

CREOL, THE COLLEGE OF OPTICS AND PHOTONICS



UCF

UNIVERSITY OF CENTRAL FLORIDA

CREOL, The College of Optics and Photonics

ANNUAL REPORT

2019

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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 Schulzgen 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 flow 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

**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

**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)

**Miguel Bandres**

Assistant Professor of Optics and Photonics
Ph.D., Physics, California Institute of Technology, 2011

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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:

- ▲ Reviewer: Science, Nature Physics, Applied Physics Letters, Laser & Photonics Reviews, IEEE Photonics Technology Letters, Optics Letters, Optics Express.

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)
- ▲ SPIE Laser Technology, Engineering and Applications Scholarship (2006)
- ▲ Technion's Excellence Scholarship for Postdoctoral Students (2018)
- ▲ SPIE Educational Scholarship in Optical Science and Engineering (2005, 2007 and 2010)

**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

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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

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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

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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 Sensing and Imaging”, 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). Atmospheric, 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 Alumni 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 Nanoplasmonics

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, organics 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)
- ▲ Topical Editor, J. Opt. Soc. Am. B., (2006-10)
- ▲ 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"

**Kyu 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)
- ▲ Journal reviewer: eLife, Nature Methods, Nanoscale, J Phys D
- ▲ Journal Advisory Panel, Journal of Physics D: Applied Physics

Honors and Awards

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

**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

**Mercedeh Khajavikhan**

Associate Professor of Optics and Photonics
Ph.D., Electrical Engineering, University of Minnesota, 2009

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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
- ▲ Committee member: CLEO-QELS 2015-2017, SIAM 2015, Meta Conference 2017
- ▲ Reviewer: Nature, Science, Nature Communications, Optica, Optics Letters, Optics Express, Applied Physics Letters, IEEE Photonics Technology Letters

Honors and Awards

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

**Pieter G. Kik**

Associate Professor of Optics and Photonics, Physics

Ph.D., Physics, FOM Institute of Atomic Molecular Physics, Amsterdam (AMOLF), 2000

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Research

Nanophotonics and near-field optics, near-field scanning optical microscopy, nanostructured 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

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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

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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

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Research

Diffraction 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

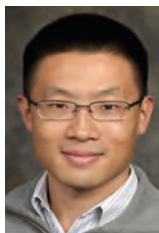
- ▲ Wave propagation in periodic and anisotropic media
- ▲ Analysis and design of optical filters
- ▲ Thin film optics

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

**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

- ▲ Optical Society Adolph Lomb Medal (1966) and Townes Medal (1976), Frederic Ives Medal (1989)
- ▲ IEEE Medal of Honor (1989)
- ▲ 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

**C. Kyle Renshaw**

Assistant Professor of Optics and Photonics

Ph.D., Applied Physics, University of Michigan, 2014

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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

**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

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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

**Martin C. Richardson**

University Trustee Chair; Northrop Grumman Prof. of X-ray Photonics; Pegasus Professor of Optics and Photonics, Physics, ECE

Ph.D., Physics, London University, 1967

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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
- ▲ SPIE Harold E. Edgerton Award
- ▲ Fellow, OSA, IEEE, SPIE, APS
- ▲ Schardin Medal

**Bahaa E. A. Saleh**

Dean & Director, Professor of Optics and Photonics

Ph.D., Electrical Engineering, Johns Hopkins University, 1971

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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
- ▲ Editor, *Journal of Optical Society of America A*, 1991-97
- ▲ Author, *Introduction to Subsurface Imaging*, Cambridge 2011
- ▲ Co-author of *Fundamentals of Photonics*, Wiley, 2nd ed., 2007
- ▲ Author, *Photoelectron Statistics*, Springer, 1978

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

**Winston V. Schoenfeld**

Professor of Optics and Photonics; Director, Solar Technologies Research Division (FSEC) Associate Dean for Postdoctoral Scholars

Ph.D., Materials Science, Univ. of California, Santa Barbara, 2000

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Research

MBE growth of oxide semiconductors, oxide and nitride semiconductor UV detectors, advanced passivation and cell architectures for c-Si photovoltaics

Other Experience

- ▲ Director, cSi Photovoltaic Manufacturing Consortium (PVMC) 2011-17
- ▲ President/CEO, Medical Lighting Solutions, 2003-04
- ▲ Device Manager, Uniroyal Optoelectronics, 2000-03

Professional Activities

- ▲ Member, SPIE, OSA, IEEE
- ▲ Principal Editor, *Journal of Materials Research*
- ▲ Chair, MOEMS/MEMS Conference – SPIE Photonics West
- ▲ Energy Sub-Committee Member, National Photonics Initiative (NPI), 2013
- ▲ NSF Research Experience for Undergraduates Program PI, 2005-11

