded by contracts and grants totaling approximately $16M. Our tradition of innovation has also continued, and the faculty and students were issued 10 patents.

Partnership with industry continues to be strong. Approximately $3.3M were received from industry or from federal grants flowing through industrial partners, a connection that gives our students a leg up on industry positions after they graduate. The 2019 Industrial Affiliates Day events were attended by 270 guests and 20 exhibitors; the students presented 28 posters, and 4 short courses were offered. CREOL maintains an ongoing relation with its alumni and holds regular alumni reunions at key conferences.

This annual report provides an overview of the education, research, and partnership activities of the faculty, staff, and students in 2019. Key data are also compared to previous years to show progress and identify trends. Academic data are reported for the academic year AY 2018-2019 (Summer 2018, Fall 2018, Spring 2019). Fiscal data, grants, and patents are reported for the fiscal year FY 2019 (July 2018–June 2019). Publications are reported for the 2019 calendar year. The report also highlights a number of selected research contributions. Information on more recent activities are reported regularly in the College’s website http://www.creol.ucf.edu/. We hope you can find the information you need in this Annual Report or on the website.

At the end of 2019, I stepped down as college dean, after 11 years in this role, and returned to teaching and research activities as a faculty member. David Hagan, Pegasus Professor and Associate Dean, is now serving as interim dean. I take this opportunity to thank the faculty and staff, as well as our industrial partners and other stakeholders, for their support during my tenure as dean.

Bahaa Saleh
Faculty and Staff

Ayman F. Abouraddy
Professor of Optics and Photonics
Photonics Center of Excellence (FPCE) Professor
Ph.D., Electrical Engineering, Boston University, 2003
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Research
Fabrication of multi-material micro-structured optical fibers, photonic band gap fibers, optical thermal, electric, and magnetic sensing using fibers, nonlinear fiber optics, supercontinuum generation, mid-infrared fibers, chalcogenide glass fibers, fibers for solar applications, quantum optics and quantum information processing, optical generation of entangled states for sensing and imaging, nanowire and nanoparticle synthesis

Other Experience
- Postdoctoral Fellow, 2003-05
- Research Scientist, 2005-08
- Research Laboratory of Electronics (RLE), M.I.T.

Professional Activities
- Subcommittee member, CLEO, 2012-2013
- Program committee member, SPIE DSS, 2009

Honors and Awards
- Florida Photonics Center of Excellence (FPCE) Professorship
- Fellow, OSA 2016
- Research Initiative Award University-wide 2015
- Reach for the Stars Award 2014
- Teaching Incentive Program Award 2014

Luca Argenti
Assistant Professor of Physics, Optics and Photonics
Ph.D., Chemistry, Scuola Normale Superiore of Pisa, Italy 2008
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Research
Ab initio and analytical description of the electronic continuum of atoms and molecules, theoretical photoelectron spectroscopy, attosecond transient-absorption spectroscopy, attosecond interferometric techniques for the reconstruction of electronic wave packets, transiently bound states, Auger decay, vibrational excitation in photoemission, intramolecular photoelectron scattering, double ionization.

Other Experience
- Post-doctoral fellow at Stockholm University (2009-2010)
- Post-Doctoral fellow at Autonomous University of Madrid (2010-2016)

Professional Activities:
- Member of the organizing committee of the Intl. Spring School on New Computational Methods for Attosecond Molecular Processes (Zaragoza, 2015)
- Member of the international organizing committee of ICPEAC (Intl. Conf. Phot. El. & At. collisions) since 2015
- Member of the local organizing committee for XXIX ICPEAC (Toledo 2015)

Rodrigo Amezcua Correa
Assistant Professor of Optics and Photonics
Ph.D., Optoelectronics, University of Southampton, 2009
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Research
Advanced optical fiber design and fabrication, photonic crystal fibers, fiber laser development, optical fiber devices and components, optical fiber sensors, nonlinear propagation in optical fibers, optical fiber for biomedical applications

Other Experience
- Laser Development Engineer, 2009-11, Powerlase Photonics
- Postdoctoral Researcher, 2007-09, University of Bath

Professional Activities
- Technical Committee Member, “2nd Workshop on specialty optical fibers and their applications”, Oaxaca, Mexico

Honors and Awards
- Graduate Student Scholarship, Mexico, 2004

Miguel Bandres
Assistant Professor of Optics and Photonics
Ph.D., Physics, California Institute of Technology, 2011
bandres@creol.ucf.edu | (407) 698-6357
www.mabandres.com

Research
Topological photonics, topological insulator lasers, non-Hermitian photonics, nondiffractive and accelerating beams, artificial gauge fields and synthetic dimensions in photonics.

Other Experience
- Postdoctoral Research Fellow, Technion – Israel Institute of Technology (2013-2018)
- Assistant Professor, INAOE, Mexico (2012-2013)

Professional Activities:

Honors and Awards
- Marie Curie International Incoming Fellowship (2014-2015)
- SPIE John Kiel Scholarship (2009)
- Premio Nacional de la Juventud, awarded by the Mexican government (2005)
- Technion’s Excellence Scholarship for Postdoctoral Students (2018)
Zenghu Chang  
University Trustee Chair; Pegasus and Distinguished Professor of Physics, Optics and Photonics  
Ph.D., Optics, Xi’an Institute of Optics & Precision Mechanics, 1988  
Zenghu.chang@ucf.edu | (407) 823-4442  

Research  
Attosecond science, terawatt femtosecond laser, ultrafast atomic physics, coherent XUV and x-ray sources, high order harmonic generation, X-ray streak camera and other detectors, near and mid-infrared femtosecond sources.  

Other Experience  
▲ Director, Institute for the Frontier of Attosecond Science and Technology (iFAST)  
▲ Ernest & Lillian Chapin Chair Prof., Kansas State Univ, 2009-10  
▲ Professor, Department of Physics, Kansas State Univ, 2006-09  
▲ Associate Prof. Dept. of Physics, Kansas State Univ, 2001-06  
▲ Assistant Research Scientist, University of Michigan, 1999-01  

Professional Activities  
▲ Guest editor, J of Physics B., Attosecond special issue, 2012  
▲ Co-chair, 5th Intl. Symposium, Ultra-fast Phenomena and THz Waves, China, 2010  
▲ Co-chair, International Conference on Attosecond Physics, Kansas, 2009  

Honors and Awards  
▲ Fellow, APS, OSA  
▲ Mercator Professorship, DFG, Germany, 2007  
▲ Huber Schardin Gold Medal, 1996  

Demetrios Christodoulides  
Pegasus Professor of Optics and Photonics; Cobb Family Endowed Chair  
Ph.D., Electrical Engineering, Johns Hopkins University, 1986  
demetri@creol.ucf.edu | (407) 882-0074  

Research  
Nonlinear wave propagation, beam synthesis and dynamics, optical thermodynamics, optical solitons, periodic and random optical structures, nonlinear optics in soft matter, quantum transport in arrays and photonic lattices.  

Professional Activities  
▲ QELS General Chair, Program Chair  
▲ OSA NLO Program Chair  
▲ OSA Ives & Wood Prize Committee  

Honors and Awards  
▲ OSA Max Born Award 2018  
▲ OSA R.W. Wood Prize, 2011  
▲ Fellow, OSA, APS  
▲ Cobb Family Endowed Chair Professor  
▲ UCF Pegasus Professor  
▲ ISI Highly Cited Researcher 2014-2019  

Peter J. Delfyett  
University Trustee Chair; Pegasus Professor of Optics and Photonics, EE, Physics; Director, Townes Laser Institute  
Ph.D., Electrical Engineering, City University of New York, 1988  
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Research  
Fundamental ultrafast laser physics, ultrafast semiconductor lasers, stabilized optical frequency combs, optoelectronic device development, quantum dot based semiconductor devices for optical networks, ultrafast photonic networks and systems, optical clock distribution, synchronization & recovery, photonics ADC’s and DAC’s, coherent optical signal processing, DWDM, OTDM, and OCDMA Links  

Other Experience  
▲ Member of Technical Staff, Bell Communications Research  
▲ President, National Society of Black Physicists  
▲ Founder - Raydiance, Inc.  

Professional Activities  
▲ Board of Directors, OSA; Board of Governors, IEEE - LEOS  
▲ Editor in Chief, IEEE J. Selected Topics in Quantum Electronics  
▲ General Chair, CLEO; General Chair IEEE LEOS Annual Meeting  
▲ Chair, APS – Division of Laser Science  

Honors and Awards  
▲ Townsend Harris Medal  
▲ NSF Presidential Early Career Award for Scientists & Engineers  
▲ Fellow, APS, IEEE, NAI, NSBP, OSA, SPIE  
▲ APS Edward Bouchet Award  
▲ UCF Pegasus Professor Award  

Dennis Deppe  
Professor of Optics and Photonics  
Ph.D., Electrical Engineering, University of Illinois, 1988  
ddeppe@creol.ucf.edu  

Research  
Semiconductor devices, epitaxial crystal growth, nano-structures, nanophotonics.  

Other Experience  
▲ ECE Department, UT Austin, 1990-05  
▲ Member Technical Staff, AT&T Bell Laboratories, 1988-90  

Professional Activities  
▲ Guest Editor, IEEE JSQE, 1999  
▲ Associate Editor, IEEE Photonics Letters, 1999-02  
▲ Technical Program Committees, IEEE LEOS Annual Meeting, SPIE Photonics West, IEEE  
▲ IEEE Semiconductor Laser Workshop Chair, 1998  
▲ SPIE Conference Chair on VCSELs, 1997  
▲ IEEE, LEOS Chair of the Semiconductor Laser Technical Committee, 99-02  

Honors and Awards  
▲ IEEE LEOS Engineering Achievement Award, 2003  
▲ IEEE LEOS Distinguished Lecturer Award, 2001-02  
▲ Fellow, IEEE, OSA  
▲ OSA Nicholas Holonyak Award 1999  
▲ NSF Presidential Young Investigator Award, 1991  
▲ ONR Young Investigator Award, 1991
Ivan Divliansky
Research Assistant Professor of Optics and Photonics
Ph.D. in Electrical Engineering – Materials Science, Penn State University, 2004
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Research
High-power laser beam combining, solid state and fiber lasers systems - design and development, holography, diffractive optical elements, implementation of volume Bragg gratings in different photonics areas, new applications and further development of various volume holographic elements.

Other Experience
▲ Group Leader, 2007-2019, University of Central Florida
▲ Visiting Professor, 2015, Laboratoire de Physique des Lasers Equipe Photonique Organique

Professional Activities
▲ Program committee member, SPIE Photonics Europe, 2020
▲ Conference session chair, Glass and Optical Materials Division Annual Meeting, 2020
▲ MRI proposal committee member, NSF
▲ Editorial Board Member, Journal of Lasers, Optics & Photonics

Honors and Awards
▲ Senior member of OSA and SPIE

Aristide Dogariu
University Trustee Chair; Pegasus Professor of Optics and Photonics
Ph.D., Engineering, Hokkaido University, Japan, 1994
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Research
Optics of complex media, waves propagation and scattering, statistical optics, optical sensing and imaging, near field optics, biophotonics, optical systems analysis, modeling, and design.

Other Experience
▲ Chair, “Mesoscale Photonics Incubator Meeting”, OSA, 2012
▲ Chair, “Computational Optical Sensing and Imaging”, OSA, 2009
▲ Chair, Topical Meeting “Computational Optical Technologies and Applications”, OSA, 2007
▲ Chair Biosensing Committee, “Topical meeting Coherent Optical Technologies and Applications”, OSA, 2006
▲ Chair, Topical Meeting “Photon Correlation and scattering”, OSA, 2004

Professional Activities
▲ Division Editor, Applied Optics – Optical Technology
▲ Member OSA Board of Editors
▲ Editorial Board: Journal of Holography and Speckle

Honors and Awards
▲ University Trustee Chair Award
▲ Fellow, APS, OSA
▲ Florida Photonics Center of Excellence (FPCE) Professorship
▲ UCF Pegasus Professor

Ronald Driggers
Professor of Optics and Photonics
Ph.D., Electrical Engineering, University of Memphis, 1990
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Research
Imaging systems, sensors, and components. Applications include target acquisition, intelligence-surveillance-reconnaissance (ISR), threat warning, and mobility (including degraded visual environments). Atmospherics, optics, detectors, signal and image processing, displays, and human vision.

Other Experience
▲ Superintendent, Optical Sciences Division, Naval Research Laboratory
▲ Chief, Electro-Optics and Photonics Division, Army Research Laboratory
▲ Director, Modeling and Simulation Division, Army Night Vision Laboratory

Professional Activities
▲ Editor-in-Chief, Applied Optics
▲ Board of Editors, Optical Society of America
▲ Conference Committee, SPIE Defense and Security
▲ Executive Committee, Military Sensing Symposium
▲ Past Editor-in-Chief of Optical Engineering
▲ Past Board of Directors SPIE

Honors and Awards
▲ US Army Engineer of the Year 2002
▲ CERDEC Technical Employee of the Year 2001
▲ Night Vision Laboratory Employee of the Year 2000
▲ US Navy Engineering Duty Officer of the Year 2001
▲ University of Memphis Alumnus of the Year 2010
▲ Fellow SPIE, OSA, MSS

Sasan Fathpour
Professor of Optics and Photonics, ECE
Ph.D., Electrical Engineering, University of Michigan, 2005
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Research
Integrated photonics, heterogeneous integration in silicon photonics, integrated nonlinear optics, semiconductor optoelectronics.

Other Experience
▲ Senior Researcher, Ostendo Technologies, Carlsbad, CA 2008
▲ Visiting Assistant Professor, Electrical Engineering Dept., UCLA 2007
▲ Postdoctoral Research Fellow, Electrical Engineering Dept., UCLA, 2005-07

Professional Activities
▲ Fellow of OSA and Senior Member of IEEE and SPIE
▲ Chair of Short Courses at the Conference on Lasers and Electro-Optics (CLEO), 2014-16
▲ Symposium Co-Chair, “Emerging Materials and Devices for on-chip Optoelectronics,” MRS Fall Meeting 2015
▲ Guest Editor of SPIE’s Journal of Nanophotonics Special Issue on Nanophotonics

Honors and Awards
▲ Fellow of OSA, The Optical Society, 2017
▲ UCF Research Incentive Award (RIA), 2017
▲ UCF Reach for the Stars Award, 2015
▲ ONR Young Investigator Award, 2013
▲ UCF Teaching Incentive Program (TIP) Award, 2013
▲ College of Optics and Photonics Excellence in Graduate Teaching Award, 2013
▲ NSF CAREER Award, 2012
▲ UCLA Chancellor’s Award for Postdoctoral Research, 2007
Romain Gaume
Associate Professor of Optics and Photonics,
NanoScience Technology
Ph.D., Materials Science, Paris VI University, France, 2002
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Research
Fabrication of transparent ceramics: powder processing, shaping and sintering, applications of transparent ceramics to lasers and scintillators, gain-engineered solid state lasers, nuclear and radiological scintillation detectors, thermoelectric ceramic materials

Other Experience
- Postdoctoral Research scientist, Applied Physics Dept., Stanford University 2002-06
- Research Scientist, Applied Physics Dept., Stanford University, 2006–11

Professional Activities
- Member, ACerS, OSA

Honors and Awards
- Dissertation Thesis Award, 2002

Ryan M. Gelfand
Assistant Professor of Optics and Photonics
Ph.D., Electrical Engineering, Northwestern University, 2013
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Research
Near-field optics, Aperture based optical trapping, Plasmonic trapping, Single protein spectroscopy, Protein biophysics, dynamics, and behavior, Fiber optic biosensing device development, Protein assay development, Compact optical based biosensors, Pharmaceutical treatment testing for proteopathy diseases

Other Experience
- NSF post-doctoral fellowship in Biology, University of Victoria, 2013 – 2015

Professional Activities
- Member – OSA, SPIE
- Program Committee – SPIE Biosensing and Nanomedicine

Honors and Awards
- NSF Postdoctoral Fellowship in Biology
- Northwestern Terminal Year Fellowship
- SPIE Scholarship in Optics and Photonics

Leonid B. Glebov
Research Professor of Optics and Photonics
Photonics Center of Excellence (FPCE) Professor
Ph.D., Physics, State Optical Institute, Leningrad, 1976
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Research
Optical properties and photoinduced processes in glasses, photosensitive glasses for hologram recording, holographic optical elements, lasers controlled by holographic optical elements.

Other Experience
- Founder of OptiGrate Corporation, an IPG Company

Professional Activities
- Member: American Ceramic Society (ACS), International Society for Optics and Photonics (SPIE), Optical Society of America (OSA), National Academy of Inventors (NAI).
- Boulder Damage Symposium, International Program Committee
- Optical Components and Materials at Photonics West, Program Committee
- Center for Research, Technology and Education in Vitreous Materials (Brazil), International Advisory Board

Honors and Awards
- Fellow of ACS, OSA, SPIE, NAI
- Dennis Gabor Award in Holography (SPIE)
- Frontiers in Glass Technology Award (ACS)
- Florida Photonics Center of Excellence (FPCE) professorship

David J. Hagan
Associate Dean of Academic Programs; Pegasus Professor of Optics and Photonics, Physics
Ph.D., Physics, Heriot Watt University, 1985
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Research
Nonlinear optics, fundamental limits for nonlinear optical coefficients, nonlinear optical switching, semiconductors and quantum dots, organic and polymers, optical limiting and suppression, ultrasensitive techniques for measuring optical nonlinearities, ultrafast spectroscopy.

Other Experience
- Founder, Polara, LLC.
- Photonics consultant, National Research Council “Defense After Next”

Professional Activities
- Executive Editor-in-Chief, Chinese Optics Letters
- Editor-in-Chief, Optical Materials Express (2010-15)
- Principal Editor, Journal of Materials Research (2001-06)
- Chair, OSA Nonlinear Optics meeting (2017)
- Chair, Frontiers in Optics (2015)
- Senior Member, IEEE

Honors and Awards
- Fellow, OSA, SPIE
- Ranked by ISI as “Highly Cited Researcher”
Kyung Young Han
Assistant Professor of Optics and Photonics
Ph.D., Chemistry, Seoul National University, Korea, 2010
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nanoscopy.creol.ucf.edu

Research
Development and applications of fluorescence nanoscopy (super-resolution fluorescence imaging), fluorescent tags, single-molecule fluorescence imaging, label-free imaging techniques to study essential problems in biology and neuroscience.

Other Experience
- Postdoctoral Fellow, Department of Physics and Howard Hughes Medical Institute, University of Illinois, Urbana, IL (2011 – 2015)
- Visiting Student, Department of NanoBiophotonics, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany (2007 – 2010)

Professional Activities
- Program session chair: SPIE Biosensing and Nanomedicine IX (08/2016)

Honors and Awards
- Max Planck Institute Fellowship (2008-2010)
- International Research Collaboration Fellowship (KRF, 2007-2008)
- Korea Science and Engineering Foundation Scholarship (2005)

Mercedeh Khajavikhan
Associate Professor of Optics and Photonics
Ph.D., Electrical Engineering, University of Minnesota, 2009
mercedeh@creol.ucf.edu | (407) 823-6829

Research
Nanophotonics, applied electromagnetic, laser physics, quantum optics, non-Hermitian photonics, silicon photonics, and plasmonics.

Other Experience
- Post-Doctoral Researcher, University of California, 2009-11
- Staff Researcher, University of California, 2012

Professional Activities
- Topical Editor: Optics Express
- Member: OSA, SPIE, IEEE

Honors and Awards
- Norton Fellowship for Academic Excellence, University of Minnesota, 2005
- NSF Early CAREER Award, 2015
- Excellence in Graduate Teaching Award- CREOL, 2016
- ONR Young Investigator Award, 2016

Aravinda Kar
Professor of Optics and Photonics, MMAE, EECS, Physics
Ph.D., Nuclear Engineering, University of Illinois at Urbana-Champaign, 1985
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Research
Laser-Advanced materials Science (LAMS), lasers in manufacturing (LIM), thermal science for LAMS and LIM, laser and optical science and technology, process modeling and diagnostics, semiconductor and optoelectronic materials processing, materials synthesis and development of new materials, medical materials, novel sensors, detectors and light-emitters

Other Experience
- Interdisciplinary science and technology
- Cross disciplinary courses (thermal science, materials and optics)
- Technology transfer from research to industrial implementation

Professional Activities
- Member, LIA
- Editorials Board Member

Honors and Awards
- Fellow, LIA
- Numerous Patents

Pieter G. Kik
Associate Professor of Optics and Photonics, MMAE, EECS, Physics
Ph.D., Physics, FOM Institute of Atomic Molecular Physics, Amsterdam (AMOLF), 2000
kik@creol.ucf.edu | (407) 823-4622

Research
Nanophotonics and near-field optics, near-field scanning optical microscopy, nanoscale optical waveguides, nanolithography, tunable plasmon optical nanosensors for biochemical detection, numerical modeling of nanophotonic integrated circuits, surface enhanced Raman spectroscopy, rare earth doped optical materials, waveguide amplifiers

Other Experience
- Post-Doctoral Researcher, California Institute of Technology, 2001-03

Professional Activities
- Member, OSA, MRS

Honors and Awards
- 2014 Excellence in Graduate Teaching Award (College Level)
- 2009 Teaching Incentive Award Program
- 2008 Excellence in Graduate Teaching Award (College Level)
- 2007 NSF Career Award
Stephen Kuebler  
Associate Professor of Chemistry, Optics and Photonics  
Ph.D., Chemistry, University of Oxford, 1998  
Stephen.kuebler@ucf.edu | (407) 823-3720

Research  
Laser-based patterning and material processing, laser beam shaping, nano-photonic structures and devices, 3D nano and microfabrication, nonlinear optical materials.

Other Experience  
▲ Asst. Staff Scientist and Research Assoc., Chemistry, Univ. Arizona, 1999-03  
▲ Post-Doctoral Researcher, California Institute of Technology, 1998-99

Professional Activities  
▲ Co-founder and Associate Director, UCF Center for Ethics (2019 - present)  
▲ Interim Assistant Vice-President of Research and Commercialization (2012-2013)  
▲ Editorial Board, J. of Micro/Nanolithography, MEMS, and MOEMS  
▲ Senior Member: SPIE & OSA; member: ACS

Honors and Awards  
▲ Research Incentive Award (“RIA”), UCF College of Science, UCF, 2018  
▲ Teaching Incentive Program Award, UCF, 2008, 2014, 2017  
▲ Excellence in Undergraduate Teaching Award, College of Sciences, UCF, 2008 & 2015  
▲ NSF CAREER Award, January 2008  
▲ Marshall Scholarship Selection Committee, Atlanta Region (2009-2013, 2019 - present)  
▲ NSF Graduate Fellowship, 1993

Guifang Li  
Professor of Optics and Photonics, Physics, EECS  
Ph.D., Electrical Engineering, University of Wisconsin-Madison, 1991  
li@creol.ucf.edu | (407) 823-6811

Research  
Fiber-optic transmission systems, all-optical signal processing, free-space optical communication, optical networking, fiber optics, microwave photonics, coherent detection and imaging.

Other Experience  
▲ Nonlinear surface polaritons  
▲ Phase conjugation  
▲ Nonlinear dynamics

Professional Activities  
▲ Associate Editor-in-Chief, Frontiers of Optoelectronics  
▲ Associate Editor, IEEE Photonics Journal  
▲ Associate Editor, Optica

Honors and Awards  
▲ ONR Young Investigator Award, 1995  
▲ NSF CAREER Award, 1996  
▲ IEEE EDS Distinguished Lecturer  
▲ Fellow, OSA, SPIE, IEEE, NAI  
▲ Florida Photonics Center of Excellence (FPCE) Professorship  
▲ IEEE PS Distinguished Lecturer  
▲ UCF Teaching Incentive Award, 2004, 2014  
▲ UCF Research Incentive Award, 2007

Patrick L. LiKamWa  
Professor of Optics and Photonics, ECE  
Ph.D., Electronic & Electrical Engineering, University of Sheffield, UK, 1987  
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Research  
Optoelectronics, integrated optics devices with gain using resonant nonlinearities, novel semiconductor nanostructures for advanced optoelectronics, implement monolithic all-Optical switching circuits, multi-platform integration using multilayer dielectric films for integrated, integrated optic bio-sensors, monolithically integrated wavelength tunable optical emitters

Other Experience  
▲ Plasmonic waveguiding devices  
▲ Fiber optic sensors

Professional Activities  
▲ Senior Member, IEEE/LEOS

Honors and Awards  
▲ IEEE/LEOS Orlando Chapter Engineer of the Year  
▲ UCF Teacher Incentive Program  
▲ College of Optics Excellence in Graduate Teaching Award

M. G. “Jim” Moharam  
Professor of Optics and Photonics  
Ph.D., EE, University of British Columbia, Canada, 1978  
moharam@creol.ucf.edu | (407) 823-6833

Research  
Diffractive holographic optics, integrated photonics grating based devices, computational photonics, theory and analysis of periodic structures, subwavelength periodic structures and devices, guided-waves grating resonant devices, analysis and design artificial metamaterial devices, novel integrated antireflective surfaces, grating based plasmonic structures.