Honors and Awards

- ▲ Fellow, SPIE
- ▲ UCF RIA Award for Research Excellence, 2016
- ▲ UCF ORC Millionaire Award, 2013/2014/2015
- ▲ UCF Innovator, 2013/2014
- ▲ UCF TIP Award for Teaching Excellence, 2010
- ▲ UCF Presidential Initiative Award, 2006
- ▲ USA Triathlon All-American 2016, 2017, 2018

**Axel Schülzgen**

Professor of Optics and Photonics

Ph.D., Physics, Humboldt University, 1992

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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, WSOE, 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

**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

- ▲ President, SPIE, 1997
- ▲ Co-Chair, SPIE Boulder Damage Symposium

Honors and Awards

- ▲ 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

**Konstantin L. Vodopyanov**

21st Century Scholar Chair and Professor of Optics and Photonics

Ph.D., Physics, Lebedev Physical Institute, Moscow, 1983

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mir.creol.ucf.edu

Research

Mid-Infrared Combs Group (MIR). Broadband mid-infrared ($\lambda > 2.5 \mu\text{m}$) frequency combs generation based on subharmonic optical parametric oscillators. Trace molecular sensing and coherent dual-comb spectroscopy using octave-wide MIR combs. Biomedical applications of frequency combs. Photonic THz wave generation and THz imaging. Nano-IR spectroscopy.

Other Experience

- ▲ Stanford University (2003-2013)
- ▲ Inrad Inc., Picarro Inc., USA (1999-2003)
- ▲ Imperial College, London, UK (1992-1998))
- ▲ University of Bayreuth, Germany (1990-1992)
- ▲ Moscow Inst. of Physics and Technology (1985-1990)
- ▲ Lebedev Physical Inst., Moscow (1983-1990)

Professional Activities

- ▲ General Chair, Inst. Symp. On Photodetection and Imaging (ISPD), Beijing, China, 2013
- ▲ Photonics West, LA106 Conference Chair (2010-present)
- ▲ CLEO General Chair, 2010, CLEO Program Chair, 2008
- ▲ Associate Editor, Optica
- ▲ Co-author, Solid-State Mid-Infrared Laser Sources, Springer, 2003

Honors and Awards

- ▲ Fellow, OSA, SPIE, APS
- ▲ Fellow, UK Institute of Physics (IOP)
- ▲ Alexander-von-Humboldt Fellow, Germany, 1990

**Shin-Tson Wu**

Pegasus Professor of Optics and Photonics

Ph.D., Physics, University of Southern California, 1981

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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

**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 nano-scale, 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

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

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 n_2 , model material nonlinearities, 2PA, n_2 , 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



Larry C. Andrews

Emeritus Professor of Mathematics, Optics and Photonics

Ph.D., Engineering, Michigan State University, 1970

Larry.andrews@ucf.edu

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



Michael Bass

Emeritus Professor of Optics and Photonics, Physics, ECE

Ph.D., Physics, University of Michigan, 1964

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

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



Glenn D. Boreman

Emeritus Professor of Optics and Photonics, Professor and Chair Univ. North Carolina

Ph.D., Optical Sciences, University of Arizona, 1984

gboreman@uncc.edu

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

**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
- ▲ Author, Textbook: "Laser Fundamentals," Cambridge University Press

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."



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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Assistant Professor of Physics

Ph.D., University of Central Florida

Physics

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**Louis Chow**

Professor and University Chair in Mechanical & Aerospace Engineering

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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Assistant Professor of Material Science & Engineering

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**Andre Gesquiere**

Associate Professor of Chemistry, Nanoscience Technology Center

Ph.D., University of Leuven

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**Florencio E. Hernandez**

Professor of Chemistry

D.Sc., Universidad Central de Venezuela & Université Franche-comté

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**David Kaup**

Provost Distinguished Research Professor of Math

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Optical Characterization of Advanced Materials

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**Alfons Schulte**

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Near-IR Raman Spectroscopy

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**Mubarak A. Shah**

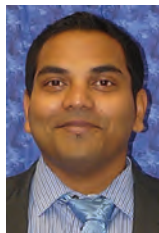
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**Michael Sigman**

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 Explosives, Chemistry & Forensics
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COURTESY FACULTY

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**Jason Eichenholz**

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 Ph.D., University of Central Florida
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**James E. Harvey**

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 Ph.D., Optical Sciences, University of Arizona, 1976
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**Hans P. Jenssen**

AC Materials
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**Vassilios Kovanis**

AFRL, Sensors Directorate
 Ph.D., University of New Mexico
 Semiconductor lasers, nonlinear optics
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**Ilya Mingareev**