Other Experience  
▲ Wave propagation in periodic and anisotropic media  
▲ Analysis and design of optical filters  
▲ Thin film optics

Professional Activities  
▲ Topical Editor - JOSA - A  
▲ Conference Chair, Topical meeting on diffractive optics  
▲ Program Committee, SPIE Europe

Honors and Awards  
▲ Fellow, OSA  
▲ Senior Member, IEEE  
▲ UCF Graduate Teaching Award
Shuo “Sean” Pang
Assistant Professor of Optics and Photonics
Ph.D., Electrical Engineering, Caltech 2013

pang@creol.ucf.edu | 407-823-6869
oisl.creol.ucf.edu

Research
Computational imaging, Optical imaging, X-ray imaging, Biophotonics: microscopy, Optical design, Microfluidics and Micro total analysis system

Professional Activities
- Chair, Microscopy and OCT Technical Group, OSA
- Member, SPIE

C. Kyle Renshaw
Assistant Professor of Optics and Photonics
Ph.D., Applied Physics, University of Michigan, 2014

krenshaw@creol.ucf.edu | 407-823-2807
tfo.creol.ucf.edu

Research
Thin-film optoelectronics, Organic LEDs, Solar Cells and Sensors, Perovskite LEDs, Lasers and Photovoltaics, Hybrid organic/inorganic materials and devices, Thin-film transistors, Flexible electronics, Nanofabrication, Large area optoelectronics

Other Experience
- Physicist, Advanced Technology Center, Northrop Grumman Corp., 2013-2015

Professional Activities
- Member, Materials Research Society

Kumar Patel
University Distinguished Professor of Optics and Photonics
Ph.D., Electrical Engineering, Stanford University, 1961

Chandra.Patel@ucf.edu

Research
Optics and laser physics and technology; infrared nonlinear optics

Other Experience
- Founder, President, and CEO of Pranalytica, Inc. (2000-present)
- Vice Chancellor for Research, UCLA (1993-1999)
- Executive Director, Physics Division and Materials Research Division, AT&T (now Lucent Technologies) Bell Laboratories (1961-1993)

Professional Activities
- Honorary Member, Gynecologic Laser Surgery Society (1980)
- Honorary Member, American Society for Laser Medicine and Surgery (1985)
- Board of Directors, Newport Corporation

Honors and Awards
- APS George E. Pake Prize (1988)
- New Jersey Governor’s Thomas Alva Edison Science Award (1987)
- National Academy of Engineering (1978) and the National Academy of Science (1974)
- Coblentz Prize (American Chemical Society, 1974)
- IEEE Lamme Medal (1976)
- National Inventors’ Hall of fame (2012)
- National Medal of Science awarded by President Bill Clinton (1996)
- Fellow, IEEE, APS, OSA, American Academy of Arts and Sciences, AAAS, LIA, ASLMS

Kathleen A. Richardson
Pegasus Professor of Optics and Photonics, Material Science and Engineering, Florida Photonics Center of Excellence (FPCE) Professor
Ph.D., Ceramics, Alfred University, 1992

kr@creol.ucf.edu | (407) 823-6815

Research
Infrared optical glass and glass ceramics, photosensitive infrared materials, integrated MIR Planar sensors, optics manufacturing science, mid-infrared optical metrology, precision glass molding (PGM), graded index optical materials

Professional Activities
- Past President, American Ceramic Society
- Member, Board of Trustees, Ceramic and Glass Industry Foundation (CGIF)
- Curator, Ernst Abbe Fund Board of Trustees, Deutsches Stiftung
- Member, External Advisory Board, Savannah River National Laboratory
- Member, Board of Trustees, Alfred University

Honors and Awards
- SPIE Maria J. Yzuel Outstanding Educator Award, 2019
- Arthur L. Friedberg Award, 2019
- Alfred R. Cooper Award, 2019
- Pegasus Professor Award, 2018
- Florida Photonics Center of Excellence (FPCE) Professorship, 2018
- Sir Richard Brook International Award, European Ceramic Society, 2017
- George W. Morey Award, American Ceramic Society, 2017
- Malcolm G. McClaren Distinguished Lecturer Award, Rutgers University Department of Materials Science and Engineering, 2017
- Fellow, ECerS, OSA, SPIE, ACerS and SGT
- Academician, World Academy of Ceramics, 2015
- I.D. Varshnei Award, Indian Ceramic Society
- Outstanding Educator Award, American Ceramic Society
- Samuel R. Scholes Lecture and Award, Alfred University
Research
Laser system development, femtosecond laser-aided materials processing, laser-induced-breakdown spectroscopy (LIBS), biological x-ray microscopy, laser medicine, optical tweezers, physics of laser plasmas, plasma & radiation modeling - X-ray sources, ultra-fast X-ray production; interaction with matter diffraction studies, X-ray and EUV optics, laser plasma EUV sources for lithography, high energy lasers, solid state lasers, high power fiber lasers development & High power ultrafast lasers, laser spectroscopy and sensing

Professional Activities
- Member, SPIE, APS, Program Committee; LEOS
- Directed Energy Consortium (UCF rep.), 2003
- Member, Expert Review Panel - Canadian Institute for Photonic Innovations, Canadian Govt.

Honors and Awards
- UCF Pegasus Professor Award

Research
Nonlinear and quantum optics quantum information processing, coherence and statistical optics, optical imaging and sensing

Other Experience
- Chair of ECE, Boston University, 1994-07
- Chair of ECE, University of Wisconsin-Madison, 1990-94
- Assoc. Director, ERC Center for Subsurface Imaging, 2000-09

Professional Activities
- Member, Board of Directors, LIA, 2011-present
- Founding Editor, Advances in Optics and Photonics, 2008-present
- Author, Introduction to Subsurface Imaging, Cambridge 2011

Honors and Awards
- OSA Mees Medal, 2013
- OSA Distinguished Service Award, 2009
- OSA Esther Hoffman Beller Medal, 1999
- Kuwait Prize, 2006
- SPIE BACUS Prize, 2004
- Fellow, IEEE, OSA, SPIE
- Fellow; Guggenheim Foundation

Research
Fiber laser devices, fiber optic sensors, linear and nonlinear light propagation in fiber, nanostructured and functionalized fibers, design and fabrication of specialty optical fiber, advanced optical materials, linear and nonlinear optical spectroscopy

Other Experience
- College of Optical Sciences, The University of Arizona, 1996-09
- Department of Physics, Trinity College, Dublin, Ireland, 1995
- Department of Physics, Humboldt University, Berlin, Germany, 1991-95

Professional Activities
- Member, OSA, SPIE, German Physical Society
- Associate Editor, Journal of Lightwave Technology, 2019
- Guest Editor, Applied Optics, 2019
- Topical Editor, Applied Optics, 2010-2016
- Guest Editor, JOSA B, 2016/2017
- Program Committee CLEO, OFC, SOF, WSOF, OFS

Honors and Awards
- Fellow, OSA
- UCF Research Incentive Award, 2019
- Excellence in Graduate Teaching Award, 2017
- CREOL Excellence in Research Award, 2015
- Habilitation Fellowship, German Research Foundation, 1993
- Carl Ramsauer Award, AEG Corporation, 1992
- Heinrich Gustav Magnus Award, Humboldt University, Berlin, 1988
Shin-Tson Wu  
Pegasus Professor of Optics and Photonics  
Ph.D., Physics, University of Southern California, 1981  
swu@creol.ucf.edu | (407) 823-4763

**Research**  
Advanced displays including LCDs, OLEDs, augmented reality and virtual reality, adaptive lenses, and adaptive optics.

**Other Experience**  
- Senior Scientist, Hughes Research Labs

**Professional Activities**  
- Chair, SID Honors and Awards Committee  
- Founding Editor-In-Chief, IEEE/OSA Journal Display Technology

**Honors and Awards**  
- 2014 Florida Inventors Hall of Fame  
- 2014 OSA Esther Hoffman Beller Medal  
- 2012 NAI Fellow  
- 2011 SID Slottow-Owaki Prize  
- 2010 OSA Joseph Fraunhofer Award  
- 2008 SPIE G.G. Stokes Award  
- 2008 SID Jan Rajchman Prize  
- Fellow, OSA, SPIE, IEEE, SID

Konstantin L. Vodopyanov  
21st Century Scholar Chair and Professor of Optics and Photonics  
Ph.D., Physics, Lebedev Physical Institute, Moscow, 1983  
vodopyanov@creol.ucf.edu | (407) 823-6818  
mir.creol.ucf.edu

**Research**  

**Other Experience**  
- Stanford University (2003-2013)  
- University of Bayreuth, Germany (1990-1992)  
- Moscow Inst. of Physics and Technology (1985-1990)  

**Professional Activities**  
- General Chair, Inst. Symp. On Photodetection and Imaging (ISPDI), Beijing, China, 2013  
- Photonics West, LA106 Conference Chair (2010-present)  
- CLEO General Chair, 2010, CLEO Program Chair, 2008  
- Associate Editor, Optica  

**Honors and Awards**  
- Fellow, OSA, SPIE, APS  
- Fellow, UK Institute of Physics (IOP)  
- Alexander-von-Humboldt Fellow, Germany, 1990

M.J. Soileau  
University Distinguished Professor of Optics and Photonics, ECE, Physics  
Ph.D., Quantum Electronics, University of Southern California, 1979  
mj@ucf.edu | (407) 823-5538

**Research**  
Nonlinear optical properties of materials, laser-induced damage; Laser-induced damage to optical materials, nonlinear refraction nonlinear absorption; Sensor protection

**Other Experience**  
- Officer, USAF, 1967-73  
- Physicist, Naval Weapons Center Physics Div., China Lake, 1973-80  
- Professor of Physics, North Texas State University, 1980-87  
- Director, School of Optics/CREOL, 1987-99  
- Chair of the Board, Orlando Science Center, 2002  
- Technology-Based Economic Development; Technology Transfer  
- Board of Directors, BEAM, Inc.; Board of Directors, Aquafibe

**Professional Activities**  
- Director’s Award, SPIE, 1999  
- Fellow, OSA, IEEE, SPIE, AAAS, NAI; Senior Member, LIA  
- Outstanding Engineer Award, State of Florida, 1994  
- SPIE Gold Medal  
- OSA Esther Hoffman Beller Award  
- Distinguished Service Medal, ICFO, Barcelona, Spain  
- EDC Chairman’s Award, 2014  
- Florida Inventors Hall of Fame  
- Foreign Member of the Russian Academy of Science

M.I. Abo-Shaeer  
Professor of Optics and Photonics, ECE, Physics  
Ph.D., Quantum Optics, University of Southern California, 1990  
mosf@creol.ucf.edu | (407) 823-6131

**Research**  
Nonlinear optical properties of materials, laser-induced damage; Laser-induced damage to optical materials, nonlinear refraction nonlinear absorption; Sensor protection

**Other Experience**  
- Officer, USAF, 1967-73  
- Physicist, Naval Weapons Center Physics Div., China Lake, 1973-80  
- Professor of Physics, North Texas State University, 1980-87  
- Director, School of Optics/CREOL, 1987-99  
- Chair of the Board, Orlando Science Center, 2002  
- Technology-Based Economic Development; Technology Transfer  
- Board of Directors, BEAM, Inc.; Board of Directors, Aquafibe

**Professional Activities**  
- Director’s Award, SPIE, 1999  
- Fellow, OSA, IEEE, SPIE, AAAS, NAI; Senior Member, LIA  
- Outstanding Engineer Award, State of Florida, 1994  
- SPIE Gold Medal  
- OSA Esther Hoffman Beller Award  
- Distinguished Service Medal, ICFO, Barcelona, Spain  
- EDC Chairman’s Award, 2014  
- Florida Inventors Hall of Fame  
- Foreign Member of the Russian Academy of Science

Xiaoming Yu  
Assistant Professor of Optics and Photonics  
Ph.D., Industrial and Manufacturing Systems Engineering, Kansas State University, 2016  
yux@creol.ucf.edu | (407) 823-6872  
https://sites.google.com/site/yulabucf2/

**Research**  
Ultrafast laser – solid interaction, laser-based lithography at micro- and nanoscale, two-photon polymerization, laser-based additive manufacturing

**Other Experience**  
- Member of OSA, ASME  
- Honors and Awards  
- National Science Foundation CAREER Award, 2019
Emeritus Faculty

Eric W. Van Stryland
Emeritus Dean and Professor of Optics and Photonics
Ph.D., Physics, Optical Sciences Center, University of Arizona, 1976

Research
Develop NLO spectroscopic techniques, e.g. Z-scan, measure nonlinear absorption spectra, e.g. two-photon absorption, 2-photon gain, 2PA, measure nonlinear refraction dispersion, e.g. bound electronic n2, model material nonlinearities, 2PA, n2, excited-state absorption, etc., measure ultrafast NLO response and temporally resolve, develop nonlinear devices - e.g. widegap IR detectors using 2PA

Other Experience
- Dean, CREOL, The College of Optics and Photonics, 2004-09
- Director, School of Optics/CREOL, 1999-04
- Visiting Professor, Heriot-Watt University, 1985
- Chair, Center for Applied Quantum Electronics, U. of N. Texas, 1983-86
- Center for Laser Studies, University of South California, 1976-78

Professional Activities
- President, Optical Society of America (OSA), 2006, Board of Directors
- Fellow, OSA, SPIE, IEEE, APS
- Senior member, LIA (Board of Directors)
- Topical Editor, Optics Letters, 1994-98

Honors and Awards
- UCF Pegasus Professor Award, 2003
- UCF Researcher of the Year, 1990 and 2009; R&D 100 Award, 2001
- ISI Highly Cited Author
- OSA R. W. Wood Prize, 2012

ewvs@creol.ucf.edu | (407) 222-1389

Larry C. Andrews
Emeritus Professor of Mathematics, Optics and Photonics
Ph.D., Engineering, Michigan State University, 1970

Research
Propagation of laser beams through random media laser communication and laser radar

Other Experience
- Staff Mathematician, Antisubmarine Warfare Operation, Magnavox Co., Fort Wayne, IN
- Assistant Professor of Mathematics and Mechanics, Tri-State University, Angola, IN

Professional Activities
- Author of many textbooks and monographs on wave propagation through random media, applications to laser communications and radar, atmospheric optics, and advanced applied mathematics.

Honors and Awards
- Fellow, SPIE

Larry.andrews@ucf.edu

Michael Bass
Emeritus Professor of Optics and Photonics, Physics, ECE
Ph.D., Physics, University of Michigan, 1964

Research
Display technologies; all-optical 2- and 3-dimensional displays, up-conversion processes in dielectric materials, laser systems development, solid state laser design, models for high-average power solid state lasers, pump requirements, performance potentials and Limitations, spray cooling of diode laser bars, thermal management of diode laser arrays sources for solid state lasers

Other Experience
- Senior Research Scientist, Raytheon, 1966-73
- Director, Center for Laser Studies, USC, 1977-84
- Chair, EE Electrophysics, USC, 1984-87
- Vice President for Research, UCF, 1988-93
- Professional Activities
- Associate Editor, Optics Express
- Editor-in-chief "Handbook of Optics, 2nd and 3rd editions, OSA
- Associate Editor, 100th Anniversary of OSA commemorative books

Honors and Awards
- R. W. Wood Prize 2014
- Fellow, OSA, IEEE
- Fellow of LIA
- Fellow of AAAS
- Fellow of Russian Academy of Engineering Science
- Fellow of National Academy of Inventors

bass@creol.ucf.edu | (407) 823-6977

Glenn D. Boreman
Emeritus Professor of Optics and Photonics, Professor and Chair Univ. North Carolina
Ph.D., Optical Sciences, University of Arizona, 1984

Research
Infrared antennas and transmission lines, infrared frequency-selective surfaces, nano-scale E-field mapping, BRDF & surface-scatter measurement.

Other Experience
- Visiting Scholar, Imperial College (London), ETH (Zurich), Defense Research Agency (FOI) Sweden, Univer. Complutense (Madrid).
- Consultant, Licensed Professional Engineer

Professional Activities
- Editor-in-Chief, Applied Optics
- Co-author, Infrared Detectors & Systems
- Author, Basic Electro-Optics for EEs & Modulation Transfer Function in Optical and Electro-Optical systems
- 2015 SPIE Vice President
- Co-founder, Plasmonics, inc.

Honors and Award
- Fellow, OSA, SPIE
- SPIE Kingslake Medal
- Fellow, Military Sensing Symposium

gboreman@uncc.edu
Ronald L. Phillips
Emeritus Professor of EECS, Optics and Photonics
Ph.D., Electrical Engineering, Arizona State University, 1971
Ronald.phillips@ucf.edu

Research
Laser space communication systems, laser radar, detection theory and math modeling, optical wave propagation through random media, random field theory

Other Experience
△ Academic positions at Arizona State University and the University of California, San Diego.

Professional Activities
△ Founding Director, UCF Florida Space Institute (FSI)
△ Founding Director of CREOL
△ Author of 3 books in the topic of wave propagation through random media and applications to laser communications and radar.
△ Co-author of a text on advanced applied mathematics.

Honors and Awards
△ Senior NATO Post-doctoral Fellow
△ ASEE 1983 Medal Outstanding Contributions to Research
△ Florida Space Business Roundtable Explorer Award for education
△ Fellow, OSA, SPIE

William Silfvast
Emeritus Professor of Optics and Photonics
Ph.D., Physics, University of Utah, 1965
silfvast@creol.ucf.edu

Research
X-Ray science and technology, EUV lithography and microscopy, X-Ray theory, X-Ray Lasers.

Other Experience
△ Chair, UCF Department of Physics, 1994-97
△ Distinguished Member Technical Staff, ATT-Bell Labs, 1994-97

Professional Activities
△ Co-Chair, CLEO, 1983
△ OSA Board of Directors, 1986-00
△ Program Committee Member, LEOS, 1994-00

Honors and Awards
△ Fellow, OSA, APS, IEEE
△ Guggenheim Fellow, Stanford University
△ Distinguished Member Technical Staff, ATT-Bell Labs, 1983
△ NATO Postdoctoral Fellow
△ Researcher of the Year, University of Central Florida, 2000

Luminary Award presented to Shin-Tson Wu

Wu is a preeminent scholar, prolific inventor, excellent teacher, student mentor and distinguished professional in the field of optics and photonics. His work, cited more than 32,000 times, led to the display technology used on smart phones and augmented displays. He has helped more than 32 doctoral and 7 master’s students who have gone on to work at places such as Google, Apple, Facebook, and research and academic centers around the world.

Shin-Tson Wu
College of Optics and Photonics

“When I was an undergraduate junior at National University, a physics professor, Eugene Wong from UCLA, spent his sabbatical year there. He gave a graduate-level course called “Atomic Spectra." With his special permission, I took his class and got a perfect score. His class inspired me to delve into optics and photonics.”

silence
**Joint Faculty**

**Matthieu Baudelet**  
Assistant Professor of Chemistry, National Center for Forensic Science  
Ph.D., Physics, Université Claude Bernard Lyon 1, France  
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**Debashis Chanda**  
Associate Professor of Physics, AMPAC/NSTC  
Ph.D., University of Toronto  
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**Michael Chini**  
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**Louis Chow**  
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Ph.D., University of California, Berkeley  
Heat Transfer Issues in Electro-Optics  
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**Kristopher Davis**  
Assistant Professor of Materials Science & Engineering  
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**David Kaup**  
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**Michael Leuenberger**  
Professor of Physics, Nanoscience Technology Center  
Ph.D., University of Basel  
Quantum Information  
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**Arkadiy Lyakh**  
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**Robert E. Peale**  
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Ph.D., Cornell University  
Defects in Semiconductors  
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**Seetha Raghavan**  
Associate Professor of MAE  
Ph.D., Purdue University  
Optical Characterization of Advanced Materials  
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**Alfons Schulte**  
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Dr. rer. Nat, Technical University of Munich  
Near-IR Raman Spectroscopy  
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Mubarak A. Shah  
University Trustee Chair; Professor of Computer Science; Director CRCV  
Ph.D., Wayne State University  
Computer Vision  
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Michael Sigman  
Professor of Chemistry  
Ph.D., Florida State University  
Explosives, Chemistry & Forensics  
michael.sigman@ucf.edu

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Ph.D., Cochin University of Science & Technology  
jayan.thomas@ucf.edu

Subith Vasu  
Associate Professor of Mechanical and Aerospace Engineering  
Ph.D., Stanford University  
Mechanical Engineering  
subith@ucf.edu

Murat Yuksel  
Associate Professor of Electrical and Computer Engineering  
Ph.D., Rensselaer Polytechnic Institute  
murat.yuksel@ucf.edu

Mykhailo Bondar  
Professor, Institute of Physics, Kiev, Ukraine  
Ph.D., Inst of Physics, NASU, Ukraine  
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Ph.D., Yale University  
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Ph.D., UC-Berkeley  
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Jason Eichenholz  
CTO, Luminar Technologies, INC.  
Ph.D., University of Central Florida  
jason@open-photonics.com

James E. Harvey  
Associate Professor of Optics and Photonics & ECE  
Ph.D., Optical Sciences, University of Arizona, 1976  
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Hans P. Jenssen  
AC Materials  
Ph.D., MIT  
h.jenssen@ac-materials.com

Vassilios Kovanis  
AFRL, Sensors Directorate  
Ph.D., University of New Mexico  
Semiconductor lasers, nonlinear optics  
vassilios.kovanis@ucf.edu

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Assistant Professor, Florida Institute of Technology  
Ph.D., RWTH Aachen University  
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Clara Rivero Baleine  
Mechanical Engineer Staff, Lockheed Martin Missiles and Fire Control  
Ph.D., University of Central Florida  
clararivero-baleine@lmco.com

Kenneth Schepler  
AFRL, Sensors Directorate  
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Mordechay Segev  
Robert J. Shillman Distinguished Professor of Physics  
Ph.D., Technion University  
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Robert Stegeman  
Sr. Optical Investigator - LGS Innovations, Inc.  
Ph.D., University of Central Florida  
robert.a.stegeman@gmail.com

C. Martin Stickley  
Special Assistant to the Vice President, Research and Commercialization  
Ph.D., Northeastern University  
stickley@creol.ucf.edu

ADJUNCT FACULTY

Umar Piracha  
Adjunct Professor  
Ph.D., University of Central Florida  
Electrical Engineering  
Umar.Piracha@imec-int.com

David Shelton  
Adjunct Professor  
Ph.D., University of Central Florida  
Materials Science  
David.Shelton@ucf.edu

# 2019 Faculty Awards and Honors

**National and International Awards**

<table>
<thead>
<tr>
<th>Award</th>
<th>Recipient</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Arthur L. Friedberg Award</td>
<td>Kathleen Richardson</td>
</tr>
<tr>
<td>Alfred R. Cooper Lecturer Award</td>
<td>Kathleen Richardson</td>
</tr>
<tr>
<td>1997 Max Born Award</td>
<td>Boris Zeldovich (in memoriam)</td>
</tr>
<tr>
<td>1999 Nicholas Holonyak Award</td>
<td>Dennis Deppe</td>
</tr>
<tr>
<td>1999 Esther Hoffman Beller Award</td>
<td>Bahaa Saleh</td>
</tr>
<tr>
<td>2008 Esther Hoffman Beller Award</td>
<td>M.J. Soileau</td>
</tr>
<tr>
<td>2008 Distinguished Service Award</td>
<td>Bahaa Saleh</td>
</tr>
<tr>
<td>2010 Joseph Fraunhofer/Robert M. Burley Prize</td>
<td>Shin-Tson Wu</td>
</tr>
<tr>
<td>2003 R. W. Wood Prize</td>
<td>George Stegeman (in memoriam)</td>
</tr>
<tr>
<td>2011 R. W. Wood Prize</td>
<td>Demetrios Christodoulides</td>
</tr>
<tr>
<td>2012 R. W. Wood Prize</td>
<td>Eric Van Stryland</td>
</tr>
<tr>
<td>2013 C.E.K. Mees Medal</td>
<td>Bahaa Saleh</td>
</tr>
<tr>
<td>2014 R. W. Wood Prize</td>
<td>Michael Bass</td>
</tr>
<tr>
<td>2018 Max Born Award</td>
<td>Demetrios Christodoulides</td>
</tr>
</tbody>
</table>

**University Awards**

<table>
<thead>
<tr>
<th>Award</th>
<th>Recipient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellence in Graduate Teaching</td>
<td>Peter Delfyett</td>
</tr>
<tr>
<td>Excellence in Undergraduate Teaching</td>
<td>Shuo “Sean” Pang</td>
</tr>
<tr>
<td>Excellence in Research</td>
<td>Aristide Dogariu</td>
</tr>
<tr>
<td>COP Research Incentive Award</td>
<td>Guifang Li</td>
</tr>
<tr>
<td>COP Research Incentive Award</td>
<td>Axel Schulzgen</td>
</tr>
<tr>
<td>Luminary Award</td>
<td>S.T. Wu</td>
</tr>
<tr>
<td>Teaching Incentive Program (TIP) Award</td>
<td>Demetrios Christodoulides</td>
</tr>
<tr>
<td>1995 Kingslake Medal and Prize</td>
<td>Glenn Boreman</td>
</tr>
<tr>
<td>2004 Bacus Award</td>
<td>Bahaa Saleh</td>
</tr>
<tr>
<td>2008 Dennis Gabor Award</td>
<td>Leonid Glebov</td>
</tr>
<tr>
<td>2008 G. G. Stokes Award</td>
<td>Shin-Tson Wu</td>
</tr>
<tr>
<td>2008 Gold Medal Award</td>
<td>M.J. Soileau</td>
</tr>
<tr>
<td>2013 Harold E. Edgerton Award</td>
<td>Martin Richardson</td>
</tr>
<tr>
<td>2015 G.G. Stokes Award</td>
<td>Aristide Dogariu</td>
</tr>
<tr>
<td>2003 Engineering Achievement</td>
<td>Dennis Deppe</td>
</tr>
<tr>
<td>2008 Jan Rajchman Prize</td>
<td>Shin-Tson Wu</td>
</tr>
<tr>
<td>2011 Slottow–Owaki Prize</td>
<td>Shin-Tson Wu</td>
</tr>
<tr>
<td>2011 Edward A. Bouchet Award</td>
<td>Peter Delfyett</td>
</tr>
<tr>
<td>ACerS Outstanding Educator Award (2009)</td>
<td>Kathleen Richardson</td>
</tr>
<tr>
<td>NSF Presidential Early Career Award (PECASE) (1997)</td>
<td>Peter Delfyett</td>
</tr>
<tr>
<td>NSF Presidential Young Investigator Award (1991)</td>
<td>Dennis Deppe</td>
</tr>
<tr>
<td>NSF Career Award (2012)</td>
<td>Sasan Fathpour</td>
</tr>
<tr>
<td>NSF CAREER Award (2007)</td>
<td>Pieter Kik</td>
</tr>
<tr>
<td>NSF CAREER Award (2008)</td>
<td>Stephen Kuebler</td>
</tr>
<tr>
<td>NSF CAREER Award (1996)</td>
<td>Guifang Li</td>
</tr>
<tr>
<td>NSF CAREER Award (2015)</td>
<td>Mercedeh Khajavikhan</td>
</tr>
<tr>
<td>NSF CAREER Award (2019)</td>
<td>Xiaoming Yu</td>
</tr>
</tbody>
</table>

*College Level*
ONR Young Investigator Award (1991)  
ONR Young Investigator Award (1995)  
ONR Young Investigator Award (2013)  
ONR Young Investigator Award (2016)  

Dr. Dennis Deppe  
Dr. Guifang Li  
Dr. Sasan Fathpour  
Dr. Mercedeh Khajavikhan  

Ralph E. Powe Junior Faculty Award (2009)  

Ayman Abouraddy  

Guggenheim Fellow (1984)  

Bahaa Saleh  

DoE Early Career Award (2019)  

Luca Argenti  

**Fellows of Professional Societies and Academies**

Ayman Abouraddy  
Michael Bass  
Zenghu Chang  
Demetrios Christodoulides  
Peter Delfyett  
Dennis Deppe  
Aristide Dogariu  
Ronald Driggers  
Sasan Fathpour  
Leonid Glebov  
David Hagan  
Guifang Li  
Jim Moharam  
James Pearson  
Kathleen Richardson  
Martin Richardson  
Bahaa Saleh  
Axel Schülzgen  
William Silfvast  
M.J. Soileau  
George Stegeman (in memoriam)  
Eric Van Stryland  
Konstantin Vodopyanov  
Shin-Tson Wu  
Boris Zeldovich (in memoriam)  

Glenn Boreman  
Peter Delfyett  
Ronald Driggers  
Leonid Glebov  
David Hagan  
James Harvey  
Guifang Li  
James Pearson  
Kathleen Richardson  
Martin Richardson  
Bahaa Saleh  
Winston V. Schoenfeld  
M.J. Soileau  
Eric Van Stryland  
Konstantin Vodopyanov  
Shin-Tson Wu  

Michael Bass  
Peter Delfyett  
Dennis Deppe  
Guifang Li  
Martin Richardson  
Bahaa Saleh  
William Silfvast  
M.J. Soileau  
Eric Van Stryland  
Shin-Tson Wu  

Zenghu Chang  
Aristide Dogariu  
Demetrios Christodoulides  
Peter Delfyett  
Martin Richardson  
Bahaa Saleh  
Eric Van Stryland  
Konstantin Vodopyanov  

Aravinda Kar  
Michael Bass  

Leonid Glebov  
Kathleen Richardson  

Shin-Tson Wu  

Michael Bass  
Martin Richardson  

M.J. Soileau  
Shin-Tson Wu  

Michael Bass  
Peter Delfyett  
Leonid Glebov  
Aravinda Kar  
Guifang Li  

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### Presidents, Directors, & Officers of Professional Societies

<table>
<thead>
<tr>
<th>Society</th>
<th>President</th>
<th>Vice-President</th>
<th>President (Year)</th>
<th>Board of Directors Member (Years)</th>
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<tbody>
<tr>
<td></td>
<td>Michael Bass</td>
<td></td>
<td>Board of Directors Member (1989–1992)</td>
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<tr>
<td></td>
<td>Peter Delfyett</td>
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<td>Board of Directors Member (2004–2006)</td>
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<tr>
<td></td>
<td>Bahaa Saleh</td>
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<td>Board of Directors Member (1998–2005)</td>
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<td></td>
<td>Eric Van Stryland</td>
<td>Shin-Tson Wu</td>
<td>Board of Directors Member (1998–2001)</td>
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<td>Board of Directors Member (2013–2014)</td>
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<td></td>
<td></td>
<td>James Harvey</td>
<td>Board of Directors Member (1997–1999)</td>
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<tr>
<td></td>
<td></td>
<td>Kathleen Richardson</td>
<td>Board of Directors Member (2001–2003)</td>
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<td></td>
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<td>Board of Directors Member (2012–2015)</td>
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<tr>
<td>SPIE Photonics Society</td>
<td>Shin-Tson Wu</td>
<td>Peter Delfyett</td>
<td>Board of Govenors (2003–present)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jim Moharam</td>
<td>Vice-President (1997–1999)</td>
<td></td>
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<td>Kathleen Richardson</td>
<td>Board of Govenors (2000–2002)</td>
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<tr>
<td>Laser Institute of America</td>
<td>Michael Bass</td>
<td></td>
<td>President (1988)</td>
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<td></td>
<td>Aravinda Kar</td>
<td>Board of Directors Member (1985–1989)</td>
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<td></td>
<td>Bahaa Saleh</td>
<td>Board of Directors Member (2005)</td>
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<td></td>
<td></td>
<td>Eric Van Stryland</td>
<td>Board of Directors Member (1992–1994)</td>
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<tr>
<td>The American Ceramic Society</td>
<td>Kathleen Richardson</td>
<td></td>
<td>Board of Directors Member (2008–2015)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>President (2014–2015)</td>
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<tr>
<td>APS</td>
<td>Peter Delfyett</td>
<td></td>
<td>Vice-Chair (2015–Present)</td>
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<tr>
<td>National Institute of Ceramic Engineers (NICE)*</td>
<td>Kathleen Richardson</td>
<td></td>
<td>President (2008–2009)</td>
<td></td>
</tr>
</tbody>
</table>
International Awards and Honors

Michael Bass  Fellow, Russian Academy of Engineering Science (1994)
Michael Bass  Fellow, International Academy of Engineering, Russia
Michael Bass  Fellow, American Association for the Advancement of Science (2016)
Zenghu Chang  Hubert Schardin Gold Medal Medal (1996)
Kathleen Richardson  I.D. Varshnei Award, Indian Ceramic Society (2013)
Martin Richardson  Hubert Schardin Gold Medal Medal (1976)
Martin Richardson  Honorary doctorate, University of Bordeaux, France (2013)
Bahaa Saleh  Kuwait Prize (2006)
Axel Schülzgen  Habilitation Grant, German Research Foundation (1993)
Axel Schülzgen  Carl-Ramsauer-Award of the AEG AG (1992)
M.J. Soileau  ICFO’s Distinguished Service Appreciation Medal (2012)
M.J. Soileau  Foreign Member of the Russian Academy of Sciences (2016)
George Stegeman  Honorary doctorate, NRS University, Canada (2013)
Shin-Tson Wu  Honorary Professorship, National Chiao Tung University, Taiwan (2018)
Boris Zeldovich (in memoriam)  USSR Academy of Sciences (1987)
Boris Zeldovich (in memoriam)  USSR State Prize (1983)

Journal Editors

Peter Delfyett  IEEE Journal of Selected Topics in Quantum Electronics (2001-2006)
Ronald Driggers  Applied Optics (2015–present)
Pieter Kik  Optics Communications (2011–2012)
Guifang Li  Editor-in-Chief of Advances in Optics and Photonics (2019)
David Hagan  Optical Materials Express (2010–present)
David Hagan  Chinese Optics Letters (2016)
Bahaa Saleh  Advances in Optics & Photonics (2008–2014)

MJ (center) and Cheryl Soileau, with Michael Bass (l) as he is inducted into the Florida Inventors Hall of Fame
ASSOCIATE AND TOPICAL EDITORS

Konstantin Vodopyanov  Optica (2014–present)
Michael Bass  Optics Express (2001–2001)
Glenn Boreman  Optics Express (2009–present)
Guifang Li  Optics Express (2007–present)
Guifang Li  Photonics Technology Letters (2007–present)
Kathleen Richardson  International Journal of Applied Glass Science (2009–present)
Kathleen Richardson  Optical Materials Express (September 2013)
Axel Schülzgen  Journal of Lightwave Technologies (2019–present)
Lawrence Shah  IEEE Journal of Quantum Electronics
Shin-Tson Wu  Liquid Crystals (2009–present)

Books Published in 2019

Ivan B. Divliansky
Advances in High-Power Fiber and Diode Laser Engineering
IET (2019)

Bahaa E. A. Saleh, and Malvin C. Teich,
Fundamentals of Photonics,

Axel Schülzgen (r) elected as a fellow of The Optical Society in November.
Books

Michael Bass,

Walter Koechner and Michael Bass,

Michael Bass, Casimer DeCusatis, Jay Enoch and Vasudevan Lakshmina-rayanan, Guifang Li, Carolyn MacDonald, Virenda Mahajan, and Eric Van Stryland,

Glenn D. Boreman,

Glenn D. Boreman,

Zenghu Chang,

Ronald Driggers, Mel Friedman, and Jon Nichols,

Craig Hoffman and Ronald Driggers, eds.

S. Susan Young, Ronald G. Driggers, Eddie L. Jacobs,

Richard H. Vollmerhausen, Donald A. Reago Jr., Ronald Driggers,

Ronald Driggers, Editor-in-Chief

R. Vollmerhausen and Ronald Driggers
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Publisher</th>
<th>Year</th>
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<tbody>
<tr>
<td>Ronald Driggers, P. Cox, and T. Edwards</td>
<td>Introduction to Infrared and Electro-Optical Systems</td>
<td>Artech House</td>
<td>1999</td>
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<tr>
<td>Sasan Fathpour and Bahram Jalali</td>
<td>Silicon Photonics for Telecommunications and Biomedicine</td>
<td>CRC Press</td>
<td>2012</td>
</tr>
<tr>
<td>J. Mazumder and Aravinda Kar</td>
<td>Theory and Application of Laser Chemical Vapor Deposition</td>
<td>Springer</td>
<td>1995</td>
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<tr>
<td>Mark L. Brongersma and Pieter G. Kik</td>
<td>Surface Plasmon Nanophotonics</td>
<td>Springer</td>
<td>2010</td>
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<tr>
<td>Bahaa E. A. Saleh</td>
<td>Photoelectron Statistics</td>
<td>Springer</td>
<td>1977</td>
</tr>
<tr>
<td>Bahaa E. A. Saleh</td>
<td>Introduction to Subsurface Imaging</td>
<td>Cambridge University Press</td>
<td>2011</td>
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<tr>
<td>Carlo G. Someda and George I. Stegeman</td>
<td>Anisotropic and Nonlinear Optical Waveguides</td>
<td>Elsevier</td>
<td>1992</td>
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</table>


## Research Staff

### Senior Research Scientists

<table>
<thead>
<tr>
<th>Robert Crabb (TISTEF)</th>
<th>Scott Webster (Prof. Abouraddy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivan Divliansky (Prof. Glebov)</td>
<td>Morgan Monroe (Prof. Abouraddy)</td>
</tr>
</tbody>
</table>

### Research Scientists

<table>
<thead>
<tr>
<th>Jose Enrique Antonio Lopez (Profs. Amezcua/Schulzgen)</th>
<th>Andrey Muraviev (Prof. Vodopyanov)</th>
</tr>
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<tbody>
<tr>
<td>Robert Bernath (Prof. M. Richardson)</td>
<td>Sarvesh Rane (Prof. Deppe)</td>
</tr>
<tr>
<td>Bruce Berry (TISTEF)</td>
<td>Shermineh Rostami Fairchild (Prof. M. Richardson)</td>
</tr>
<tr>
<td>Basanta Bhaduri (Prof. Abouraddy)</td>
<td>Matthew Salfer-Hobbs (TISTEF)</td>
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<tr>
<td>Shi Chen (Profs. Abouraddy/Gaume)</td>
<td>Frank Sanzone (TISTEF)</td>
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<td>Joseph Coffaro (TISTEF)</td>
<td>Soroush Shabahang (Prof. Abouraddy)</td>
</tr>
<tr>
<td>Larissa Glebova (Prof. Glebov)</td>
<td>Jonathan Spychalsky (TISTEF)</td>
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<tr>
<td>Nicholas Harris (Prof. Abouraddy)</td>
<td>Chetan Swamy (Prof. Deppe)</td>
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<tr>
<td>Shikha Kalbele (Prof. Deppe)</td>
<td>Franklin Titus (TISTEF)</td>
</tr>
<tr>
<td>Joshua Kaufman (Prof. Abouraddy)</td>
<td>Oussama Mhibik (Prof. Abouraddy)</td>
</tr>
<tr>
<td>Esat Kondakci (Prof. Abouraddy)</td>
<td>Myungkook Kang (Prof. K. Richardson)</td>
</tr>
<tr>
<td>Majid Masnavi (Prof. M. Richardson)</td>
<td>Gisela Lopez Galmiche (Prof. Christodoulides)</td>
</tr>
</tbody>
</table>

### Post-Doctoral Scholars

<table>
<thead>
<tr>
<th>Alyssa Allende Motz (Prof. Abouraddy)</th>
<th>Myungkook Kang (Prof. K. Richardson)</th>
</tr>
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<tbody>
<tr>
<td>Melissa Beason (TISTEF)</td>
<td>Gisela Lopez Galmiche (Prof. Christodoulides)</td>
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<tr>
<td>Nathan Bodnar (Prof. M. Richardson)</td>
<td>Amirreza Mahigir (Prof. Khajavikhan)</td>
</tr>
<tr>
<td>Yingjie Chai (Prof. Soileau)</td>
<td>Julian Martinez Mercado (Prof. Amezcua)</td>
</tr>
<tr>
<td>Matthieu Chazot (Prof. K. Richardson)</td>
<td>Oussama Mhibik (Prof. Abouraddy)</td>
</tr>
<tr>
<td>Jaehyuck Choi (Prof. Khajavikhan)</td>
<td>Natalia Munera Ortiz (Profs. Hagan/Van Stryland)</td>
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<tr>
<td>Daniel Cruz Delgado (Prof. Amezcua)</td>
<td>Nicholas Nye (Prof. Christodoulides)</td>
</tr>
<tr>
<td>Xinpeng Du (Profs. Kar/Yu)</td>
<td>Midya Parto (Prof. Christodoulides)</td>
</tr>
<tr>
<td>Asaf Farhi (Prof. Dogariu)</td>
<td>Rashi Sharma (Prof. K. Richardson)</td>
</tr>
<tr>
<td>Claudia Goncalves (Prof. K. Richardson)</td>
<td>Pavel Shirshnev (Prof. Glebov)</td>
</tr>
<tr>
<td>Md Selim Habib (Prof. Amezcua)</td>
<td>Qitian Ru (Prof. Vodopyanov)</td>
</tr>
<tr>
<td>William Hayenga (Prof. Khajavikhan)</td>
<td>Felix Tan (Prof. Abouraddy)</td>
</tr>
<tr>
<td>Mohammad Hokmabadi (Prof. Khajavikhan)</td>
<td>Manual Triana Valencia (Prof. Wu)</td>
</tr>
</tbody>
</table>

### Visiting Research Scientists

<table>
<thead>
<tr>
<th>Dante Maria Aceti (Prof. Khajavikhan)</th>
<th>Xiaomin Liu (Prof. Wu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cristian Acevedo Caceres (Prof. Dogariu)</td>
<td>Partha Mukhopadhyay (Prof. Schoenfeld)</td>
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<tr>
<td>Mykhailo Bondar (Profs. Hagan/Van Stryland)</td>
<td>Armando Perez Leija (Prof. Christodoulides)</td>
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<tr>
<td>Enguo Chen (Prof. Wu)</td>
<td>Felix Jose Salazar Bloise (Prof. Dogariu)</td>
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<tr>
<td>Ziyang Chen (Prof. Dogariu)</td>
<td>He Wen (Prof. Li)</td>
</tr>
<tr>
<td>Pawel Jung (Prof. Christodoulides)</td>
<td>Guangye Yang (Prof. Christodoulides)</td>
</tr>
<tr>
<td>Kang Taek Lee (Prof. Han)</td>
<td>Hongbo Zhu (Prof. Li)</td>
</tr>
</tbody>
</table>

### Research Associates

| Helene Mingareev (Prof. Glebov) |   |

### Lab Technicians

<table>
<thead>
<tr>
<th>Arthur Freeman (Prof. M. Richardson)</th>
<th>Mishal Patel (Prof. Abouraddy)</th>
</tr>
</thead>
</table>

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2019 Gabor Award presented to Mike McKee

The Gabor Award, which is sponsored by The Gabor Agency, was established to recognize and reward the outstanding job performance of a selected Administrative & Professional (A&P) employee. The honoree, selected annually, is announced during the Annual Employee Awards Program, and received a check for $2,500.

Mike McKee receiving the Gabor Award from President Seymour (L) and representatives from Gabor and UCF Human Relations.
Perhaps the biggest challenge that the College faces is spreading the word that there is a field called photonics. While most high school students and teachers know about electrical engineering, relatively few have heard about photonics and what it means.

Recruiting Efforts

Some students declare Photonic Science and Engineering (PSE) as their major upon admission to UCF but it is far more common for students to enroll in the program after transferring to UCF.

A majority of students who transfer to UCF do so through three of the six UCF Direct Connect partners: Valencia, Seminole or Eastern Florida State College. At each campus, students who have declared their major as engineering are enrolled in “Introduction to Engineering.” Mike McKee, the Associate Director for the Undergraduate Program, visits the classes each semester. He presents information about the Photonic Science and Engineering program. In Fall 2019, 72% of students who chose PSE at the start of the semester were transfer students, while the remaining were freshmen, otherwise known as FTIC (First Time in College.)

UCF also has an Introduction to Engineering class, in which all 1200 FTIC students who have declared as an engineering major are enrolled. David Hagan and Mike McKee present information to these students and, as a result, we see an increase in enrollment after the semester starts. While official fall preliminary numbers for PSE show we have 143 students, our numbers continue to increase throughout the fall semester as FTIC students learn about the major. By the end of Fall 2019, we have approximately 170 students enrolled.

Over the last several years, the College has increased recruiting efforts by targeting high school math and science teachers who can then help distribute information to students. Mike McKee conducts outreach around the state at events such as the Florida Association of Science Teachers in October 2019 or the Miami-Dade Science and Engineering Fair, which attracts about 20,000 attendees.

While recruiting at state colleges and UCF have an immediate impact in PSE enrollment, the impact from efforts to recruit high school students will not be seen for years. Furthermore, efforts to recruit high school students must be sustained over a long period of time. The College has invested in promotional materials that can be sent to classrooms, and a website has been created that helps to answer “What is Photonics?” That website is found at https://photonics.creol.ucf.edu.

PSE Graduates

Now six years old, 57 students have graduated and have either opted for graduate school or have been employed locally or outside the region. In a recent survey of graduates conducted by the College, average starting salaries are approximately $65,000. UCF conducts a First Destination Survey of graduating students and their report shows an average starting salary of $72,000.

About 71% are employed in the field of photonics, while 19% are attending graduate school. The remaining are either working outside the field (for example in electrical engineering) or are looking for a position at the time of the survey.

Graduates reported they have been employed at a companies such as L3Harris, LightPath Technologies, Control Laser, Northrop Grumman, Lockheed Martin, Verizon, and Particle Measuring System.
**Graduate Program**

**Graduate Recruitment and Enrollment**

Enrollment of 111 students the Ph.D. program in Fall 2019 represents an increase over the previous eight year average of 101. This is primarily due to the hiring of new faculty, along with increase in external funding from the prior year. As new faculty increase their research funding portfolios, we expect the Ph.D. enrollment to grow over the next 5 years. Overall, we received 188 full applications (144 Ph.D. and 44 M.S.) to the graduate programs for Fall 2019.

24 new students (19 Ph.D. and 5 M.S.) enrolled in Fall 2019.

The following tables reflect the enrollment recorded at the start of fall semester each academic year. This number fluctuates slightly throughout the year due to students entering and graduating in different terms.

The average M.S. enrollment has remained roughly constant over the past eight years, with an average enrollment of 22 students each year.

**Photonics in the 21st Century: An Introduction to the Field of Optics & Photonics**

Undergraduate students from universities in Florida were invited to attend this first annual event. The purpose of the event was to learn about optics and photonics – enabling technologies for the 21st century. They were informed about graduate school opportunities in optics and photonics, how to prepare a graduate school application, funding opportunities, and what life as a graduate student is like.

November 10-11
New initiatives for future years, including the offering of Photonics courses at Lockheed Martin, are expected to increase enrollment in the MS program. Interest from other Industrial Affiliates has been received and we look forward to expanding to meet the community’s needs.

Our M.S. and Ph.D. programs emphasize rigorous coursework and strong opportunities to conduct leading-edge research. Our goal is that when our M.S. and Ph.D. students graduate, they are well prepared to become leaders in the field of optics and photonics, whether they choose a career in industry or academia.

**Fall 2019 Mean GRE Scores**

The Ph.D median GRE Quantitative percentile score for admitted students in fall is 91%, is above the five year median score of 85.5%. The highest Mean Percentile Ranking achieved over the last five years was 93% in 2018.