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Mechanical Engineer Staff, Lockheed Martin
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**Mordechai Segev**

Robert J. Shillman Distinguished Professor of
Physics
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**Robert Stegeman**

Sr. Optical Investigator - LGS Innovations, Inc.
Ph.D., University of Central Florida
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**C. Martin Stickley**

Special Assistant to the Vice President, Research and
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ADJUNCT FACULTY

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Adjunct Professor
Ph.D., University of Central Florida
Electrical Engineering
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**David Shelton**

Adjunct Professor
Ph.D., University of Central Florida
Materials Science
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Eric Van Stryland's retirement party. Left to right, Peng Zhao, David Hagan, Tiejun Xia, Edesly Canto-Said, Tai Wei, Ali Said, Eric Van Stryland, Mansoor Sheik-Bahae, Arthur Dogariu, Trenton Ensley, Richard DeSalvo, MJ Soileau, Shekhar Guha

2019 FACULTY AWARDS AND HONORS

NATIONAL AND INTERNATIONAL AWARDS

The Arthur L. Friedberg Award
Alfred R. Cooper Lecturer Award

Kathleen Richardson
Kathleen Richardson

UNIVERSITY AWARDS

Excellence in Graduate Teaching
Excellence in Undergraduate Teaching
Excellence in Research
COP Research Incentive Award
COP Research Incentive Award
Luminary Award
Teaching Incentive Program (TIP) Award

Peter Delfyett
Shuo "Sean" Pang
Aristide Dogariu
Guifang Li
Axel Schulzgen
S.T. Wu
Demetrios Christodoulides

*College Level

HISTORICAL FACULTY AWARDS AND HONORS



1997 Max Born Award
1999 Nicholas Holonyak Award
1999 Esther Hoffman Beller Award
2008 Esther Hoffman Beller Award
2008 Distinguished Service Award
2010 Joseph Fraunhofer/Robert M. Burley Prize
2003 R. W. Wood Prize
2011 R. W. Wood Prize
2012 R. W. Wood Prize
2013 C.E.K. Mees Medal
2014 R. W. Wood Prize
2018 Max Born Award

Boris Zeldovich (in memoriam)
Dennis Deppe
Bahaa Saleh
M.J. Soileau
Bahaa Saleh
Shin-Tson Wu
George Stegeman (in memoriam)
Demetrios Christodoulides
Eric Van Stryland
Bahaa Saleh
Michael Bass
Demetrios Christodoulides



1995 Kingslake Medal and Prize
2004 Bacus Award
2008 Dennis Gabor Award
2008 G. G. Stokes Award
2008 Gold Medal Award
2013 Harold E. Edgerton Award
2015 G.G. Stokes Award

Glenn Boreman
Bahaa Saleh
Leonid Glebov
Shin-Tson Wu
M.J. Soileau
Martin Richardson
Aristide Dogariu



2003 Engineering Achievement

Dennis Deppe



2008 Jan Rajchman Prize
2011 Slottow–Owaki Prize

Shin-Tson Wu
Shin-Tson Wu



2011 Edward A. Bouchet Award

Peter Delfyett



ACerS Outstanding Educator Award (2009)

Kathleen Richardson



NSF Presidential Early Career Award (PECASE) (1997)
NSF Presidential Young Investigator Award (1991)
NSF Career Award (2012)
NSF CAREER Award (2007)
NSF CAREER Award (2008)
NSF CAREER Award (1996)
NSF CAREER Award (2015)
NSF CAREER Award (2019)

Peter Delfyett
Dennis Deppe
Sasan Fathpour
Pieter Kik
Stephen Kuebler
Guifang Li
Mercedeh Khajavikhan
Xiaoming Yu



ONR Young Investigator Award (1991)
ONR Young Investigator Award (1995)
ONR Young Investigator Award (2013)
ONR Young Investigator Award (2016)

Dennis Deppe
Guifang Li
Sasan Fathpour
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



Michael Bass
Peter Delfyett
Leonid Glebov

Aravinda Kar
Guifang Li

M.J. Soileau
Shin-Tson Wu



Michael Bass
M.J. Soileau
Shin-Tson Wu



Kathleen Richardson

PRESIDENTS, DIRECTORS, & OFFICERS OF PROFESSIONAL SOCIETIES



Eric Van Stryland	President (2006)
Michael Bass	Board of Directors Member (1989–1992)
Peter Delfyett	Board of Directors Member (2004–2006)
Bahaa Saleh	Board of Directors Member (1998–2005)
Eric Van Stryland	Board of Directors Member (1998–2001)
Shin-Tson Wu	Board of Directors Member (2013–2014)