<table>
<thead>
<tr>
<th></th>
<th>Quantitative</th>
<th>%</th>
<th>Verbal</th>
<th>%</th>
<th>Analytic Writing</th>
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<tr>
<td><strong>Ph.D.</strong></td>
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<tr>
<td>US</td>
<td>161</td>
<td>79%</td>
<td>156</td>
<td>70%</td>
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<td>59%</td>
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<tr>
<td>Intl</td>
<td>167</td>
<td>91%</td>
<td>151</td>
<td>52%</td>
<td>3</td>
<td>29%</td>
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</table>

**New Matriculant Demographic Fellowships & Scholarships**

In association with UCF’s goals of becoming more inclusive and diverse, CREOL is aiming to attract a more equitable gender balance. In fall 2019, 21% of Ph.D. and 40% of M.S. students were female. Our goal is to grow the number of female students admitted by 10% each year. The College maintains a strong focus on education at both undergraduate and graduate levels. We are taking advantage of the ORC Fellowship that is funded by the Office of Research, College of Optics and Photonics, and Academic Affairs.

**Ph.D.**

- Male: US 6, Intl 9
- Female: US 1, Intl 3
- FT: US 7, Intl 12
- PT: US 0, Intl 0

**M.S.**

- Male: US 3, Intl 0
- Female: US 2, Intl 0
- FT: US 5, Intl 0
- PT: US 0, Intl 0

**Total New Students**: 26

*Northrop Grumman, Schwartz, Suchoski, Frances Townes

**Degrees Awarded**

The charts below display the number of graduate degrees awarded in each academic year for the last eight years.

The Ph.D. chart shows that there was a decrease in the number of Ph.D. degrees awarded in the past year. A total of 146 Optics degrees plus 28 from other programs were awarded in the ten year period between 2009-10 to 2018-19, and the average number of degrees awarded is 17.4 per year.

*Note: the UCF academic year begins in the summer term.*

Ph.D. degrees awarded to students in the College of Optics and Photonics and students in other UCF colleges with College of Optics and Photonics advisors.
The number of MS graduates in 2018-2019 has increased over the previous year and we believe that this increase will continue due to recent program changes. The degrees awarded for the last 10 years in the M.S. program is 215 with an average number of degrees awarded of 21.5 per year.

MS degrees awarded. Recipients of these degrees are classified into two groups: those who leave with an MS degree. ("Terminal MS") and those who are continuing on to the PhD. degree ("En-route to PhD").

Courses Taught

The Academic Program changes that have taken place during the last year include:

- OSE 5115 Interference, Diffraction and Coherence
- OSE 5312 Light Matter Interaction
- OSE 6111 Optical Wave Propagation
- OSE 6211 Imaging and Optical Systems
- OSE 6474 Fundamentals of Optical Fiber Communications
- OSE 6525 Laser Engineering

The Master’s Program is now requiring all students to take the M.S. Comprehensive Examination immediately following their completion of the program’s core courses.

<table>
<thead>
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<th>Course Number and Name</th>
<th>Spring 2019</th>
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<th>Fall 2019</th>
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<td>OSE 5115</td>
<td>Dogariu</td>
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<td>Moharam</td>
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<tr>
<td>OSE 5312</td>
<td>Gaume</td>
<td></td>
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<tr>
<td>OSE 5414</td>
<td>Gelfand</td>
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</tr>
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<td>OSE 6111</td>
<td>Argenti</td>
<td></td>
<td>Moharam</td>
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<td>Driggers</td>
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<td>Course Number and Name</td>
<td>Spring 2019</td>
<td>Summer 2019</td>
<td>Fall 2019</td>
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<td>IDS 6416</td>
<td>History of Physical Science and Cultural Connections</td>
<td>Soileau</td>
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<td>OSE 5313</td>
<td>Materials for Optical Systems</td>
<td>K. Richardson</td>
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<td>OSE 6125</td>
<td>Computational Photonics</td>
<td>Moharam</td>
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<td>OSE 6143</td>
<td>Fiber Optics Communication</td>
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<td>OSE 6334</td>
<td>Nonlinear optics</td>
<td>Vodopyanov</td>
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<td>OSE 6347</td>
<td>Quantum Optics</td>
<td>Saleh</td>
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<td>OSE 6349</td>
<td>Applied Quantum Mechanics for Optics</td>
<td>Kik</td>
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<td>OSE 6445</td>
<td>Fundamentals of Ultrafast Optics</td>
<td>Delfyett</td>
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<td>OSE 6447</td>
<td>Attosecond Optics</td>
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<td>OSE 6455C</td>
<td>Photonics Laboratory</td>
<td>Yu</td>
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<td>OSE 6526C</td>
<td>Laser Engineering Laboratory</td>
<td>Vodopyanov, M. Richardson</td>
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<tr>
<td>OSE 6527</td>
<td>Fiber Lasers</td>
<td>Schulzgen</td>
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<td>OSE 6650</td>
<td>Optical Properties of Nanostructured Materials</td>
<td>Kik</td>
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<td>OSE 6820</td>
<td>Flat Panel Displays</td>
<td>Wu</td>
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<tr>
<td>OSE 6938</td>
<td>ST: Infrared Systems</td>
<td>Driggers</td>
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<tr>
<td>OSE 6938</td>
<td>ST: Quantum Cascade Lasers</td>
<td>Lyakh</td>
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**Undergraduate Courses**

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<th>Course Number and Name</th>
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<th>Fall 2019</th>
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<tr>
<td>OSE 1101</td>
<td>Seeing the Light</td>
<td>Soileau</td>
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<tr>
<td>OSE 3043</td>
<td>Analytical Methods of Photonics</td>
<td>Gelfand</td>
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<tr>
<td>OSE 3052</td>
<td>Foundations of Photonics</td>
<td>Amezcua-Correa, LiKamWa</td>
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<tr>
<td>OSE 3052L</td>
<td>Foundations of Photonics Laboratory</td>
<td>Divliansky, Divliansky</td>
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<td>OSE 3053</td>
<td>Electromagnetic Waves for Photonics</td>
<td>Moharam</td>
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<td>OSE 3200</td>
<td>Geometric Optics</td>
<td>Han, Renshaw</td>
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<td>Geometric Optics Laboratory</td>
<td>Yu, Ulseth</td>
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<td>OSE 4240</td>
<td>Optics and Photonics Design</td>
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<td>Optoelectronics</td>
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<td>OSE 4470</td>
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<td>Visual Optics</td>
<td>Soileau</td>
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<td>OSE 4721</td>
<td>Biophotonics</td>
<td>Han</td>
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<td>OSE 4830</td>
<td>Imaging and Display</td>
<td>Pang</td>
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<td>OSE 4830L</td>
<td>Imaging and Display Laboratory</td>
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<td>OSE 4930</td>
<td>Frontiers of Optics and Photonics</td>
<td>Kuebler</td>
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<td>OSE 4951</td>
<td>Senior Design I</td>
<td>Hagan, Hagan, Hagan</td>
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<tr>
<td>OSE 4952</td>
<td>Senior Design II</td>
<td>Hagan, Hagan, Hagan</td>
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</table>

**Undergraduate Courses at other colleges**

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<thead>
<tr>
<th>Course Number and Name</th>
<th>Spring 2019</th>
<th>Summer 2019</th>
<th>Fall 2019</th>
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<tr>
<td>CHM 2046</td>
<td>Chemistry Fundamentals</td>
<td>Kuebler</td>
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<tr>
<td>EEL 4440</td>
<td>Optical Engineering</td>
<td>LiKamWa</td>
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<tr>
<td>EMA5140</td>
<td>Intro to Ceramic Materials</td>
<td>Gaume</td>
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<tr>
<td>PHY 2048C</td>
<td>General Physics Using Calculus</td>
<td>Argenti</td>
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<tr>
<td>Name</td>
<td>Degree</td>
<td>Year</td>
<td>Dissertation Title</td>
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<tr>
<td>Absar Ulhassan</td>
<td>Ph.D. Optics &amp; Photonics</td>
<td>Summer 2018</td>
<td>Non-Hermitian Optics</td>
</tr>
<tr>
<td>William Hayenga</td>
<td>Ph.D. Optics &amp; Photonics</td>
<td>Fall 2018</td>
<td>Fundamental Properties of Metallic Nanolasers</td>
</tr>
<tr>
<td>Alex Sincare</td>
<td>Ph.D. Optics &amp; Photonics</td>
<td>Fall 2018</td>
<td>Non-Hermitian Optics</td>
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<tr>
<td>Yun-Han Lee</td>
<td>Ph.D. Optics &amp; Photonics</td>
<td>Fall 2018</td>
<td>Liquid Crystal Phase Modulation for Beam Steering and Near-Eye Displays</td>
</tr>
<tr>
<td>Nicholas S. Nye</td>
<td>Ph.D. Optics &amp; Photonics</td>
<td>Spring 2019</td>
<td>Non-Hermitian And Space-Time Mode Management</td>
</tr>
<tr>
<td>Sara Bakhshi</td>
<td>Ph.D. Electrical Engineering</td>
<td>Summer 2018</td>
<td>Excellent Surface Passivation for High Efficiency C_{Si} Solar Cells</td>
</tr>
<tr>
<td>Melissa Beason</td>
<td>Ph.D. Electrical Engineering</td>
<td>Fall 2018</td>
<td>Effects of Nonclassical Optical Turbulence on a Propagating Laser Beam</td>
</tr>
<tr>
<td>Eduardo Castillo</td>
<td>Ph.D. Mechanical Engineering</td>
<td>Summer 2018</td>
<td>Electrospray and Superlens Effect of Microdroplets for Laser-Assisted Nanomanufacturing</td>
</tr>
</tbody>
</table>
Xuan Chen  
Ph.D. Material Science & Engineering, Fall 2018  
Dissertation Title: Fabrication and Characterization of Nonlinear Optical Ceramics for Random Quasi-Phase-Matching  
Advisor: Romain Gaume  
Employer: Lawrence Livermore National Lab  
Position Title: Post-Doctoral Scientist

Jeffrey Jennings  
Ph.D. Material Science & Engineering, Fall 2018  
Dissertation Title: Theoretical and Experimental Studies for Tailoring the Electromagnetic Surface Properties of Conductive Materials  
Advisor: Aravinda Kar  
Employer: L3Harris Technologies, Inc.  
Title: Lead Mechanical Engineer

Tabbakh Thamer  
Ph.D. Electrical Engineering, Fall 2018  
Dissertation Title: Monolithically Integrated Wavelength Tunable Laser Diode for Integrated Optic Surface Plasmon Resonance Sensing  
Advisor: Patrick LiKamWa  
Employer: King Abdulaziz City of Science and Technology (KACST), Egypt  
Position Title: Assistant Professor Research

Master’s Theses

Degrees granted in academic year Summer 2018 – Spring 2019

Bumjin Oh  
M.S. Optics & Photonics, Summer 2018  
M.S. Thesis Title: Power Scaling of High Power Solid State Lasers  
Advisor: Martin Richardson  
Employer: Central Force of National Security, Rep. of Korea Army  
Position Title: Lead Mechanical Engineer

Fei Jia  
M.S. Optics & Photonics, Summer 2018  
M.S. Thesis Title: Mode-locked Laser Based on Large Core Yb3+-doped fiber  
Advisor: Rodrigo Amezcua Correa  
Employer: Panduit  
Position Title: Fiber Research Intern

Rowel Go  
M.S. Optics & Photonics, Summer 2018  
M.S. Thesis Title: Room Temperature Operation of Quantum Cascade Lasers Monolithically Integrated onto a Lattice-mismatched Substrate  
Advisor: Arkadiy Lyakh  
Employer: UCF, CECS  
Position Title: Ph.D. Student, Electrical Engineering

Dong Jin Shin  
M.S. Optics & Photonics, Fall 2018  
M.S. Thesis Title: Single Mode Wavelength-Tunable Thulium Fiber  
Advisor: Martin Richardson  
Employer: Cymer Corp  
Position Title: Engineer

Daniel McGill  
M.S. Optics & Photonics, Spring 2019  
M.S. Thesis Title: Processing of Advanced Infrared Materials  
Advisor: Kathleen Richardson  
Employer: Lockheed Martin  
Position Title: Materials & Process Engineer
STUDENT SCHOLARSHIPS AND AWARDS

National

SCHOLARSHIPS AND FELLOWSHIPS
Derek Burrell, SPIE D.J. Lovell Scholarship
Fangwang Gou, SPIE Educational scholarship
Jennifer Hewitt, DoD SMART Scholarship for Service
Gabriela Rodriguez, DoD SMART Scholarship for Service
Justin Cook, DEPS Graduate Scholarship (2018-2019)
Patrick Roumayah, DEPS Graduate Scholarship (2018-2019)
Daniel Thul, DEPS Graduate Scholarship (2019-2020)
Rafaela Frota, McNair Scholarship
Teodor Malendevych, DAAD RISE Germany Fellowship
Joshua Carter, DoD SMART Scholarship for Service
Guanjun Tan, SPIE AR/VR/MR Optical Design Challenge Award

BEST PAPERS OR POSTERS
Md Selim Habib, Outstanding paper Award from SPIE Photonics West
Benjamin Croop, Best Student Paper Award from SPIE Photonics West
Sajad Saghaye-Polkoo, Best poster Award from IEEE Photonics Summer Topicals
Fangwang Gou, Tao Zhan, Kun Yin, SID’19 Distinguished Paper Award
Ziqian He, Honorable mention, 2020 Lighting R&D Workshop Student Poster Competition

TRAVEL GRANTS
Jialei Tang, Ben Croop, Alireza Safaei, Sepehr Benis, Rachel Sampson, Guanjun Tan, Yuge Huang, Fedor Kompan, A F M Saniul Haq, Daniel Thul, Boyang Zhou, Justin Cook, Patrick Roumayah, Photonics West Student Travel Gr

UCF
UNDERGRADUATE
Lattfah Maasarani, Order of Pegasus
Rafaela Frota, Joust New Venture Competition

GRADUATE
Qitian Ru, UCF 3MT Competition
Guanjun Tan, Graduate Dean’s Dissertation Completion Fellowship
Mengdi Sun, UCF Presentation Fellowship

College of Optics & Photonics Awards
Jose Rafael Guzman-Sepulveda, College of Optics & Photonics Student of The Year Award
Jian Zhao, finalist, Student of the Year Award
Zheyuan Zhu, finalist, Student of the Year Award
Sajad Saghaye Polkoo, Best Poster Award

GRADUATE STUDENTS

Doctoral Students

STUDENT
Abdelsalam, Kamal Mohamed Khalil
Ahmadzadeh Benis, Sepehr
Alvarado Zacarias, Juan Carlos
Alvarez Aguirre, Roberto Alejandro
Anderson, James
Azim, Ahmad
Batarseh, Mahed
Bayat, Mina
Biswas, Aritra
Burrell, Derek
Bustos Ramirez, Ricardo
Butrimas, Steven
Camacho Gonzalez, Guillermo Fernando
Chang, Hao-Jung
Chen, Hao
Chen, Suyuan
Chen, Weiyu
Cheng, He
Chew, Andrew
Cook, Justin
Cox, Nicholas
Croop, Benjamin
Ding, Lei
Ebrahimi, Vahid
Eshaghi, Mahdi
Fan, Shengli
Fardoost, Alireza
Faryadras, Sanaz
Fudala, Nicolette
Gao, Munan
Gaußmann, Stefan
Gemar, Heath
Ghadi Vanani, Fatemeh
Ghulipour Vazimali, Milad
Gou, Fangwang
Grimming, Robert
Guzman Sepulveda, Jose Rafael
Hale, Evan
Haq, A F M Saniul
Hathaway, Dagan
Hatipoglu, Ismael
Hayenga, William
He, Juan "Rachel"

ADVISOR
Fathpour
Hagan/Van Straylight
Amezua-Correa
Glebov
Schulzgen
Lyakhh
Dogariu
Deppe
Chanda
Driggers
Delfyett
Driggers
Fathpour
Hagan/Van Straylight
Dong
Vodopyanov
Pang
Chang
M. Richardson
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Khajavikhan
Han
Dogariu
Li
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Driggers
Schoenfeld
Schulzgen
Driggers
Li
Driggers
Wu
Driggers
Dogariu
Glebov
Yuksel
Lyakhh
Schoenfeld
Khajavikhan
Wu
He, Ziqian
Hewitt, Jennifer
Hossain, Mohammad Jobayer
Hsiang, En-Lin
Hu, Xiaowen "Steven"
Huang, Di
Huang, Yu
Jayaprakash Saiji, Shruti
Kawamori, Taiki
Kazemi Lahromi, Ali
Kerrigan, Haley
Kompan, Fedor
Konnov, Dmitri
Larson, Walker
Lee, Yun Han
Leshin, Jason
Li, Jinxin
Li, Yannanqi
Liu, Huiyuan
Liu, Yuzhou
Lopez Aviles, Helena
Ma, Zhao
Mach, Lam
Malinowski, Marcin
Martinez-Martinez, Ricardo
Modak, Sushrut
Mohammadinan, Nafiseh
Nicholas, Robert
Nye, Nicholas
Ordouie, Ehsan
Porto, Midy
Pena, Jessica
Rahaman, Arifur
Ren, Jinhua
Roumayah, Patrick
Ru, Qitian
Sampson, Rachel
Sanchez Cristobal, Enrique
Shen, Zhean
Shin, Dong Jin
Shirpurkar, Chinmay
Sincore, Alex
Singh, Mamtta
Sjaarda, Tracy
Smith-Dryden, Seth
Sun, Mengdi
He, Ziqian
Hewitt, Jennifer
Hossain, Mohammad Jobayer
Hsiang, En-Lin
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Sjaarda, Tracy
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Wu
K. Richardson
Davis
Wu
Schulzgen
Delfyett
Wu
Bandres
Vodopyanov
Abouraddy
M. Richardson
Glebov
Vodopyanov
Saleh
Wu
Khajavikhan
Gelfand
Wu
Li
Khajavikhan
Christodoulides
Renshaw
Abouraddy
Fathpour
Gelfand
Chanda
Driggers
Christodoulides
Fathpour
Christodoulides
M. Richardson
Yu / Kar
Khajavikhan
M. Richardson
Vodopyanov
Li
Lyakhh
Dogariu
M. Richardson
Delfyett
M. Richardson
China
Fathpour
Saleh
Kik

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Rafaela Frota, Joust New Venture Competition

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Jian Zhao, finalist, Student of the Year Award
Zheyuan Zhu, finalist, Student of the Year Award
Sajad Saghaye Polkoo, Best Poster Award
Doctoral Students Continued

**STUDENT**
Sun, Yangyang
Suttinger, Matthew
Talukder, Md Javed Rouf
Tan, Felix
Tan, Guanjun
Tang, Jialei
Thul, Daniel
Tofighi, Salimeh
Trask, Lawrence
Ulhasan, Absar
Wang, Ning
Weng, Chun Hung
Wittek, Steffen
Wu, Fan
Wu, Ruitao
Xiong, Jianghao
Xu, Chi
Yessenov, Murat
Yin, Kun
Zhan, Tao
Zhang, Chenzhi
Zhang, Yuanhang
Zhao, Jian
Zhou, Boyang
Zhou, Fangjie
Zou, Junyu
Zhu, Zheyuan

**PROGRAM/ADVISOR**
Pang
Lyakh
Abouraddy
Wu
Han
M. Richardson
Hagan/Van Stryland
Dehfeyt
Christodoulides
Li
Han
Amezcua-Correa
Christodoulides
Dogaru
Wu
Kuebler
Abouraddy
Wu
Wu
Gelfand
Li/LiKamWa
Schulzgen
Yu
Chang
Wu
Pang

**Master’s Students**

**STUDENT**
Abdelsalam, Kamal Mohammad Khalil
Alvarez Aquirre, Roberto Alejandro *
Calkins, Eric
Casas, Andres
Chen, Hao
Cheng, He
Childs, Joshua
Cox, Nicholas
Cramer, Alexander

**ADVISOR**
Fathpour
Dehfeyt
Dong
Dong
Pang
Hagan/Van Stryland

**Master’s Graduates**

**STUDENT**
Abdelsalam, Kamal *
Alvarez Aquirre, Roberto Alejandro *
Calkins, Eric
Cheng, He *
Croop, Benjamin *
Jia, Fei
Lee, Hee Cheon
Leshin, Jason *
Li, Chih-Hao
Liu, Yuzhou *
Lopez, Helena *
Ma, Zhao *
McGill, Daniel
Mohammadian, Nafiseh *
Oh, Bumjin
Rowel, Go
Shah, Tarj
Shin, Dong Jin
Singh, Mamta
Sjaardema, Tracy *
Tang Jialei *
Tofighi, Salimeh *
Wittek, Steffen *
Wu, Fan *
Zhang, Yuanhang *

**PROGRAM/ADVISOR**
Fathpour
Dehfeyt
Dong
Han
Pang
Hagan/Van Stryland
Amezcua-Correa
Christodoulides
Renshaw
K. Richardson/Gaume
Driggers

*Master’s Along the Way to Ph.D.*
<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Title</th>
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<tbody>
<tr>
<td>1/15/2019</td>
<td>Charmaine Gilbreath NRL (retired)</td>
<td>Stereoscopy for Combining Science and Art for 3D Visualization and Volumetrics</td>
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<td>1/17/2019</td>
<td>Gaurav Bahl</td>
<td>Non-Reciprocal Photonics with Optomechanical Resonator Systems</td>
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<tr>
<td>1/24/2019</td>
<td>Giancarlo C. Righini Francesco Enrichi</td>
<td>Glasses and Guided-Wave Optics: More Than 50 Years of History</td>
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<tr>
<td>1/24/2019</td>
<td>Ivan Diviansky CREOL/UCF</td>
<td>Complex Holographic Elements and Laser Development based on PTR Glass (Candidate Talk)</td>
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<tr>
<td>1/29/2019</td>
<td>Yanlei Yu Fudan University</td>
<td>Liquid Crystal Polymers and Bioinspired Applications (SID Student Chapter Seminar)</td>
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<tr>
<td>1/29/2019</td>
<td>Rebecca Dylla-Spears Lawrence Livermore National Laboratory</td>
<td>Additive Manufacturing of Glass Optics</td>
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<td>2/14/2019</td>
<td>Per Niklas Hedde University of California, Irvine</td>
<td>Optical Imaging with Super-resolution and Light Sheet Microscopy to Unravel Transient Processes in Live Cells, Tissues and Organisms (Biophotonics Faculty Candidate Seminar)</td>
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<tr>
<td>2/22/2019</td>
<td>Filiz Yesilkoy EPFL/STI-IBI-BIOS, Switzerland</td>
<td>Nanophotonic Biosensors: from Plasmonics to Dielectric Metasurfaces (Biophotonics Faculty Candidate Seminar)</td>
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<tr>
<td>2/28/2019</td>
<td>Peter Marasco AFRL</td>
<td>Science and Technology Opportunities at Air Force Research Lab for Engineers and Scientists</td>
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<tr>
<td>3/05/2019</td>
<td>Denis Seletskiy Polytechnique Montreal</td>
<td>Time-Domain Quantum Electrodynamics</td>
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<tr>
<td>4/01/2019</td>
<td>Melik Demirel Center for Advanced Fiber Technologies (CRAFT)</td>
<td>Protein based Photonic and Phononic Material</td>
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<td>4/03/2019</td>
<td>Haizheng Zhong Beijing Institute of Technology</td>
<td>In-situ Fabricated Perovskite Quantum Dots for Display Applications (SID Student Chapter Seminar)</td>
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<td>4/08/2019</td>
<td>Paul McManamon Exciting Technology LLC</td>
<td>A Hyper Data Center using Very High Data Rate Lasercom</td>
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<td>4/18/2019</td>
<td>Andreas Vasdeksis University of Idaho</td>
<td>Looking at Cellular Noise, as a Matter of Fat</td>
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<tr>
<td>4/19/2019</td>
<td>Joseph A. Izatt Duke University</td>
<td>New Optical Technologies for Real-Time Volumetric Biomedical Imaging and Image-Guided Robotic Microsurgery</td>
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<tr>
<td>4/23/2019</td>
<td>Richard Vollmerhausen St. Johns Optical Systems</td>
<td>Silicon Waveguide Imaging and Image Fusion</td>
</tr>
<tr>
<td>4/25/2019</td>
<td>Arash Mafi University of New Mexico</td>
<td>Anti-Stokes Fluorescence Cooling of Fiber Lasers</td>
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<tr>
<td>5/01/2019</td>
<td>Qitian Ru Guanjun Tan CREOL/UCF</td>
<td>The Appealing Features of Subharmonic OPOs for Achieving Mid-Infrared Frequency Combs Optical Challenges in AR/VR Displays (OSA Student Section Graduate Research Symposium)</td>
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<td>5/20/2019</td>
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11/13/2019 | Brian T. Cunningham                          | University of Illinois at Urbana-Champaign | Biosensing with Digital Resolution for Ultrasensitive Diagnostics (IEEE Student Chapter Seminar) |
The faculty, scientists, and students of CREOL, The College of Optics and Photonics, engage in research in areas utilizing radiation at wavelengths extending from millimeter waves to X-rays and cover the basic science and physics of optics and photonics, as well as prototyping development and demonstration of feasibility of applications. They vigorously pursue joint research projects with industry, academia, and government laboratories. In addition to CREOL (Center for Research and Education in Optics and Lasers), which is the primary research arm of the College, three centers are also active:

**Research Centers**

**Florida Photonics Center of Excellence (FPCE)**

The FPCE was established with a $10 million grant from the State of Florida to create a new center of excellence within The College of Optics and Photonics at the University of Central Florida. The program began in 2003 with three primary goals: Advance excellence in research and graduate education to serve existing and emerging industry clusters in the state (photonics, optics, lasers), leverage state resources via partnerships with industry and government, and work in partnership with local, state and regional economic development organizations to attract, retain and grow knowledge-based, wealth producing industries to Florida. The focus of the FPCE research and education work has been on the technologies of nanophotonics, biophotonics, advanced imaging and 3D displays, and ultra-high bandwidth communications, all of which are forecast to experience rapid market growth. The grant has been used for developing the research infrastructure (new faculty, new facilities, new equipment), funding competitive R&D Partnership Projects at Florida universities in partnership with Florida industry, and pursuing commercialization and outreach with the help of the FPCE Industrial Advisory Board, the UCF Technology Incubator, and the Florida Photonics Cluster.

**Townes Laser Institute**

The Townes Laser Institute was established in 2007 in the presence of and in honor of Charles Townes, inventor of the concept of the laser, and a 1964 Nobel Laureate for Physics. Established for the development of next-generation lasers and their uses in medicine, advanced manufacturing and defense applications, the Institute was funded by a $4.5M grant from the State of Florida, together with matching funds from UCF for 5 faculty positions and $3M for start-ups and infrastructure. Since its founding, the Townes Laser Institute has grown to a faculty of 14 and has developed major capabilities in optical fibers, attoscience and new laser materials. It has made significant investments in optical fiber pulling facilities, pre-form fabrication, glass science and processing. It is currently building up a comprehensive capability in transparent ceramic laser materials. Future areas of investment include mid-infrared sources and materials, medical laser technology, laser-bioengineering, advance laser-based manufacturing and new defense-related laser technologies including long-distance laser light propagation through the atmosphere. The Townes Laser Institute is directed by Peter Delfyett.

**Institute for the Frontier of Attosecond Science and Technology (iFAST)**

The Institute for the Frontier of Attosecond Science and Technology (iFAST), directed by Prof. Zenghu Chang, is established in 2013. At the present time, iFAST has 6 research groups dedicated to research, education and outreach of attosecond physics and optics. The mission is to provide unique opportunities for faculty, scientists and students from the College of Sciences and CREOL to closely collaborate in attosecond science research, create and disseminate new knowledge in attosecond physics by conducting, presenting, and publishing cutting-edge fundamental and applied research and develop next generation attosecond lasers for technology transfer and creating jobs in the State of Florida and the nation. An $8 million DARPA PULSE and a $7.5 million MURI have been awarded to Chang and his collaborators to develop high energy and ultrashort attosecond light sources.
Five major photonic technologies are pursued in the College: 1) lasers, 2) optical fibers, 3) semiconductor and integrated photonic devices, 4) nonlinear and quantum optics, and 5) imaging, sensing and display. Each of these technologies have applications in industry, communication and information technology, biology and medicine, energy and lighting, aerospace, and homeland security and defense. Design of optical systems, which has been the core of optical engineering, remains a principal component of the optics discipline, but advanced topics such as nano-photonics, attosecond optics, meta-materials, plasmonics, and biophotonics, are being embraced as areas of strength and future growth. The College is well positioned to take advantage of the revolution taking place in several areas enabled by optics and photonics. The following list describes some of the details of each research area and the applications pursued. A list of the faculty active in each of these areas and their specializations is available at http://www.creol.ucf.edu/Research/.

**LASERS**

Science and Technology
- Solid State Lasers
- Ceramic Lasers
- Semiconductor Lasers
- EUV & X-ray Lasers
- High Power Lasers
- Ultrafast Lasers
- Optical Frequency Combs
- Attosecond science

Applications
- Laser Fabrication & Lithography
- Laser Material Processing
- Lasers in Medicine

**OPTICAL FIBERS**

Science and Technology
- Fiber Fabrication Technology
- Multimaterial Fibers
- Nano-structured Fibers
- Mid Infrared Fibers
- Fiber Lasers

Applications
- Fiber Optic Communication
- Fiber Optic Networks
- Fiber Optic Sensing
OPTOELECTRONICS & INTEGRATED PHOTONICS

Science and Technology
- Epitaxial Growth
- LEDs & Laser Diodes
- Quantum Dots & Nanostructures
- Optoelectronics
- Oxide Semiconductors
- Photovoltaics
- Integrated Optics
- Periodic Structures & Photonic Crystals
- Nanophotonics & Plasmonics
- Silicon Photonics
- GRATings & Holographic Optical Elements

Applications
- Optical Communication
- Optical Processing & Switching
- Solar Energy Applications
- Integrated-Optic Sensing
- Integrated-Optic Signal Processing

NONLINEAR & QUANTUM OPTICS

Science and Technology
- Nonlinear Guided Waves & Fibers
- Nonlinear Optical Materials
- Nonlinear Optics & Spectroscopy
- Nonlinear Optics in Periodic Structures
- Photosensitive Glasses
- Quantum Optics
- Solitons

Applications
- Laser Protectors
- Quantum Communication & Information
- Lasers in Medicine

SENSING, IMAGING, & DISPLAY

Science and Technology
- Optical Design & Image Analysis
- Near Field Imaging
- Propagation in Random Media
- X-ray & EUV Technology
- Infrared Sensors & Systems
- Millimeter & THz Technology
- Optics of Liquid Crystals

Applications
- Laser Protectors
- Quantum Communication & Information

Intraoperative real-time blood monitoring: Fiber-optic technology allows for the real-time monitoring of blood coagulability in the operating room.
LABORATORIES AND FACILITIES

The main facilities of the College are housed in a state-of-the-art 104,000 sq. ft. building dedicated to optics and photonics research and education. Other facilities, like the Optical Materials Laboratory (pictured below) are located on the main UCF campus.

COLLEGE FACILITIES

NANOPHOTONICS SYSTEMS FABRICATION FACILITIES
A 3,000 square foot multi-user facility containing Class 100 and Class 1000 cleanrooms and a Leica 5000+ e-beam lithography instrument capable of 10-nm resolution. These facilities are used for fabrication and study of nanostructured materials and nanophotonic integrated circuits. The facility equipment includes a Suss MJB-3 and MJB-4 aligners, 2 Plasma-Therm 790 RIE systems with silicon and III-V etching capabilities, a Temascal and V&N E-beam evaporators, along with an atomic force microscope, a profilometer, a rapid thermal annealer, a bonder, a scriber and microscope. The Laboratory is designed and operated as a multi-user facility, with availability to companies and other outside users. Rm 180.

OPTOELECTRONIC FABRICATION CLEANROOM
800 square foot multiuser facility containing class 100 and class 10,000 cleanrooms. Used in the development of optoelectronic semiconductor devices. The facility includes a Suss MJB-3 aligner, a Plasma-Therm 790 RIE/PECVD, an Edwards thermal evaporator, and a bonder, scriber, and microscope. Rm 211

SCANNING ELECTRON MICROSCOPE (SEM) FACILITY
Vega SBH system built by Tescan is a tungsten-filament scanning electron microscope. The system is designed with a fully electronic column and is capable of imaging from 1–30 keV with nanometer scale resolution. Additionally, the system is equipped with the state of the art sample positioning stage with 5 nm resolution and a full scale travel of 42 mm. The shared SEM is ideal for checking the fidelity of travel of 42 mm. The shared SEM is ideal for checking the fidelity of the microfabrication routinely performed in the CREOL cleanroom. Rm 176

MACHINE SHOP
Has two modern Sharp LMV milling machines and a 16–50G lathe capable of achieving the tolerances required for the instruments used in CREOL. Classes are offered to qualify research scientists and students to safely modify and construct instruments critical to their research. Rm A106. Richard Zotti.

OPTICAL MATERIALS LABORATORY (OML)
The Optical Materials Laboratory (OML) is a new 4,000 square-foot facility with state-of-the-art laboratory fabrication and characterization capabilities for research in optical ceramics, IR glasses and glass-ceramics as well as optical fibers. It features dedicated ceramic laboratories with extensive powder processing and sintering equipment, IR glass and glass-ceramic advanced manufacturing, and cutting-edge MOCVD fiber-preform fabrication laboratory. These laboratories also include dedicated analytical tools and post-processing capabilities offering student training opportunities in these areas. The OML is located on the UCF main campus (Building 154 on 12871 Ara Drive) in close proximity to the Material Characterization Facility (MCF).

CARY SPECTRA-PHOTOMETER AND MICROSCOPE
Cary 500 is Spectrophotometer that is capable of measuring light absorption in both transmitted and reflected light in the UV, visible and near IR spectrum. Rm 159

ZYGO FACILITY
Rm 211B. Shared facility administered by Martin Richardson.

TOWNES INNOVATIVE SCIENCE & TECHNOLOGY FACILITY (TISTEF)
The TISTEF site is a secure facility located at the Kennedy Space Center, Florida. It was a Navy SSC PAC operated facility, but is now an Air Force facility on NASA property, managed and operated by UCF.

TISTEF was originally built in 1989 to support the Strategic Defense Initiative Organization’s Innovative Sciences and Technology Office (SDIO/ISTEF). Today TISTEF has a much broader mission; it supports research and development of electro-optics sensing technologies for DOD, commercial and academic applications. DOD customers include: the Army, Navy Air Force, DARPA, and DIA. The facilities include a laser and optics laboratory, a 1 km laser test range, a precision tracker (gimbal) with a 0.5 meter telescope and coude mirror path (for laser transmission), and several transportable trackers capable of supporting active (laser) or passive testing at remote sites. Additionally, TISTEF maintains an assortment of telescopes, optics, and sensors to support various data collection requirements. Since TISTEF is a tenant of the 45th Space Wing and NASA, operating agreements are in place that permit tasking AF Eastern Range and NASA assets as needed. It also has standardized range operations and procedures for laser testing against boosting rockets, satellites, and other terrestrial targets. TISTEF has a close partnership with the CREOL which provides access to cutting edge R&D and expertise in atmospheric propagation of lasers, laser communications, laser radar (LADAR), fiber-optic lasers, passive imaging, and optical design.

FACULTY FACILITIES

DIFFRACTIVE AND HOLOGRAPHIC OPTICS LAB
Conducting research of holographic optical elements (volume Bragg gratings and phase masks) in photosensitive (photo-thermo-refractive) glass. Studying applications of those elements for narrowband filtering, spectral and coherent laser beam combining, spectral and spatial laser beams control and mode transformation along with effects of high peak and average power on optical properties of holographic optical elements. Leonid Glebov, Ivan Diviliansky.
DISPLAY AND PHOTONICS LAB
Developing 1) Advanced displays including LCDs, quantum dots, perovskites, LEDs, OLEDs, augmented reality and virtual reality, and sunlight readable displays, 2) Adaptive lenses for tunable-focus lens, optical imaging and light field displays, and 3) Adaptive optics for wavefront correction and laser beam control. Shin-Tson Wu.

FIBER OPTICS LAB
Research in fiber fabrication technology, nano-structured fibers, nonlinear fiber materials, fiber lasers, and fiber sensing applications. Axel Schülzgen and Rodrigo Amezcua.

FLORIDA ATTOTECOND SCIENCE AND TECHNOLOGY LAB
Generation of attosecond (10-18 s) and zeptosecond (10-21 s) X-ray pulses. Zenghu Chang.

GLASS PROCESSING AND CHARACTERIZATION LABORATORY (GPCL)
Investigating the design, processing methodologies, fabrication and characterization of novel oxide and non-oxide glass and glass ceramic materials for the infrared. Applications include, on-chip sensors, bulk and film materials for GRIN, optical nanocomposites, 3D printing of chalcogenide materials. Kathleen Richardson.

INTEGRATED PHOTONIC EMERGING SOLUTIONS (IPES) LAB
Specialized in groundbreaking research on ultracompact integrated photonic device physics and circuit design, nanofabrication and characterization, as emerging solutions for a variety of engineering applications, such as data- and tele-communication, microwave engineering and nonlinear and quantum information systems in the visible to the mid-infrared wavelengths and on materials ranging from silicon and III-V compound semiconductors, to nonlinear dielectrics and glasses. Sasan Fathpour

LASER ADVANCED MATERIAL PROCESSING (LAMP)
Engaged in novel manufacturing technology; new materials synthesis including optical, electronic and magnetic materials for a variety of applications such as sensors, detectors and medical devices; and process physics modeling. Aravinda Kar.

LASER AIDED MATERIALS PROCESSING LABS
Investigating the interaction of lasers with absorbing and non-absorbing materials, growth, solidification, and plasma effects; laser CVD; laser ablation, laser drilling, cutting, welding; developing process-monitoring and diagnostic techniques. Stephen Kuebler (NPM) and Martin Richardson (LPL).

LASER PLASMA LAB
Conducting research on X-ray and EUV optics and sources, X-ray microscopy, laser-aided material processing, and laser generated plasmas. Martin Richardson.

LASER SYSTEM DEVELOPMENT LABS
Developing new solid-state lasers, external cavity semiconductor lasers and amplifiers, seeding lasers, laser-induced damage, far infrared semiconductor lasers, high-average-power solid state lasers, semiconductor and solid state volume Bragg lasers, high power laser beam combining, ultra-high-intensity femtosecond lasers, new solid state lasers and materials development (crystals & glasses). Michael Bass, Martin Richardson, Peter Delfyett, Leonid Glebov, Ivan Diviliansky.

LIQUID CRYSTAL DISPLAY LAB
Investigating 1) advanced liquid crystal display materials, display devices, and device modeling, 2) electronic laser beam steering and adaptive optics using fast-response spatial light modulators, 3) adaptive liquid crystal and liquid lenses for forveated imaging and zoom lens, and 4) bio-inspired tunable optical filters using cholesteric liquid crystals. Shin-Tson Wu.

MID-INFRARED COMBS GROUP (MIR)

MULTI-MATERIAL OPTICAL FIBER DEVICES LAB
Research on novel optical fiber structures, nanophotonics, fiber-based optoelectronic devices, optical imaging using large-scale three-dimensional arrays constructed from photosensitive fibers, and mid-infrared fiber nonlinear optics. Ayman Abouraddy.

MULTIPLE QUANTUM WELLS LAB
Research on the design, fabrication and testing of novel all-optical switching devices using III-V multi-quantum well semiconductors, and the integration of high-speed optical and optoelectronic devices to form monolithic integrated optical circuits for high data throughput optical networks. Patrick LikamWa

NANOPHOTONIC DEVICES LAB
Research in epitaxial growth and properties of oxide semiconductors, oxide and nitride-semiconductor light emitting diodes, self-assembled quantum dots, and e-beam nanolithography. Winston Schoenfeld.

NANOBIOPHOTONICS LAB (NBPL)
Developing nanoaperture optical trapping based single molecule biophysics methods for studying protein dynamics, structure, and behavior; protein-protein and protein-small molecule interactions; drug discovery; and fundamental life sciences. Ryan Gelfand

NANOPHOTONICS CHARACTERIZATION LAB
Optical analysis tools for investigation of nanostructured devices including Near-field Scanning Optical Microscope, fiber-coupled microscope for single particle spectroscopy, leakage radiation setup for surface plasmon imaging, near-infrared waveguide analysis setup, and variable temperature photoluminescence setup. Projects include manipulation of surface plasmon dispersion in nanoscale thin films, enhancement of erbium excitation in semiconductor nanocrystal doped oxides, and enhancement of optical nonlinearities using plasmon resonances. Pieter Kik.

NONLINEAR OPTICS LAB
Research on nonlinear optical effects in semiconductors, dielectrics and gasses with characterization from femtosecond to nanoseconds for applications in devices including in in waveguides, e.g. Optical Power Limiting, 2-Photon Absorption and gain, Laser-Induced Damage: David Hagan, Eric Van Stryland, and M.J. Soileau.

Zach Loparo (l) and Suyuan Chen build a broadband mid-infrared optical parametric oscillator for spectroscopic measurements
**Nonlinear Waves Lab**
Research in nonlinear optics, spatial and spatio-temporal solitons, discrete solitons in photonic lattices, and curved beams. Demetrios Christodoulides.

**Optical Ceramics Lab**
Conducting research on the synthesis of transparent ceramics, powder processing, ceramic casting, vacuum and pressure sintering, diffusion bonding, dopant diffusion, and crystal growth for laser and nuclear detector applications. Romain Gaume.

**Optical Communication Lab**
High-capacity optical communication through linear and nonlinear channels including free space and optical fiber using synergy of advanced optical and electronic techniques. Guifang Li.

**Optical Glass Sciences & Photo-Induced Processing Lab**
Conducting studies of new materials for high-efficiency, robust holographic optical elements; high power laser beam combining, glass spectroscopy, refractometry and interferometry; photo-induced processes in glasses; technology of optical quality and high-purity glasses. Leonid Glebov.

**Optical Imaging System Laboratory**
Creating novel imaging systems by integrating physical coding and computational methods for biological research, medical diagnosis, and industrial imaging applications in both visible and X-ray regimes. Shuo "Sean" Pang.

**Optical Nanoscopy Lab**
Developing and applying novel optical tools such as fluorescence nanoscopy (super-resolution imaging) and single-molecule imaging to study essential problems in biology and neuroscience. Kyu Young Han

**Optical Imaging System Lab (OISL)**
Research in OISL is focused on developing computational imaging platforms for biomedical research, medical diagnosis, and industrial imaging applications in both visible and X-ray regimes. Research topics include Computational Imaging, Coded Aperture, X-ray Tomography, X-ray Scatter Imaging, Fluorescence Microscopy, Lens-less Optical Imaging, Bio-sensor and Portable Imaging Devices. Shuo "Sean" Pang.

**Plasmonics and Applied Quantum Optics Lab**

**Photonics Diagnostic of Random Media**
Exploring different principles for optical sensing, manipulation of electromagnetic fields, and phenomena specific to optical wave interactions with complex media. Aristide Dogariu.

**Quantum Optics Lab**
Conducting research on the generation and detection of nonclassical light, such as entangled photons, and its quantum information applications, including quantum imaging and quantum communication. Bahaa Saleh.

**Semiconductor Lasers Lab**
A III-V epitaxial growth facility used to research new types of semiconductor heterostructures and devices that include quantum dots, quantum dot laser diodes, vertical-cavity surface-emitting laser diodes, spontaneous light sources, and single quantum dots. A characterization laboratory is used to study the optical properties of the samples, including their light emission, microcavity effects, and laser diode characteristics. Dennis Deppe.

**Thin-Film Optoelectronics Lab**
Developing novel optoelectronic materials and devices for sensors, solar cells, lighting and displays that are large area, flexible, cost-effective and efficient. Kyle Renshaw

**Ultrafast Photonics Laboratory**
Conducting research on the generation, modulation, transmission and detection of ultrafast optical signals from semiconductor quantum based materials, for applications in applied photonic networks and signal processing systems. Peter Delfyett

**Instructional Laboratories**

**Laser Engineering Laboratory**
Designing and device implementation of diode pumped solidstate lasers, nonlinear frequency conversion, Q-switching, mode locking, and pulse second harmonic generation.

**Photonics Laboratory**
Experimental study of photonic devices and systems including liquid crystal displays, fiber-optic sensors, laser diodes, electro optic modulation, acousto-optic modulation, lightwave detection, optical communications, and photonic signal processing.

**Optoelectronic Device Fabrication Laboratory**
Design and micro-fabrication of semiconductor optoelectronics devices including passive waveguides, light emitting diodes (LEDs), laser diodes (LDs), photodetectors. Prerequisite Course: Graduate standing or consent of the instructor.

**Undergraduate Laboratory**
A multipurpose space that accommodates laboratory courses for Optoelectronics, Fiber Optics, Introduction to Photonics, Laser Engineering, and Imaging and Display. The space includes basic instrumentation necessary to conduct experiments.

**Senior Design Laboratory**
Comprised of six laboratory benches, the Senior Design laboratory space is designed to permit students with flexibility to design, test, and construct their Senior Design projects. Students have access to this space in the semester in which they are enrolled in OSE 4951 and OSE 4952, the Senior Design Courses. They are able to work in this space at any time, day or night.
Novel mid-infrared lasers for driving “water window” attosecond sources

The advent of femtosecond Ti:Sapphire lasers in the 1990s leads to the first demonstration for attosecond light in 2001. With commercially available femtosecond lasers centered at 800 nm as the driver, extreme ultraviolet pulses with up to 150 eV photon energy can now be routinely generated for time-resolved experiments[1]. In recent years, carrier-envelope phase stabilized lasers at 1.6 to 2.1 micron based on Optical Parametric Chirped Pulse Amplification (OPCPA) pushed attosecond light sources to the “water window (282 to 533 eV)” X-rays[2]. The shortest attosecond X-ray pulses around the absorption edge of carbon atom (284 eV) was generated by driving high harmonic generation with an OPCPA based on Ti:Sapphire pumped BiBO nonlinear crystals[3]. The new generation attosecond light source allowed element and state specific attosecond transient absorption spectroscopy measurements at the nitrogen K-edge (~400 eV at for the first time[4]).

A more efficient way of producing mid-infrared, high energy, femtosecond pulses is through Chirped Pulse Amplification. We have demonstrated the generation of 3.5 mJ, 44 fs, 2.5 µm laser pulses from a Chirped Pulse Amplifier employing Cr2+:ZnSe crystals as the active gain medium. The optical layout and the FROG measurements are shown in Fig. 1 and Fig. 2 respectively. Our results show the highest peak power, 80 GW, at 2.5 µm with a 1 kHz repetition rate[5, 6]. Such lasers will be powerful sources for enhancing the X-ray photon flux at/beyond the Oxygen K-edge (533 eV), which are highly desirable in chemical and material sciences.

References:
5. X. Ren, L. H. Mach, Y. Yin, Y. Wang, and Z. Chang, “Generation of 1 kHz, 2.3 mJ, 88 fs, 2.5 µm pulses from a Cr2+: ZnSe chirped pulse amplifier,” Optics letters 43, 3381-3384 (2018).
Gauge fields are a fundamental concept in physics, describing the basic interactions between charged particles. For example, electrons interact with each other through its gauge field, the photon. Neutral particles (such as photons) by being chargeless are thus decoupled from real gauge fields. However, by properly engineering a physical system through its geometric design or through some specific external modulation, an artificial gauge field can be induced, such that the effective dynamics of the system behaves as if it were governed by a real gauge field, even if the particles are neutral. Several year ago, the idea of using of artificial gauge fields to induce a fundamentally new kind of waveguiding mechanism was proposed [1], but this concept has thus far evaded experimental observation.

This year, we present the first experimental observation of waveguiding by artificial gauge fields [2]. To implement this idea, we fabricate an array of identical laser-written waveguides that are evanescently coupled with each other. We induce an artificial gauge field in such an array by solely controlling the trajectory of the waveguides by tilting or oscillating the waveguides as shown in Fig. 1. In this way, the waveguides in the core and cladding region follow different trajectories (or have different oscillating phases) and therefore are subject to different gauge fields besides being identical, i.e. all the waveguides in the array have the same geometry and the same index of refraction.

We demonstrate two mechanisms for waveguiding with artificial gauge fields. In our first realization, by tilting the waveguides in the core region and in the cladding region in opposite directions, the dispersion relations in the core and in the cladding shift from one another in momentum space, as depicted in Fig 2. This engineered dispersion relation creates propagating modes that are confined to the core region only in specific ranges of transverse momenta, i.e. where the dispersion relations do not overlap. Our second realization is even more intriguing: by oscillating the core and cladding region with the same amplitude but opposite phase we create a system made not only of the same material, but that also has the same artificial gauge field, such that the core and cladding have exactly the same dispersion relation. Because the core and cladding have an identical dispersion relation, it may appear that it is not possible to guide the light, because leakage of the light from the core to cladding looks inevitable. However, we theoretically and experimentally demonstrate that for a specific value of the transverse momentum, perfect core confinement is obtained, see Fig 3. This specific value can be controlled by the system parameters —for example the amplitude of the oscillation — and therefore can act as a transverse momentum filter.

The new guiding mechanisms that we demonstrated may have a substantial impact on Optics and other physical systems, by offering new ways to confine and guide waves in space. By their fundamental nature these new waveguiding mechanisms are applicable not only to the entire electromagnetic spectrum and different optical systems, but also to other physical systems such as acoustics and cold atoms. Taking our ideas further by creating inhomogeneous distributions of artificial gauge fields opens unlimited opportunities for future research and applications.

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Publications and Presentations

Book Chapters


Journal Publications

M. Yessenov and A.F. Abouraddy, Changing the speed of optical coherence in free space, Optics Letters, 44(21), 5125-5128 (2019).


B. Bhaduri, M. Yessenov, and A.F. Abouraddy, Space-time wave packets that travel in optical materials with velocity in free space, Nature Communications, 10, 929 (2019).


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Full-time CREOL faculty authors are highlighted in black; those of joint and courtesy appointments who listed CREOL as one of their affiliations are highlighted in blue; CREOL scientists and students with no faculty co-authors are highlighted in green.


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J. Kim, K.Y. Han, N. Khanna, T. Ha, and A.S. Belmont, Nuclear speckle fusion via long-range directional motion regulates speckle morphology after transcriptional inhibition (journal cover), Journal of Cell Science 132(8), jcs226563 (2019).


augmented reality displays, Optics Express, 27(13), pp. 18169-18179 (2019).


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K.A. Richardson, Redefining material design paradigms for next generation optical materials, EPFL Photonics Day - Microcity, Neuchatel, Switzerland 6 December (2019).


K.A. Richardson, Rethinking infrared optical design strategies: tailorable property solutions from novel infrared materials and processing routes, AFRL - Albuquerque NM (2019).


B. Bhaduri, M. Yessenov, D. Reyes, M. Meem, S. Rostami-Fairchild, M.C. Richardson, R. Menon, and A.F. Abouraddy, Broadband space-time wave packets propagating 70 meters in free space, SPIE Photonics West (2019).


M.C. Richardson, Challenges associated with directed energy and beam projection systems, IEEE Research and Applications of Photonics in Defense (RAPID) Conference, San Destin, FL (2019).


M.C. Richardson, Challenges to new science and technologies in the infrared, North American Summer School on Photonic Materials, University of Laval, Quebec, Canada (2019).


M.C. Richardson, New science and technologies in the infrared, North American Summer School Photonic Materials, University of Laval, Quebec, Canada (2019).


M.C. Richardson, The development of high-energy lasers: getting serious, University of Rochester, Laboratory for Laser Energetics (2019).


A. Schülzgen, Image transport through glass-air disordered optical fiber, International Conference and Exhibition on Optics and Electro Optics (OASIS) 7, International Fiber Lasers and Applications (IFLA), Tel Aviv, Israel, paper # 2 (2019). Invited


Q. Ru, T. Kawamori, S. Vasiliev, S.B. Mirov, and K.L. Vodopyanov, Broadband randomly phase matched OPO using a thin 0.5-mm ZnSe ceramic and a dispersion-free cavity, Conference on Lasers and Electro-Optics (CLEO), STh3J.6 (2019).

K.L. Vodopyanov, Frequency divide-and-conquer approach to producing super-octave mid-IR combs, Photonics, North, Quebec City, 22 May (Keynote) (2019).


K.L. Vodopyanov, Ultra-broadband high power mid-IR frequency combs produced via subharmonic generation, Workshop on Ultrafast Bandgap Photonics April 15-17, Georgetown University (2019).


S.T. Wu, Mini-LED backlit LCDs, BOE Hefei R&D Center (>200 attendees) (2019).


K.A. Richardson, Thulium fiber lasers, MIT, Lincoln Labs (2019).


Patents


Invited Lectures and Tutorials


M.C. Richardson, Thulium fiber lasers, MIT, Lincoln Labs (2019).
Provisional/Utility


Disclosures


Theses and Dissertations

F.A. Tan, Design and fabrication of scalable multifunctional multimaterial fibers and textiles, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

H. Chen, Quantum dot light emitting devices (QLEDs), A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

M. Parto, Artificial magnetism and topological phenomena in optics, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

N. Nye, Non-Hermitian and space-time mode management, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).


J.R. Guzman-Sepulveda, Optical sensing of structural dynamics in complex media, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

N. Fudala, A comparison of MW vs LW UAV signatures for IRST, A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in CREOL, The College of Optics and Photonics at the University of Central Florida, Orlando (2019).

G.F. Camacho-Gonzalez, Hybrid integration of second and third-order highly nonlinear waveguides on silicon substrates, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

M. Malinowski, Third-order optical nonlinearities for integrated microwave photonics applications, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

F. Kompan, Holographic optical elements for visible light applications in photo-thermo-refractive glass, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

E. Hale, Novel solid state lasers based on volume bragg gratings, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

H. Liu, Mode coupling in space-division multiplexed systems, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

Y. Alahmadi, Mode conversions in active semiconductor quantum well integrated optic devices, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

Y. Sun, Computational imaging systems for high-speed, adaptive sensing applications, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

History of disclosures, applications and issued patents by fiscal year.


J. He, *Stable, highly luminescent perovskite-polymer composites for photonics applications*, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).
Research has been funded by a combination of federal, industrial, and state grants. The amounts shown below are actual funds received for each year, with each grant covering a different period. Some of the industrial grants include federal funding that has come via industry. Not included in the chart of funding history are the state grants. A $10M fund was received in FY 2004 for the Florida Photonics Center of Excellence (FPCE) and a $4.5M grant received in FY2007 to establish the Townes Laser Institute (TLI). These funds continue to support the research and educational activities of these centers.

<table>
<thead>
<tr>
<th>Recepient</th>
<th>Source</th>
<th>Title of Award</th>
<th>Begin</th>
<th>End</th>
<th>Awarded</th>
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<tr>
<td>PI: Abouraddy, Ayman</td>
<td>Massachusetts Institute of Technology</td>
<td>Electrically Controlled Color-Changing Fabrics</td>
<td>2/16/2018</td>
<td>12/30/2019</td>
<td>$239,063</td>
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<td>PI: Abouraddy, Ayman</td>
<td>Massachusetts Institute of Technology</td>
<td>Harnessing in-fiber fluid instabilities for scalable and universal multidimensional nanosphere design, manufacturing, and applications</td>
<td>12/1/2014</td>
<td>10/31/2019</td>
<td>$96,367</td>
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<tr>
<td>PI: Abouraddy, Ayman; CoPI: Atia</td>
<td>Office of Naval Research</td>
<td>Development of Diffraction-Free Space-Time Optical Beams</td>
<td>7/1/2017</td>
<td>6/30/2021</td>
<td>$146,000</td>
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<td>PI: Abouraddy, Ayman; CoPI: Bai, Li</td>
<td>Harris Corporation</td>
<td>Strong Ultra-Small Highly Integrated (SUSHI) Phase 2 Fiber Optic Cable (Prime 1)</td>
<td>4/30/2017</td>
<td>12/20/2018</td>
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<td>PI: Amezcua Correa, Rodrigo</td>
<td>Harris Corporation</td>
<td>19 Fibers Photonics Lantern</td>
<td>4/19/2018</td>
<td>5/31/2019</td>
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<tr>
<td>PI: Argenti, Luca</td>
<td>National Science Foundation (NSF)</td>
<td>Attosecond photoemission dynamics: novel ab initio methods for atomic and molecular ex-situ spectroscopies</td>
<td>8/1/2019</td>
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<tr>
<td>PI: Argenti, Luca</td>
<td>National Science Foundation (NSF)</td>
<td>Theoretical atomic attosecond spectroscopy: Monitor and control of electron correlation in real time</td>
<td>9/1/2016</td>
<td>8/31/2020</td>
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<td>PI: Chang, Zenghu</td>
<td>National Science Foundation (NSF)</td>
<td>Collaborative Research: Probing Attosecond Charge Dynamics in Atoms and Molecules</td>
<td>8/1/2018</td>
<td>7/31/2021</td>
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<td>PI: Chang, Zenghu</td>
<td>University of Ottawa</td>
<td>Tabletop Ultrafast X-rays for Metrology of Magnetic Materials</td>
<td>7/1/2018</td>
<td>12/31/2019</td>
<td>$50,843</td>
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<td>PI: Christodoulides, Demetrios N</td>
<td>Georgia State University</td>
<td>Novel Nonlinear Optical Processes in Active, Random, and Nanostructures Systems</td>
<td>6/1/2017</td>
<td>8/31/2020</td>
<td>$127,134</td>
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<td>PI: Christodoulides, Demetrios N</td>
<td>Pennsylvania State University</td>
<td>MRSEC - Center for Nanoscale Science</td>
<td>11/1/2014</td>
<td>10/31/2020</td>
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<td>PI: Christodoulides, Demetrios N; CoPI: Abouraddy, Khajavikhan</td>
<td>US Air Force Office of Scientific Research (AFOSR)</td>
<td>MURI: PT-Symmetric Optical Materials and Structures</td>
<td>10/15/2013</td>
<td>7/14/2020</td>
<td>$700,000</td>
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<tr>
<td>PI: Christodoulides, Demetrios N; CoPI: Khajavikhan</td>
<td>Wesleyan University</td>
<td>Advanced Symmetry Concepts and their Violation in Composite Photonic Structures</td>
<td>8/6/2018</td>
<td>2/5/2020</td>
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<td>PI: Christodoulides, Demetrios; CoPI: Amezcua Correa, Schulzgen</td>
<td>US Air Force Research Laboratory (AFRL)</td>
<td>Generating optical pulses with time-varying polarization states</td>
<td>2/2/2018</td>
<td>11/1/2021</td>
<td>$250,000</td>
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<td>PI: Christodoulides, Demetrios; CoPI: Khajavikhan</td>
<td>United States-Israel Binational Science</td>
<td>RF: Non-Hermitian Topological Photonics</td>
<td>9/1/2017</td>
<td>8/31/2021</td>
<td>$33,000</td>
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<td>PI: Christodoulides, Demetrios; CoPI: Khajavikhan, Moharam</td>
<td>University of California, San Diego</td>
<td>Programmable Universal Multifunctional Apertures (PUMA)</td>
<td>8/6/2018</td>
<td>2/6/2020</td>
<td>$137,235</td>
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<td>PI: Crabbas, Robert F</td>
<td>Office of Naval Research</td>
<td>Modeling of the lower atmosphere to facilitate improved laser propagation</td>
<td>12/1/2017</td>
<td>11/30/2022</td>
<td>$125,131</td>
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<td>PI: Crabbas, Robert F</td>
<td>UTC Aerospace Systems</td>
<td>UTC Aerospace Testing at SLF</td>
<td>5/1/2018</td>
<td>6/1/2018</td>
<td>$14,080</td>
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<td>PI: Crabbs, Robert F</td>
<td>Office of Naval Research</td>
<td>Atmospheric Propagation for High Energy Lasers, Supporting APSHEL Program</td>
<td>1/1/2017</td>
<td>12/31/2019</td>
<td>$250,000</td>
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<td>PI: Crabbs, Robert F</td>
<td>University of Florida Board of Trustees</td>
<td>Operations Support for CHOMPTT CubeSat Mission</td>
<td>10/1/2018</td>
<td>12/31/2019</td>
<td>$50,608</td>
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<td>PI: Deppe, Dennis G</td>
<td>University of Texas at Austin</td>
<td>Research and Development of Nanocavity Lasers for Integration with Single Mode Silicon Waveguides</td>
<td>12/1/2016</td>
<td>11/30/2019</td>
<td>$160,127</td>
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<td>PI: Dogariu, Aristide</td>
<td>Office of Naval Research</td>
<td>Stochastic Electromagnetics for Active Sensing</td>
<td>4/1/2018</td>
<td>3/31/2022</td>
<td>$150,297</td>
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<td>PI: Dogariu, Aristide; CoPI: Han</td>
<td>Defense Advanced Research Projects Agency (DARPA)</td>
<td>Electrodynamically mediated energy transduction in cytoskeleton</td>
<td>10/1/2017</td>
<td>12/31/2019</td>
<td>$382,574</td>
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<td>PI: Driggers, Ronald</td>
<td>IMEC</td>
<td>IPA: Ron Driggers IMEC Support</td>
<td>8/8/2017</td>
<td>5/31/2020</td>
<td>$98,880</td>
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<td>PI: Driggers, Ronald G</td>
<td>DRS Network &amp; Imaging Systems, LLC</td>
<td>Longwave Infrared Pitch-Well-Processing (PWP) Proof of Concept</td>
<td>11/9/2017</td>
<td>12/30/2019</td>
<td>$119,000</td>
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<td>PI: Driggers, Ronald G</td>
<td>IMEC</td>
<td>mmW and Thz Imaging System Performance</td>
<td>1/1/2018</td>
<td>12/31/2020</td>
<td>$154,000</td>
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<td>PI: Driggers, Ronald G</td>
<td>IMEC</td>
<td>Research Support for IMEC in the Area of Time-of-Flight Technologies</td>
<td>9/1/2018</td>
<td>2/21/2022</td>
<td>$146,966</td>
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<td>PI: Fathpour, Sasan</td>
<td>Northwestern University</td>
<td>Integrated Optics for Single-Photon Nonlinear Interactions</td>
<td>6/1/2017</td>
<td>5/31/2020</td>
<td>$175,808</td>
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<td>PI: Gaume, Romain; CoPI: Baudelet</td>
<td>Engi-Mat Co.</td>
<td>LIBS Characterization of Ceramic Powders</td>
<td>6/28/2019</td>
<td>9/30/2020</td>
<td>$904</td>
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<td>PI: Glebov, Leonid CoPI: Divliansky</td>
<td>IPG Photonics</td>
<td>Holographic optical elements in photo-thermo-refractive glass for laser parameters control</td>
<td>2/1/2019</td>
<td>10/31/2019</td>
<td>$500,000</td>
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<td>PI: Han, Kyu Young CoPI: Khajavikhan</td>
<td>National Science Foundation (NSF)</td>
<td>High-speed and minimally photo-damaging STED microscopy using nanolaser arrays</td>
<td>7/15/2018</td>
<td>6/30/2021</td>
<td>$600,000</td>
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<td>PI: Khajavikhan, Mercedes</td>
<td>US Army Research Office</td>
<td>DURIP: Acquisition of an Advanced Plasma Etcher for III-V Nano-structures</td>
<td>7/17/2018</td>
<td>7/16/2019</td>
<td>$250,000</td>
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<td>PI: Khajavikhan, Mercedes</td>
<td>Office of Naval Research</td>
<td>DURIP: Time Resolved Micro-Photo-Luminescence Measurement Station</td>
<td>6/1/2019</td>
<td>6/14/2020</td>
<td>$299,870</td>
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<td>PI: Khajavikhan, Mercedes</td>
<td>Defense Advanced Research Projects Agency (DARPA)</td>
<td>YFA: Topological Phenomena in Active Photonic Platforms</td>
<td>7/2/2018</td>
<td>7/1/2021</td>
<td>$500,000</td>
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<td>PI: Khajavikhan, Mercedes; CoPI: LiKamWa</td>
<td>US Army Research Office</td>
<td>Design fabrication and characterization of Electrically Pumped Coaxial Nanoscale Lasers</td>
<td>11/16/2015</td>
<td>8/15/2019</td>
<td>$40,000</td>
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<td>PI: Kim, Yoon-Seong; CoPI: Han, Bossy-Wetzel</td>
<td>National Institute of Neurological Disorders and Stroke (NINDS)</td>
<td>Pum2-dependent translational regulation of a-SYN near mitochondria and contribution to the pathogenesis of Parkinson’s disease</td>
<td>9/15/2018</td>
<td>5/31/2023</td>
<td>$32,594</td>
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<td>PI: Kim, Yoon-Seong; CoPI: Han, Tatulian</td>
<td>National Institute of Neurological Disorders and Stroke (NINDS)</td>
<td>Contribution of transcriptional mutagenesis of oxidative DNA lesions to generating new mutant alpha-synuclein species and aggregation toward the pathogenesis of Parkinson’s disease</td>
<td>12/15/2017</td>
<td>4/30/2020</td>
<td>$10,912</td>
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<td>PI: Kuebler, Stephen M</td>
<td>Academy of Applied Science</td>
<td>2018 High School Summer Research Experience in the Kuebler-Group at UCF with the REAP/AEOP Program</td>
<td>10/1/2017</td>
<td>9/30/2019</td>
<td>$600</td>
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<td>PI: Li, Guifang</td>
<td>National Science Foundation (NSF)</td>
<td>NSF/ENG/ECCS-BSF: Collaborative Research: Random Channel Cryptography</td>
<td>9/1/2018</td>
<td>8/31/2021</td>
<td>$225,000</td>
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<td>PI: Li, Guifang</td>
<td>US Army Research Office</td>
<td>Acquisition of Coherent Transceivers</td>
<td>8/1/2018</td>
<td>1/31/2020</td>
<td>$93,000</td>
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<td>PI: Li, Guifang</td>
<td>Skyloom Global Corporation</td>
<td>High-Speed Laser Communication Systems</td>
<td>9/14/2018</td>
<td>11/30/2019</td>
<td>$64,991</td>
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<td>PI: Raghavan, Seetha; CoPI: Schulgen, O’Neal</td>
<td>National Science Foundation (NSF)</td>
<td>PFI:AIR - TT: Multi-scale and in-situ sensing technology for structural integrity</td>
<td>7/15/2017</td>
<td>3/31/2020</td>
<td>$1,889</td>
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<tr>
<td>PI: Richardson, Kathleen A.</td>
<td>Lockheed Martin Missiles and Fire Control</td>
<td>Advanced Materials IRAD – Broadband Gradient Index (GRIN) Optics Characterization (Broadband GRIN #5)</td>
<td>1/26/2018</td>
<td>12/1/2018</td>
<td>$35,000</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>The Charles Stark Draper Laboratory, Inc.</td>
<td>ATLIS: All-in-one Tunable Long-wave Infrared Spectral Imager</td>
<td>2/1/2018</td>
<td>6/30/2020</td>
<td>$59,836</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>Massachusetts Institute of Technology</td>
<td>Large-scale Reconfigurable and Multifunctional 2.5-D Conformal Optics</td>
<td>4/1/2017</td>
<td>3/31/2020</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>LightPath</td>
<td>RF K. Richardson Equipment Use Account</td>
<td>1/1/2015</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>Savannah River National Laboratory</td>
<td>RF K. Richardson Equipment Use Account</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>Massachusetts Institute of Technology</td>
<td>RF: K. Richardson Equipment Use Account -2</td>
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<td>PI: Richardson, Kathleen A.</td>
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<td>1/1/2018</td>
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<td>PI: Richardson, Martin C</td>
<td>EoL Co., Ltd.</td>
<td>High Power Thulium Laser Marking System Development for Visibly Transparent Polymers</td>
<td>9/1/2017</td>
<td>12/31/2019</td>
<td>$75,000</td>
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<td>PI: Richardson, Martin C</td>
<td>US Army Research Office</td>
<td>Light Filamentation Science Add on (Topological photonic structures based on light filamentation)</td>
<td>5/20/2016</td>
<td>10/30/2019</td>
<td>$121,514</td>
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<td>PI: Saleh, Bahaa</td>
<td>UCF Foundation, Inc</td>
<td>CREOL - UCF Foundation Gifts</td>
<td>7/1/2014</td>
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<td>PI: Schulzgen, Axel</td>
<td>Pennsylvania State University</td>
<td>Anti-resonant Hollow Core Fiber (ARHCF) for High Power and MWIR</td>
<td>9/1/2019</td>
<td>8/31/2021</td>
<td>$23,098</td>
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<td>PI: Vodopyanov, Konstantin L</td>
<td>University of California, Los Angeles</td>
<td>Fundamental Studies of Nonlinear Optics and Laser-plasma Phenomena in Gases and Solids Using High-Power LWIR Lasers</td>
<td>8/1/2017</td>
<td>7/31/2020</td>
<td>$100,000</td>
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<td>PI: Wu, Shin-Tson</td>
<td>Microsoft Corporation</td>
<td>Broadband Optical Shutter</td>
<td>10/16/2018</td>
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<td>PI: Wu, Shin-Tson</td>
<td>Shadevision GmbH</td>
<td>Smart Windows for Automotive Applications</td>
<td>6/1/2018</td>
<td>5/31/2021</td>
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<td>PI: Yu, Xiaoming; CoPI: Kar</td>
<td>Elsner Engineering Works</td>
<td>Laser Beam Engineering for high speed perforation of composite materials</td>
<td>8/10/2018</td>
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</table>
Affiliated Research Centers

The University of Central Florida has several nationally and internationally recognized research institutes in addition to the three at CREOL, The College of Optics and Photonics that are devoted to research and development.

Advanced Materials Processing and Analysis Center

The Advanced Materials Processing and Analysis Center (AMPAC) is an interdisciplinary research and education center for materials science and engineering, one of two major UCF research centers that comprise the Center of Advanced Materials and Nanotechnology. Our two university-wide multi-user facilities — the Materials Characterization Facility (MCF) and the Advanced Microfabrication Facility (AMF) - are available to all researchers at UCF and from outside companies, government labs, and universities, enabling them to perform cutting-edge research, and to train and educate students and other personnel in the use of state-of-the-art equipment. AMPAC’s vision is to make UCF an international leader in materials science and engineering research and education by excelling in the development, processing and characterization of advanced materials to achieve prominence in targeted research areas; providing leadership to the UCF Materials Science and Engineering research and education program; and enhancing economic growth and promoting industrial development through effective partnerships with industry.

NanoScience Technology Center

In 2004 the Nanoscience Technology Center (NSTC) was formed with a $4M grant from the state of Florida when leaders recognized the potential of nanotechnology as its applications in medicine, materials, computing and electronics began entering the mainstream. Since that time, NSTC has consolidated UCF researchers across multiple disciplines and hired many more to better respond to nanoscience funding opportunities and to develop the technologies demanded by the industries of the future. In 2007 the NSTC officially opened a 20,000-square-foot renovated research facility in the Central Florida Research Park. A total of 19 faculty, 7 staff and more than one hundred graduate students, postdocs, researchers at the center are creating tools to treat neurological diseases; materials that can advance solar and fuel cell technology; and longer batteries that can make ever-smaller electrical devices a reality. Current research areas include Green Energy, In Vitro Test Systems, Functional Nanomaterials, Computer/Mathematical Simulations, Quantum Dynamics, Nano-Bio-Imaging, NanoElectronics & NanoPhysics, and Integrated Device Development.

Burnett School of Biomedical Sciences

The Burnett School of Biomedical Sciences is an integral part of the UCF College of Medicine, making the college a research-intensive medical school where cutting edge medical research spans the entire spectrum from laboratory bench to bedside of the patients, providing a great environment of training physicians and biomedical researchers. The School's mission is to provide quality undergraduate and graduate programs in the biomedical sciences and build excellent research programs focused on cancer, cardiovascular, neurodegenerative diseases, and infectious diseases. Our faculty are working to take science from the bench to the bedside. In addition to conducting cutting edge research in biomedicine with potential application to curing major diseases, the School is committed to helping to develop a technology-based industry in Florida. Active partnerships formed with other units at UCF such as the College of Optics and Photonics, the School of Electrical Engineering and Computer Science and the NanoScience Technology Center will facilitate interdisciplinary research and education programs in the innovative applications of photonics, bioinformatics and nanoscience to biomedical problems. The School offers three BS degree programs: Biomedical Sciences; Biotechnology; and Medical Laboratory Sciences. Graduate programs include the MS Biomedical Sciences (non-thesis), the MS Program in Biotechnology (thesis), and a new MS Professional Science in Biotechnology. The interdisciplinary Ph.D. and MD-Ph.D. programs in Biomedical Sciences prepare tomorrow's biomedical research scientists.

Florida Solar Energy Center

The Florida Solar Energy Center® (FSEC®) is the largest and most active state-supported energy research institute in the United States. Located on the Cocoa campus of UCF at Eastern Florida State College, FSEC has gained national and international respect for its programs on photovoltaics, solar thermal systems, energy-efficient buildings, advanced cooling technologies, hydrogen and fuel cells, and the testing and certification of solar equipment. The Center conducts continuing education workshops for professionals, government and industry leaders around the world. Additionally, FSEC offers Science, Technology, Engineering and Mathematics (STEM)-focused opportunities to K-12 and college level-students, professional development for teachers, and renewable energy curriculum and activities to schools throughout Florida.

Florida Space Institute

The Florida Space Institute (FSI) supports space research, development, and education activities. In addition, FSI supports the development of Florida’s space economy—civil, defense, and commercial.

Since 1996, FSI has been an institute of the State University System of Florida. FSI is made up of researchers, educators, and staff from various science and engineering departments at the University of Central Florida. FSI research ranges from studying the Earth’s upper atmosphere to the origin of the planets and from the workings of asteroids to propulsion technologies for high-Mach aerospace vehicles.

FSI is involved in space missions as diverse as high altitude rocket launches, next-gen suborbital flights, the NASA Cassini mission to Saturn, and NASA’s Explorer program. In addition,
one FSI faculty is the Principal Investigator for the Global-scale Observations of the Limb and Disk (GOLD) project which was recently awarded a $55 million grant from NASA. This grant makes UCF the first university in Florida to lead a satellite mission for NASA. The Center for Lunar and Asteroid Surface Science (CLASS), a NASA sponsored Center, is also housed at FSI and the Physics department. FSI administratively houses the Florida Space Grant Consortium (FSGC) for NASA, and operates the Space Research Initiative (SRI) for the State of Florida.

**Institute for Simulation and Training**

IST is an internationally recognized research institute that focuses on advancing modeling and simulation technology and increasing our understanding of simulation’s role in training and education. Founded in 1982 as a research unit of the University of Central Florida, the institute provides a wide range of research and information services for the modeling, simulation and training community. Faculty and staff are distributed among IST’s three Central Florida Research Park buildings, Partnership II, Partnership III and the Army Research Laboratory Simulation and Training Technology Center (ARL-STTC).

**Center for Research in Computer Vision**

The common goal and purpose of the center is to strongly promote basic research in computer vision and its applications in all related areas including National Defense & Intelligence, Homeland Security, Environment Monitoring, Life Sciences and Biotechnology and Robotics. Computer vision is the science of electronically acquiring, analyzing and understanding images in ways superior to the human brain. The CRCV is directed by Dr. Mubarak Shah of the Department of Electrical Engineering and Computer Science. Shah is also an affiliate faculty member at CREOL.

**Other Facilities & Centers**

Other organized programs at UCF offer researchers and students additional support in pursuit of their research goals. These include:

- National Center for Simulation (NCS)
- Center for Advanced Transportation Systems Simulation (CATSS)
- National Center for Forensic Science (NCFS)
- Small Business Development Center (SBDC)
- University of Central Florida Business Incubation Program (UCFBIP)

**BRIDG**

BRIDG is a Florida not-for-profit industry-led smart sensor consortium founded by Osceola County, UCF, and the Florida High Tech Corridor Council, with the goal of accelerating technology commercialization by bridging technology and capability gaps across multiple fields. BRIDG is focused on manufacturing development of advanced technologies in smart sensors, imagers, advanced devices, 2.5D/3D chip integration, and photonic devices. Service areas include research, development, and commercialization. BRIDG is located in Osceola County, FL, in a new 109,000 square foot facility inaugurated in March 2017. The facility includes approximately 40,000 square feet of cleanroom laboratory/manufacturing space.
Since its early years, the College has benefitted from a strong partnership with industry. It endeavors to transfer the technology developed by the faculty, scientists, and students to industry, particularly Florida industry, and to assist in forming, recruiting, and retaining optics and optics-related industries in Florida. The College has established a large industrial affiliates program (with current membership of 63 companies, sustained over many years). Our Industrial Affiliates Day brings in optics companies from around the country to learn about the ongoing research, recruit students, and identify new partnering opportunities.

**Philanthropy**

**Eric Van Stryland creates the Founding Faculty Graduate Fellowship Fund**

Dr. Eric and Barbara Van Stryland created the CREOL Founding Faculty Graduate Fellowship Fund which will support graduate students at the College of Optics and Photonics for generations to come. The $2.6 million endowed estate gift will produce 4 full graduate fellowships once realized. To honor the Van Stryland’s, former students of Dr. Van Stryland, Teijun Xia and Honghua Hu, along with the Verizon Foundation have also given to this fellowship fund. The College of Optics and Photonics will continue to be able to attract top talent to UCF in the field of optics thanks to these gifts.

**Undergraduate Advisory Board**

The Undergraduate Advisory board provides insight and direction on the Photonic Science and Engineering Program. Their leadership helps inform the curriculum, provides feedback on ABET accreditation requirements, and serves as a valuable connection to industry.

This year, a new charter was approved. Clara Rivero-Baleine was elected Chair of the advisory board. Members serve two year, renewable terms.

The table displays the members of the advisory board and their company affiliations.
Industrial Affiliates Program

Membership in the Industrial Affiliates (IA) program provides corporations, organizations, and individuals many benefits, most of which are also of mutual benefit to CREOL. One of these is regular communication and contact with CREOL’s research faculty and students as well as other IIA members who are developing new technologies and products for their business.

Our faculty and students play leading roles in both local and international professional associations and can provide effective introductions to the extensive network of industry and expertise to which CREOL connects. Through the IA program companies can also readily connect with other optics, photonics, and industrial organizations through local Florida organizations in which the College maintains an active participation.

We thank our Industrial Affiliates for their generous support of our academic and research missions!

Membership Benefits

Membership in the Industrial Affiliates (IA) program provides to industrial corporations, organizations, and individuals many benefits, most of which are also of mutual benefit to CREOL. One of these mutual benefits is the regular communication and contact the program provides between the research faculty and students at the College and the IA member company’s engineers and scientists who are developing new technologies and products for their business. The following is a list of other benefits.

▲ Affiliates establish a close association with a leading center in optics and photonics, and exposure to the latest research and development in cutting edge technologies.
▲ Close interaction with the world-renowned faculty at CREOL can result in research projects for which federal funding may be received.
▲ Membership in the IA program enables some access to state-of-the-art facilities for specialized optical measurement, testing, and calibration.
▲ Affiliates have access to students interested in internship opportunities, and receive early notice of students approaching graduation, and ability to post job openings on CREOL’s website (an exclusive benefit for IA members).
▲ IA members receive notifications of seminars presented by leading figures in the optics and photonics community, and copies of CREOL’s periodic newsletter, Highlights, which lists new discoveries and inventions in the field, awards and recognitions of the faculty and students, and alumni news.
▲ Companies that donate equipment get their hardware/software in the hands of faculty and students, providing visibility and product marketing for potential future customer prospects.
▲ Membership provides affiliates with an opportunity to promote their companies by making presentations about their products to the faculty and students, exhibiting and giving presentations at the CREOL annual Industrial Affiliates meeting, posting a link to their website from the College’s website. Affiliates are listed in CREOL publications and website, and receive special recognition at the Industrial Affiliates Meeting, and plaques in their names are prominently displayed in the entrance lobby of the CREOL building.
▲ Affiliation is a venue for supporting the education of the future workforce. Members receive a certificate or plaque for display in their facility highlighting their partnership and cooperation with educational institutions.

There are also many intangible benefits that accrue from association with this dynamic research and education institution. Among these are facilitated access to and collaboration with other specialized facilities within the University of Central Florida and the central Florida area. In addition to resources at CREOL and the Florida Photonics Center of Excellence (FPCE), UCF facilities include the following major research centers:

▲ NanoScience & Technology Center (NSTC)
▲ Advanced Materials Characterization Facility (AMPAC)
▲ Materials Characterization Facility (MCF)
▲ Biomolecular Science Center
▲ Institute for Simulation and Training (IST)
▲ Center for Distributed Learning
▲ National Center for Forensic Science (NCFS)
▲ Florida Solar Energy Center (FSEC)
▲ Florida Space Institute (FSI)

The College’s faculty and students play leading roles in both local and international professional associations and can provide effective introductions to the extensive network of industry and expertise to which CREOL connects. Through the IA program companies can also readily connect with other optics, photonics, and industrial organizations through local Florida organizations in which the College maintains an active participation, including the Florida Photonics Cluster (FPC), the Laser Institute of America (LIA), Florida High Technology Corridor Council (FHTCC), the UCF Technology Incubator and a large family of laser and optics companies in the Central Florida region.
## Industrial Affiliates Members

### Life Members
- Cobb Family Foundation
- Northrop Grumman Corporation
- Nufern

### Memoriam Members
- Dr. Arthur H. Guenther and Dr. William C. Schwartz

### Medallion Members
- Breault Research
- Coherent, Inc.
- IPG Photonics
- MKS, Newport, Ophir, Spectra-Physics
- Northrop Grumman Laser Systems
- Paul G. Suchoski, Jr
- Synopsys

### Senior Members
- AFL
- Amplitude Laser, Inc
- ASML US
- BAE Systems, Inc.
- CST of America
- FARO Technologies
- LAS-CAD GmbH
- Lockheed Martin
- Oculus
- Optronic Laboratories, Inc.
- Optimax Systems, Inc
- Tektronix
- Zemax
- Zygo Corporation

### Affiliate Members
- Analog Modules
- Andor Technology
- Applicote Associates, LLC
- Asphericon, Inc.
- AVO Photonics
- Beam Co.
- DataRay
- Edmund Optics
- Elbit Systems of America
- eVision, LLC
- Finetech
- Gentec-EO
- HORIBA Jobin Yvon
- J.A. Woollam, Co.
- JENOPTIK Optical Systems Inc
- L3Harris
- Laser Institute of America
- LG Electronics
- LGS Innovations
- Lightpath
- Luminar
- Menlo Systems
- NKT Photonics Inc.
- Ocean Insight
- Ophir-Spiricon
- OptoSigma
- OIDA
- Optigrate
- Plasma-Therm
- Plasmonics
- Q-Peak, Inc
- SPIE - The International Society for Optics & Photonics
- The Optical Society
- Thorlabs
- TwinStar Optics, Coatings & Crystals
- ULVAC Technologies, Inc
- Vescent Photonics
- Yokogawa
Industrial Affiliates Day

Industrial Affiliates Symposium: Advances in Optics & Photonics March 14-15, 2019

The CREOL Industrial Affiliates event brings in optics companies from around the country to learn about the ongoing research, recruit students, and identify new partnering opportunities. The 2019 event, held on March 14 & 15, 2019, drew 237 attendees including industrial affiliates, guests from industry and academia, representatives from photonics professional societies, faculty and students. It featured 21 exhibitors. Four technical sessions covered advances in various areas of optics and photonics. Four distinguished speakers from around the country and four UCF faculty speakers participated (see program details on the next page). In addition to the technical talks, three industrial affiliates gave brief overviews of their respective companies. Special guest John Grievencamp, President of SPIE gave a presentation.

Events also included four short courses, four student talks, tours of the CREOL facilities and viewing of posters featuring research of 28 graduate and undergraduate students. The Best Poster Award went to graduate student Sajad Saghaye Polkoo for his poster entitled “Imaging Beam Steering for LiFi Communication”. The Student of the Year Award went to Jose Rafael Guzman-Sepulveda. And a Special tribute to honor the life of Boris Zeldovich by Nelson Tabiryan of BEAM Co. The following Saturday, the attendees were invited to the traditional annual event known as the “Spring Thing”. It is hosted annual by M.J. Soileau, who is the founding director of CREOL. The festivities included great fellowship and featured cajun cuisine.

Short Courses

Title: Computational Optical Imaging
Instructor: Shuo “Sean” Pang

Computational imaging is the process of image forming from indirect measurements that does not resemble the image of interest. In optical imaging, in contrast to traditional lens-based imaging, computational imaging systems requires the integration of the sensing system and the computation requires algorithms to reconstruct the image. The ubiquitous availability of fast computing platforms (such as multi-core CPUs and GPUs) and the advances in algorithms open the opportunity for redesigning the imaging systems with enhanced performance in acquisition time, dynamic range, image resolution, etc.. In this Short Course, we will introduce the principles of computational imaging and its application in optical imaging systems.

Title: Emerging Augmented Reality and Virtual Reality Displays
Instructor: Shin-Tson Wu

Virtual reality (VR), augmented reality (AR) and mixed reality (MR) displays are growing rapidly with numerous applications, such as entertainment, education, tourism, medicine, and simulation training. Display panel and imaging optics play critical roles on the ergonomics and optical performance of these head mounted (or glass-type) display systems. Some technical challenges including resolution density, field of view, motion picture response time, high dynamic range, compactness and lightweight, latency, focus cue mismatch, and occlusion capability remain to be improved. Presently, three technologies are competing for near-eye displays; they are organic light-emitting diode (OLED) display, liquid crystal display (LCD; both transmissive and reflective modes), and micro-LED display. In this short course, I will introduce the optical system including field-of-view and foveated imaging, analyze the pros and cons of each display technology, review the latest progress, and discuss the future development directions.

Title: Fundamentals of Ultrafast Photonics-Techniques and Applications in Optical Communication and Signal Processing
Instructor: Peter Delfyett

The development of high-speed communication, interconnects, and signal processing are critical for an information based economy. This short course will cover basic concepts in the generation of ultrafast optical signals, and in developing approaches for modulating, transmitting and detecting these signals. We then show how these technologies can be applied in several optical communication and signal processing applications.

Title: Mechanical Action of Light and Applications
Instructor: Aristide Dogariu

The idea that light can affect the position of small objects goes back hundreds of years and has its origin in the corpuscular theory of light. Controlling the transfer of momentum from light to matter has led to unique possibilities to cool and trap atoms or to manipulate small objects such as microparticles, cells, molecular motors, etc. For instance, tiny forces in live biological entities are now commonly measured with “laser tweezers”. We will review the basic concepts behind the mechanical action of light and we will survey applications where harnessing light at scales comparable with the wavelength offers distinctive capabilities for sensing, guiding, and controlling material systems.
**Presenters at the Industrial Affiliates Symposium**

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization/Institution</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>Bahaa Saleh</td>
<td>Dean &amp; Director, CREOL, UCF</td>
<td>Welcome and overview</td>
</tr>
<tr>
<td>Stan Whitcomb</td>
<td>California Institute of Technology (Caltech)</td>
<td>Optical Challenges in LIGO: Past and Future</td>
</tr>
<tr>
<td>Demetrios Christodoulides</td>
<td>CREOL, UCF</td>
<td>Parity-Time and other Symmetries in Optics</td>
</tr>
<tr>
<td>Craig A. Hoffman</td>
<td>Naval Research Lab</td>
<td>Optics Research within the Naval Research Enterprise</td>
</tr>
<tr>
<td>David Hagan</td>
<td>CREOL, UCF</td>
<td>Ultrafast Nonlinear Optics: New Tricks from Old Materials</td>
</tr>
<tr>
<td>Ursula Gibson</td>
<td>Norwegian University of Science and Technology</td>
<td>Laser Structuring of Fibers and Films</td>
</tr>
<tr>
<td>Miguel Bandres</td>
<td>CREOL, UCF</td>
<td>Topological Photonics</td>
</tr>
<tr>
<td>Clara Rivero Baleine</td>
<td>Lockheed Martin</td>
<td>Engineered Materials for Next Generation EO/IR Sensors</td>
</tr>
<tr>
<td>Stephen Kuebler</td>
<td>CREOL, UCF</td>
<td>Controlling Light with Spatially-Variant Photonic Crystals</td>
</tr>
<tr>
<td>Kent Rochford</td>
<td>CEO</td>
<td>SPIE</td>
</tr>
</tbody>
</table>

**Product Reviews**

- Alexei Glebov: OptiGrate Corp.
- Eric Park: Q-Peak, Inc.
- Jeffrey Oleske: Andor Technologies

**Student Talks**

- **Student of the Year:**
  - Rafael Guzman: Optical Monitoring of Blood Coagulability during Cardiovascular Surgery via Coherence-Gated DLS
- Sepehr Benis: Large Optical Nonlinearities in Transparent Conductive Oxides at Epsilon-Near-Zero
- Nafiseh Mohammadian: Performance Comparison of Millimeter Wave Imager Configurations
- Jonathon White: Attosecond Streaking Phase Retrieval with Deep Neural Network

**Awards Presentations**

- Clara Rivero Baleine: Lockheed Martin, Distinguished Alumni Award

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*Tribute to Dr. Boris Zeldovich by Nelson Tabirian*
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tr>
<td>Arifur Rahaman</td>
<td>Thermal Effects of Ultrafast Laser Interaction with Polypropylene</td>
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<td>Jian Zhao</td>
<td>Deep Learning Cell Imaging through Anderson Localizing Optical Fiber</td>
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<td>Milad Gholipour Vazimali</td>
<td>Burmese Python Target Reflectivity Compared to Natural Florida Foliage Background Reflectivity</td>
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<td>Fedor Kompan</td>
<td>Coherent Beam Splitter for Simultaneous Generation of Multiple Vortex Beams Based on Holographic Phase Mask in Photo-Thermo-Refractive Glass</td>
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<td>Heath Gemar</td>
<td>Clutter Characterization and its Effect on Infrared Search and Track (IRST) Range Performance Model</td>
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<td>Quentin Fouliard</td>
<td>Configurations for Luminescence-based Temperature Sensing Thermal Barrier Coatings</td>
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<td>Zhao Ma</td>
<td>Compact Optical Imaging with Metasurfaces</td>
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<tr>
<td>A F M Saniul Haq</td>
<td>A Prototype of In-Band Full-Duplex Free-Space Optical Transceiver on UAVs</td>
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<td>Boyang Zhou</td>
<td>Optical Breakdown and Sub-Optical-Cycle Dynamics in Laser-Induced Damage by Ultrashort Pulses</td>
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<td>Robert Short</td>
<td>Optimization of LWIR Imagers for Target Acquisition</td>
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<td>Daniel Thul</td>
<td>Initial High-Intensity Laser Propagation Experiments at the Mobile Ultrafast High-Energy Laser Facility (MU-HEL)</td>
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<td>Pooya Nabavi</td>
<td>Conformal VLC Receivers with Photodetector Arrays: Design, Analysis and Prototype</td>
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<td>Pooya Nabavi</td>
<td>Empirical Modeling and Analysis of Water-to-Air Optical Wireless Communication Channels</td>
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<td>Walker Larson</td>
<td>A Common-Path Polarization-Based Image-Inversion Interferometer</td>
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<td>Marcin Malinowski</td>
<td>Stimulated Brillouin Scattering in All-Silicon Waveguides</td>
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<td>Roberto Alvarez</td>
<td>Scattering in Photo-Thermo-Refractive Glass after UV Exposure and Nucleation</td>
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<td>Stefan Gausmann</td>
<td>Higher Order Mode Suppression in Ytterbium Doped Large Mode Area Fiber with Confined Rare Earth Doping</td>
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<td>Chun Xia</td>
<td>Aberration Analysis using Zernike Polynomials in a High-NA Multiphoton Lithography System</td>
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<td>Mengdi Sun</td>
<td>Size Dependent Optical Performance of Light Trapping Metallic Electrodes</td>
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<td>Zachary Labossiere</td>
<td>Fresnel Zone Plate Array for beam homogenization produced in PTR Glass</td>
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<td>Matthew Julian</td>
<td>Optical Ceramics Science for High-Power Lasers</td>
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<td>Tracy Sjaardema</td>
<td>Nonlinear Frequency Conversion in Nanophotonic Periodically-Poled Lithium Niobate Waveguides</td>
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<tr>
<td>Salimeh Tofighi</td>
<td>Beam Deflection Measurements of Transient Nonlinear Refraction in Air in the Mid-</td>
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<td>Sajad Saghaye Polkoo</td>
<td>Imaging Beam Steering for LiFi Communication</td>
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<td>Guanjun Tan</td>
<td>Near-Eye Multiplane Display with Polarization Multiplexing</td>
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<tr>
<td>Derek Burrell</td>
<td>Wave-Optics Simulation of Correlated Speckle Fields for use in Closed-Loop-Phase-Compensation Studies</td>
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# Industrial Projects

In Fiscal Year 2019, CREOL had industry sponsored research totaling over $3.56M. Some of these projects are Federal Flow Thru while others are direct industry supported research and development. These collaborations gives our students experience and a leg up on industry positions after they graduate.

<table>
<thead>
<tr>
<th>RECIPIENT</th>
<th>SOURCE</th>
<th>TITLE OF AWARD</th>
<th>BEGIN</th>
<th>END</th>
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</tr>
</thead>
<tbody>
<tr>
<td>PI: Driggers, Ronald G</td>
<td>DRS Network &amp; Imaging Systems, LLC</td>
<td>Longwave Infrared Pitch-Well-Processing (PWP) Proof of Concept</td>
<td>11/9/2017</td>
<td>12/30/2019</td>
<td>$119,000</td>
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<tr>
<td>PI: Yu, Xiaoming; CoPI: Kar</td>
<td>Elsner Engineering Works</td>
<td>Laser Beam Engineering for high speed perforation of composite materials</td>
<td>8/10/2018</td>
<td>6/30/2020</td>
<td>$375,000</td>
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<tr>
<td>PI: Gaume, Romain; CoPI: Baudelet</td>
<td>Engi-Mat Co.</td>
<td>LIBS Characterization of Ceramic Powders</td>
<td>6/28/2019</td>
<td>9/30/2020</td>
<td>$904</td>
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<tr>
<td>PI: Richardson, Martin C</td>
<td>EoL Co., Ltd.</td>
<td>High Power Thulium Laser Marking System Development for Visibly Transparent Polymers</td>
<td>9/1/2017</td>
<td>12/31/2019</td>
<td>$75,000</td>
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<tr>
<td>PI: Abouraddy, Ayman; CoPI: Bai, Li</td>
<td>Harris Corporation</td>
<td>Strong Ultra-Small Highly Integrated (SUSHI) Phase 2 Fiber Optic Cable (Prime 1)</td>
<td>4/30/2017</td>
<td>12/20/2018</td>
<td>$33,104</td>
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<td>PI: Amezcua Correa, Rodrigo</td>
<td>Harris Corporation</td>
<td>19 Fibers Photonics Lantern</td>
<td>4/19/2018</td>
<td>5/31/2019</td>
<td>$20,000</td>
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<tr>
<td>PI: Driggers, Ronald</td>
<td>IMEC</td>
<td>IPA: Ron Driggers IMEC Support</td>
<td>8/8/2017</td>
<td>5/31/2020</td>
<td>$98,880</td>
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<td>PI: Driggers, Ronald G</td>
<td>IMEC</td>
<td>mmW and Thz Imaging System Performance</td>
<td>1/1/2018</td>
<td>12/31/2020</td>
<td>$154,000</td>
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<tr>
<td>PI: Driggers, Ronald G</td>
<td>IMEC</td>
<td>Research Support for IMEC in the Area of Time-of-Flight Technologies</td>
<td>9/1/2018</td>
<td>2/21/2022</td>
<td>$146,966</td>
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<tr>
<td>PI: Glebov, Leonid CoPI: Divliansky</td>
<td>IPG Photonics</td>
<td>Holographic optical elements in photo-thermo-refractive glass for laser parameters control</td>
<td>2/1/2019</td>
<td>10/31/2019</td>
<td>$500,000</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>LightPath</td>
<td>RF K. Richardson Equipment Use Account</td>
<td>1/1/2015</td>
<td>12/31/2019</td>
<td>$956</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>Lockheed Martin Missiles and Fire Control</td>
<td>Advanced Materials IRAD – Broadband Gradient Index (GRIN) Optics Characterization (Broadband GRIN #5)</td>
<td>1/26/2018</td>
<td>12/1/2018</td>
<td>$35,000</td>
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<tr>
<td>PI: Abouraddy, Ayman</td>
<td>Massachusetts Institute of Technology</td>
<td>Electrically Controlled Color-Changing Fabrics</td>
<td>2/16/2018</td>
<td>12/30/2019</td>
<td>$239,063</td>
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<td>PI: Richardson, Kathleen A.</td>
<td>Massachusetts Institute of Technology</td>
<td>RF: K. Richardson Equipment Use Account -2</td>
<td>1/1/2018</td>
<td>12/31/2019</td>
<td>$7,769</td>
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<tr>
<td>PI: Wu, Shin-Tson</td>
<td>Microsoft Corporation</td>
<td>Broadband Optical Shutter</td>
<td>10/16/2018</td>
<td>7/31/2019</td>
<td>$65,000</td>
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<td>PI: Wu, Shin-Tson</td>
<td>Shadevision GmbH</td>
<td>Smart Windows for Automotive Applications</td>
<td>6/1/2018</td>
<td>5/31/2021</td>
<td>$180,000</td>
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<td>PI: Li, Guifang</td>
<td>Skyloom Global Corporation</td>
<td>High-Speed Laser Communication Systems</td>
<td>9/14/2018</td>
<td>11/30/2019</td>
<td>$64,991</td>
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<tr>
<td>PI: Richardson, Kathleen A.</td>
<td>The Charles Stark Draper Laboratory, Inc.</td>
<td>ATLIS: All-in-one Tunable Long-wave Infrared Spectral Imager</td>
<td>2/1/2018</td>
<td>6/30/2020</td>
<td>$59,836</td>
</tr>
<tr>
<td>PI: Richardson, Kathleen A.</td>
<td>Various</td>
<td>RF: K. Richardson Equipment Use Account -2</td>
<td>1/1/2018</td>
<td>12/31/2019</td>
<td>$2,889</td>
</tr>
</tbody>
</table>
 Photonics Incubator

The Photonics Incubator is part of the UCF Business Incubation Program and is located within the facilities of the College. It is one of the ways that the College fulfills one element of its mission, namely to “Aid the development of Florida’s and the nation’s high technology industries.” Companies in the Photonics Incubator have ready access to the CREOL faculty, graduate students, laboratory facilities and other excellent UCF resources including the staff of the Office of Research and Commercialization and the Venture Lab. The following is a list of 2018 clients:

**LC Matter Corp.**
LC Matter Corporation offers custom design and manufacturing of liquid crystal materials and its polymeric composites. Applications include military electronically driven laser devices, optical telecommunication and entertainment systems. Contact: Sebastian Gauza. www.lcmatter.com

**Olkin Optics, LLC**
Olkin Optics is developing specialty fiber optics and fiber components for telecommunications, sensing, medical and laser applications. Contact: info@olkinoptics.com

**Plasmonics, Inc.**
Plasmonics is developing tunable infrared metamaterials which are engineered composites with unique refractive-index characteristics. Metamaterials with tunable resonances have wide ranging potential for optical devices, modulators, and sensors. Contact: James Ginn. www.plasmonics-inc.com

**SDPhotonics LLC**
SDPhotonics is an emerging leader in the development of high power laser diode technologies that provide improved power, efficiency, brightness and reliability. Contact: Dennis Deppe

Alumni News

UCF Grad Selected to Help Introduce Scientific Perspectives to Congress

Laser scientist Christina C. C. Willis ’09MS ’13PhD has been selected for a one-year congressional fellowship in Washington to help craft recommendations and scientific policies beginning in September. Willis will begin her Arthur H. Guenther Congressional Fellowship as a special legislative assistant in September thanks to her selection for the post by The Optical Society and SPIE, the international society for optics and photonics.

“I am excited to learn as much as I can about the legislative process and how science policy is crafted,” says the UCF alumna, who graduated with both her master’s degree and doctorate in optics. “I look forward to expanding my skill set by working on a broad range of technical topics, especially the areas of energy and environmental policy, STEM education and STEM diversity.”

Placement in a specific congressional office is made after orientation and involves interviewing in a variety of offices to find a mutual fit, which could be in either the House or Senate. “I am currently doing research and talking with former fellows about their experiences, and I am keeping my mind open to the many possibilities,” she says.

The fellowship program aims to introduce technical and scientific backgrounds and perspectives to the decision-making process in Congress and provide scientists with insight into the workings of the federal government. Fellows typically have the opportunity to conduct legislative or oversight work, assist in congressional hearings and debates, prepare policy briefs and write speeches.

Jason Eichenholz presents Commencement Address

Jason Eichenholz, Co-Founder and Chief Technology Officer at Luminar, was selected as the Commencement Speaker at the UCF Fall 2019 Commencement Ceremonies. Graduates were from the College of Business Administration, College of Engineering and Computer Science, and CREOL, The College of Optics and Photomics.
**Photonics Finland delegation returns to CREOL**

As a follow-up to a previous visit to CREOL by Juha Purmonen, CEO of Photonics Finland his colleague Jyrki Saarinen were joined by other key people from Finland to learn more about CREOL. Dr. Saleh provided an overview of the College, and Mr. Mike McKeel provided information on the bachelors program and student outreach efforts. Potential research collaborations. Following the CREOL meeting, they met with Dr. Alexi Glebov and industry members of the Florida Photonics Cluster. January 29.

**Visit to CREOL by Mr. Franc Uff, University of St. Gallen, Switzerland**

This visit was requested by Ms. Heather Shubrig with the Orlando Economic Partnership stemming from meetings at Photonics West 2019. Mr. Uff wanted to learn more about CREOL and investigate potential partnerships between his university and CREOL. The meeting with Dr. Saleh set the stage for a potential 2nd visit by leadership of from St. Gallen to further explore potential collaborations. The visit concluded with tour of CREOL conducted by Dr. Ivan Divliansky. March 2.

**Lockheed Martin/ARL Visit**

Jason C. Huff of Lockheed Martin and Terrance P. O’Regan of US. Army Combat Capabilities Development Command visited UCF. Lockheed Martin is working with the Army Research Lab on developing different collaboration mechanisms as part of their Open Campus initiative and came to discuss potential 3-way collaboration projects. While on campus, they toured the CREOL labs of Drs. Axel Schulzgen, Ronald Driggers, and Kyle Renshaw. Dr. Saleh provided a CREOL overview during their lunch. April 17.

**University of Eastern Finland Student Visit**

During their trip to the Kennedy Space center, as part of NASA’s Epic Challenge Program at UEFIL, 3 students toured CREOL to learn what is currently being researched in the field of photonics at an American University. June 10.

**Instituto Tecnológico de Aeronáutica, Brazil**

This visit was requested by Dr. Vaidyanathan Palavoor with the President, Provost, and key faculty members of ITA to explore the potential to establish joint research and educational programs. The group visited CREOL during their visit to UCF CATER. Dr. Peter Deiflyett provided an overview of CREOL. September 16.

**Visitors**

**Industry Visitors**
- Juha Purmonen, Jyrki Saarinen, Sara Peltola, Tuuuka Pakarinen, Jaakko Rintamaki, Photonics Finland, January 29
- Jihua Du, Changgeng (Chris) Ye, Loren Eyres, Lumentum, January 30
- Carlos Lee, European Photonics Industry Consortium (EPIC), February 1
- Glaiko Stratis, Lockheed Martin, February 7, & April 23, & May 16
- Craig Fitzgerald, Navitar Inc., April 12
- Luareen Martinez, Justin Braun, Orlando Economic Development; Pete Bigelow, Automotive News; Kate Warrington, Development Counsellors International, July 16
- Soon Beom Kim, Seunggyu Lee, Woo J. Park, Sang-Cheon Kim, LG Electronics, October 24
- Ankush Oberai, Synopsys Inc., November 21
- Frank Effenberger, Futurewei Technologies, December 10
- Arash Mafi, University of New Mexico, April 25
- Juuso Uusimäki, Jesse Korhonen, Eero Hägglöf, University of Eastern Finland, June 10
- Grover Swartzlander, Rochester Institute of Technology, July 18
- Yves Bellouard, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, July 22
- Paul Corkum, University of Ottawa, November 4
- Brian T. Cunningham, University of Illinois at Urbana-Champaign, November 14
- Kirsten Howley, Ben Grover, Lawrence Livermore National Laboratory, June 20
- Carlos Gutierrez, Sandia National Labs, October 25

**University and Research Center Visitors**
- Gaurav Bahl, University of Illinois at Urbana-Champaign, January 17
- Per Niklas Hedde, University of California, Irvine, February 14
- Filiz Yesilkoy, EPFL/STI-IBI-BIOS, Switzerland, February 22
- Denis Seletskiy, Politechnique Montreal, March 5
- David Messinger, RIT, March 12
- Melik Demirel, Penn State University, April 1
- Paul McManamon, University of Dayton, April 8
- Philippe Fauchet, Vanderbilt, Martin Fejer, Stanford, Ian Ferguson, Missouri S&T University, April 9
- Andreas Vassdeki, University of Idaho, April 16

**Government Visitors**
- Charmaine Gilbreath, NRL (retired), January 15
- Yehuda Braiman, ORNL, April 15
- Terrance O’Regan, Jason Huff, ARL, April 17
- Paul Pellegrino, ARL, April 29
- Arash Mafi, University of New Mexico, April 25
- Juuso Uusimäki, Jesse Korhonen, Eero Hägglöf, University of Eastern Finland, June 10
- Grover Swartzlander, Rochester Institute of Technology, July 18
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The college is home to six optics and photonics societies displayed below. The vice president of each society serves on the board of CAOS, the CREOL Association of Optics Students, which coordinates college-level events like Optics Day and fall picnic. Student organizations in CREOL host a variety of outreach, career development, invited talks and social events listed on the following pages. Event highlights in 2019 include the International OSA® Network of Students (IONS) conference hosted by OSA student chapter, Optics demo design competitions organized by IEEE Photonics Society, and partnership with Orlando Science Center for long-term collaborations on science outreach programs.

<table>
<thead>
<tr>
<th>Student Organizations</th>
<th>President</th>
<th>Vice President</th>
<th>Treasurer</th>
<th>Event Manager</th>
<th>Webmaster</th>
<th>Secretary</th>
<th>Faculty Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAOS, the CREOL Association of Optics Students</td>
<td>Charles Volz</td>
<td>Kendra Kordack</td>
<td>Nicolas Bonduce</td>
<td>Cesar Lopez Zelaya</td>
<td>Qian Yang</td>
<td>Anthony Badillo</td>
<td>David Hagan</td>
</tr>
<tr>
<td>The Society aids in promoting close cooperation with other IEEE societies and councils in the form of joint publications, sponsorships of meetings, and other forms of information exchange. Appropriate cooperative efforts will also be undertaken with non-IEEE societies.</td>
<td>Isa Hatipoglu</td>
<td>Sajad Saghaye-Polkoo</td>
<td>Alireza Fardoost</td>
<td>Fatemeh Ghaedi Vanani</td>
<td>Qian Yang</td>
<td>Kyle Renshaw</td>
<td></td>
</tr>
<tr>
<td>The purpose of the chapter shall be to promote the discipline of Optics through an organized effort of study, research, and discussion. We shall disseminate the knowledge of the field of Optics to the general public and further the professional development of all our student members.</td>
<td>Daniel Thul</td>
<td>Cesare Lopez-Zelaya</td>
<td>Charles Volz</td>
<td>Alireza Fardoost</td>
<td>Ahmed Yousif</td>
<td>Eric Van Stryland</td>
<td></td>
</tr>
<tr>
<td>The mission of SPIE Student Chapter is to advance an interdisciplinary approach to the science and application of light and provide professional development opportunities for UCF students.</td>
<td>Sanaz Faryadras</td>
<td>Kamal Abdelsalam</td>
<td>Patrick Roumayah</td>
<td>Sajad Saghaye-Polkoo</td>
<td>Weiyu Chen</td>
<td>M.J. Soileau</td>
<td></td>
</tr>
<tr>
<td>The mission of the Society of Optics Students is to uphold the principles of academic excellence, peer mentoring, leadership, and entrepreneurship to make an impact in the discipline of optics and photonics. The purpose of this Chapter shall be the advancement and diffusion of the knowledge of science of optics/photonics, and the encouragement of student interest in optics/photonics throughout the academic and local communities.</td>
<td>Charles Volz</td>
<td>Kendra Kordack</td>
<td>Teodor Malendevych</td>
<td>Yajaira Varillas Perez</td>
<td>Marcos Berrios</td>
<td>Stephen Kuebler</td>
<td>Mike McKee</td>
</tr>
<tr>
<td>SID, the society for information display is comprised of the top scientists, engineers, corporate researchers, and business people of the display industry. The SID UCF chapter is aimed to disseminate the knowledge of the field of displays to the general public and further the professional development of all our student members.</td>
<td>Jianghao Xiong</td>
<td>Zhiyong Yang</td>
<td>Yanning Li</td>
<td>En-lin Hsiang</td>
<td>Qian Yang</td>
<td>S.T. Wu</td>
<td></td>
</tr>
<tr>
<td>The mission of WiLO is to promote personal and professional growth for women of CREOL in the field of Optics, Photonics and Lasers through community building, networking opportunities, and encouraging young women to choose optics as a career. This organization will also work towards preparing all CREOL students, enrolled in undergraduate and graduate degrees, for the transition from student to professional life.</td>
<td>Jessica Peña</td>
<td>Kendra Kordack</td>
<td>Fatemeh Ghaedi Vanani</td>
<td>Sanaz Faryadras</td>
<td>Yajaira Varillas Perez</td>
<td>Kathleen Richardson</td>
<td></td>
</tr>
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</table>
EDUCATIONAL OUTREACH

Seminole County Science Fair
CREOL students Wesley Norris, Charles Volz, and Zheyuan Zhu volunteered to judge the physics (Volz, Zhu) and engineering (Norris) category during the annual Seminole County Science Fair. More than 300 students from 6th to 12th grade showcased their science projects during the event. February 2.

Science Night at Glenridge Middle School
CREOL students Latifah Maasarani, Charles Volz, Wesley Norris, Zheyuan Zhu, and Blake Pylipow hosted an optics presentation on light and spectroscopy during the Science Night at Glenridge Middle School. Through this interactive presentation and demonstration experiments, students learned about the wave properties of light, how colors work, how diffraction grating glasses work, and discover the answer to the question: how do we know what the sun is made from? February 12.

Lockheed Martin Science Challenge
Lockheed Martin Science Challenge is an annual science competition held in Orlando Science Center. Science fair winners from Orange, Seminole, Lake, Volusia, Brevard, Osceola, Marion, Polk, and Sumter counties presented their projects during this event. CREOL faculty Dr. Stephen Kuebler and students Charles Volz, Tao Zhan, Zheyuan Zhu served on the physics (Zhao, Zhu) and chemistry (Volz, Kuebler) judging committee, and provided feedback on the science projects. March 9.

STEM Day
Society of Optics Students gave what has become an annual presentation on light and spectroscopy for a variety of schools that visited CREOL. Learning about the wave properties of light, how colors work, and how diffraction grating glasses work, kids got to discover the answer to the question: how do we know what the sun is made from? March 29.

Florida Science Olympiad
The College of Optics and Photonics sponsored the Florida Science Olympiad State Tournament. Middle and high school students compete in 23 science and engineering events and vie for honors to attend the national tournament. UCF hosted 84 schools around the state of Florida, with nearly 2000 spectators and participants in attendance. March 30.

Optics Day
CREOL opened its door to the public for the annual Optics Day, a fun-filled event of lab tours, optics demos, and talks from CREOL faculty members and affiliates. The event started with an introductory talk on the applications of optics and photonics given by Dr. Saleh, followed by lab tours of the Integrated Photonics Lab, Liquid Crystal Displays Lab and Photointerduced Processing Lab. Demonstrations contributed by IEEE Photonics Society and CREOL students were presented in the lobby as a self-guided tour. The event concluded with a panel discussion on the career opportunity and outlook of photonics industry joined by MKS engineers. More than 40 students, educators and CREOL affiliates from UCF, community colleges, and local high schools registered and attended the Optics Day on site. In addition, STEMConnect broadcasted the event live to more than 200 students in classrooms across the central Florida region. April 5.

Visiting Students from University of East Finland
Students from University of East Finland visited CREOL. CREOL students Daniel Thul, Guillermo Fernando Camacho Gonzalez and Zheyuan Zhu gave the visitors lab tours and an overview of ongoing research and teaching activities at the College of Optics and Photonics. June 10.

MakeFest at Orlando Science Center
CAOS and SOS were invited to host an exhibition on optics and photonics at MakeFest in Orlando Science Center (OSC). This event celebrated the first anniversary of OSC’s The Hive Makerspace and was open to the general public. Student volunteers Charles Volz, Jessica Peña, Wesley Norris and Zheyuan Zhu set up two tables of presentations, including Michelson’s Interferometer, thermal lensing, Schlieren Imaging, fiber music player and diffraction. Visitors learned about photonics as an indispensable field in cutting edge researches, industrial/medical inspections, and everyday applications such as communication and entertainment. Participants also received free diffraction glasses, posters, and books on photonics in a series of interactive activities. The exhibition was well-attended, reaching more than 250 students, parents and educators during the event. June 15.

STEMConnect Session for Orlando Science Center Summer Camp
Society of Optics Students member Charles Volz and Wesley Norris joined an Orlando Science Center summer camp that focused on various technologies bringing science fiction to life. They presented a workshop on diffraction and holography to help the students understand the wave property of light, and how it is applied in making 3D displays in Sci-Fi a reality. July 16.

SPIE/COP Outreach Workshop
Mike McKee presented a workshop to 37 elementary teachers in Chula Vista, CA, south of San Diego. This was part of the SPIE Optics and Photonics conference. In the 4-hour workshop teachers learned about the electromagnetic spectrum, emission spectra, lenses and mirrors, and how light travels. Participants were given a light kit from SPIE and a book of lesson plans from CREOL. August 12.
There were over 40 student technical presentations. Day 4 was undergraduates talk series, a career fair, and an industry dinner. Student technical presentation session, an ultimate to-do list for talks from optics professionals on day 2. Day 3 consisted of a co-founders, and Senior Researchers. In total, there were 16 2018 and 2019 OSA President, CEOs, CTOs, Executive Directors, students chapter competitions. Speakers on day 2 included the on career paths in optics, a career development workshop, and programming with a number of plenary speakers, a workshop environment. Day 2 started the professional development picnic to allow students to get to know each other in a casual environment. The first day of the conference consisted of a large welcome or universities, and many alumni. The conference focused on or territories, as well as 14 companies, professional societies, or magazines, and job and internship placement. The conference was a great success and brought members of industry, and job and internship placement.

**Student Professional Development**

**Harris Lab Tour**

Society of Optics Students hosted an industrial tour to Harris Corporation in Melbourne. CREOL alumnus Aaron Coville led the students on a tour of the research and development facilities at Harris. Participants also talked to members in Harris Corporation on career opportunities after graduation. February 20.

**Knight Hacks**

Society of Optics Students organized two CREOL teams to participate in UCF Knight Hacks, which is a 36-hour event to design and build a product prototype. Team 1 consisted of CREOL students Teodor Malendevych and Kevin Landau, who worked on a fiber communication device. Team 2 consisted of CREOL students Charles Volz and Kendra Kordack, as well as two other ECE students, working on building a laser engraver controlled by a phone app. March 1-3.

**International OSA® Network of Students (IONS)**

From March 10th - 13th, 2019, the CREOL OSA student chapter hosted the International OSA® Network of Students (IONS) Orlando 2019. The conference was a great success and brought together over 150 students from 12 countries and 10 US states or territories, as well as 14 companies, professional societies, or universities, and many alumni. The conference focused on professional development, networking between students and members of industry, and job and internship placement.

The first day of the conference consisted of a large welcome picnic to allow students to get to know each other in a casual environment. Day 2 started the professional development programming with a number of plenary speakers, a workshop on career paths in optics, a career development workshop, and student chapter competitions. Speakers on day 2 included the 2018 and 2019 OSA President, CEOs, CTOs, Executive Directors, co-founders, and Senior Researchers. In total, there were 16 talks from optics professionals on day 2. Day 3 consisted of a student technical presentation session, an ultimate to-do list for undergraduates talk series, a career fair, and an industry dinner. There were over 40 student technical presentations. Day 4 was a social day where students took a trip to either Kennedy Space Center or Cocoa Beach. For many students, this was their first time in Florida and they were excited for some sunshine and rockets. More information on the conference can be found at http://ionsorlando.osahost.org/. March 10-13.

**OSA Graduate Research Symposium**

In this series of talks sponsored by OSA student chapter, graduate students are invited to present their researches conducted at CREOL. The symposium aims to stimulate discussions and collaborations among different research groups at CREOL, and offers an opportunity for the graduate students to practice presentation skills. Talks this year were given by Qitian Ru from Mid-Infrared Combs Group, and Guanjun Tan from Liquid Crystal Displays Group. May 1.

**Optics & Photonics Demo Design Competition**

IEEE Photonics Society hosted the third Demo Design Competition to encourage undergraduate and graduate students to design and build creative demonstrations that showcase some aspect of optics and photonics. In this competition, participants proposed ideas and received sponsorship on designing and building their own demos of a particular optics concept. Judges from CREOL, MKS/Newport and Northrop Grumman evaluated the works and provided feedback to the participants on the Optics Day. Demos from previous competitions have been presented during CREOL’s Optics Day in 2018 and 2019, and are on display in CREOL lobby for future CREOL outreach programs. October 2018-April 2019

**SOS Resume Workshop**

Society of Optics members invited UCF Career Services to host a resume workshop on how to prepare a professional resume for job interviews for its members. September 25.

**Mock Interview with Newport and Lockheed Martin**

Society of Optics members invited recruiters from Newport and Lockheed Martin to conduct mock interviews. This provides an opportunity for students to practice their interview skills and have their resumes critiqued by company recruiters. October 16.
Professional Society Talk Series

In a series of talks hosted by one of the professional student societies in the college, industry professionals and invited faculty give a non-technical talk geared around professional development, soft skills, or broader perspectives. These talks provide an intimate setting for the students to better understand the topics in the field, while simultaneously passing down knowledge from career experts.

<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Title</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/29/19</td>
<td>Yanlei Yu</td>
<td>Liquid Crystal Polymers and Bioinspired Applications</td>
<td>SID</td>
</tr>
<tr>
<td>04/03/19</td>
<td>Haizheng Zhong</td>
<td>In-situ Fabricated Perovskite Quantum Dots for Display Applications</td>
<td>SID</td>
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<tr>
<td>04/04/19</td>
<td>M.J. Soileau</td>
<td>CREOL, The College of Optics and Photonics: The Early Days</td>
<td>SPIE</td>
</tr>
<tr>
<td>05/01/19</td>
<td>Qitian Ru</td>
<td>The appealing features of subharmonic OPOs for achieving mid-infrared frequency combs</td>
<td>OSA</td>
</tr>
<tr>
<td>05/01/19</td>
<td>Guanjun Tan</td>
<td>Optical challenges in AR/VR displays</td>
<td>OSA</td>
</tr>
<tr>
<td>07/11/19</td>
<td>Tien-Chang Lu</td>
<td>One-dimensional Surface Plasmon Polariton Nanolasers and Arrays</td>
<td>IEEE-PS, SID</td>
</tr>
<tr>
<td>07/18/19</td>
<td>Grover Swartzlander</td>
<td>Flying on a Rainbow with a Diffractive Solar Sail</td>
<td>SID</td>
</tr>
<tr>
<td>09/12/19</td>
<td>Alvaro Casas Bedoya</td>
<td>Silicon, chalcogenides, and Brillouin scattering: An approach for integrated microwave photonics</td>
<td>OSA</td>
</tr>
<tr>
<td>10/14/19</td>
<td>Liam Barry</td>
<td>Advanced optical sources for spectrally efficient photonic systems</td>
<td>IEEE-PS</td>
</tr>
<tr>
<td>11/14/19</td>
<td>Brian Cunningham</td>
<td>Biosensing with digital resolution for ultrasensitive diagnostics</td>
<td>IEEE-PS</td>
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</tbody>
</table>

Student Organization Socials and Mentoring

CAOS and Qualifier Exam
CAOS provided refreshments to the students on the qualifier exam days: January 16 and 17.

SPIE Social hour
SPIE Student Chapter hosted a lunchtime social hour on Friday, February 15th, 2019. The event featured pizzas, beverages, and entertainment in a relaxing atmosphere. The social hour also served as a platform to inform students of SPIE’s and other CREOL activities and garner new members or volunteers for events. Social Hours are a long-standing favorite for the close-knit graduate student community at CREOL, with well over 40 attendees at each event. February 15.

CREOL Faculty & Staff Appreciation Breakfast
WiLO organized a staff appreciation breakfast to show gratitude to CREOL faculty and staff for their wonderful support and outstanding help over the past year. The event coincided with the International Women’s Day. March 8.

CREOL Affiliates/Student Networking Mixer
Society of Optics Students invited CREOL industrial affiliates and students to attend a networking mixer during the CREOL industrial affiliates day. This event provided an opportunity for undergraduate and graduate students to make connections with leading optics and photonics companies. March 14.

International Day of Light Celebration and Social hour
SPIE Student Chapter and WiLO joined venture to celebrate International Day of Light with a social hour. The event featured snacks, beverages, and other board/card/video games. The social hour provided a platform for CREOL students to network with each other in a relaxing environment. May 16.