M.J. Soileau	President (1997)
Glenn Boreman	Board of Directors Member (1997–1999)
James Harvey	Board of Directors Member (2001–2003)
Kathleen Richardson	Board of Directors Member (2012–2015)



Shin-Tson Wu	Board of Governors (2003–present)
Peter Delfyett	Board of Governors (2000–2002)
Jim Moharam	Vice-President (1997–1999)
Kathleen Richardson	Board of Directors Member (2012–2015)



Michael Bass	President (1988)
Michael Bass	Board of Directors Member (1985–1989)
Aravinda Kar	Board of Directors Member (2005)
Bahaa Saleh	Board of Directors Member (2010–2012)
Eric Van Stryland	Board of Directors Member (1992–1994)



Peter Delfyett	President (2008–2011)
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Kathleen Richardson	Board of Directors Member (2008–2015)
Kathleen Richardson	President (2014–2015)



Peter Delfyett	Vice-Chair (2015–Present)
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Kathleen Richardson	President (2008–2009)
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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

Michael Bass	Journal of the Optical Society of America B (1984–1987)
Glenn Boreman	Applied Optics (2000–2005)
Glenn Boreman	Applied Optics/Optical Technology (1998–2003)
Aristide Dogariu	Applied Optics/Optical Technology (2004–2010)
Peter Delfyett	IEEE Journal of Selected Topics in Quantum Electronics (2001–2006)
Peter Delfyett	IEEE/LEOS Newsletter (1995–2000)
Ronald Driggers	Applied Optics (2015–present)
Ronald Driggers	Optical Engineering (2012–2015)
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	Journal of the Optical Society of America A (1991–1997)
Bahaa Saleh	Advances in Optics & Photonics (2008–2014)
Shin-Tson Wu	IEEE/OSA Journal of Display Technology (2004–2008)



MJ (center) and Cheryl Soileau, with Michael Bass (I) as he is inducted into the Florida Inventors Hall of Fame

ASSOCIATE AND TOPICAL EDITORS

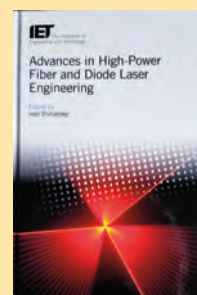
Konstantin Vodopyanov	Optica (2014– present)
Michael Bass	Optics Express (2001–2001)
Glenn Boreman	Optical Engineering (Radiometry & Detectors) (1998–1999)
Glenn Boreman	Applied Optics (Radiometry & Detectors) (1992–1997)
Glenn Boreman	Optics Express (2009–present)
Glenn Boreman	International Journal of Optics (2008–present)
Peter Delfyett	IEEE Photonics Technology Letters (1995–2003)
Demetrios Christodoulides	IEEE J. of Quantum Electronics (1996–2001)
Demetrios Christodoulides	Journal of the Optical Society of America B (2001–2003)
David Hagan	Journal of the Optical Society of America B (2007–2013)
David Hagan	Journal of Materials Research (2000–2007)
Stephen Kuebler	Journal of Experimental Nanoscience (2008–present)
Stephen Kuebler	Journal of Micro/Nanolithography, MEMS, & MOEMS (2008–present)
Guifang Li	Optics Express (2007–present)
Guifang Li	Photonics Technology Letters (2007–present)
Jim Moharam	Journal of the Optical Society of America A (1998–2004)
Kathleen Richardson	International Journal of Applied Glass Science (2009–present)
Kathleen Richardson	Optical Materials Express (September 2013)
Martin Richardson	Journal of Quantum Electronics (1980–1986)
Bahaa Saleh	Journal of the Optical Society of America A (1984–1990)
Bahaa Saleh	Journal of the Optical Society of America (1980–1983)
Winston Schoenfeld	Journal of Materials Research (2007–present)
Axel Schülzgen	Journal of the Optical Society of America B (2016–2017)
Axel Schülzgen	Applied Optics (2018–2019)
Axel Schülzgen	Journal of Lighthwave Technologies (2019–present)
Lawrence Shah	IEEE Journal of Quantum Electronics
Eric Van Stryland	Optics Letters: Nonlinear Optics (1995–1998)
Eric Van Stryland	Reviews of Scientific Instruments (1978–1981)
Shin-Tson Wu	IEEE/OSA Journal of Display Technology (2008–present)
Shin-Tson Wu	Liquid Crystals (2009–present)



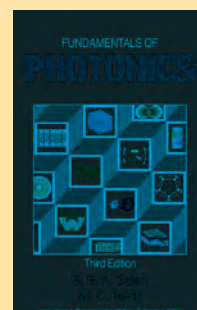
Axel Schülzgen (r) elected as a fellow of The Optical Society in November.

BOOKS PUBLISHED IN 2019

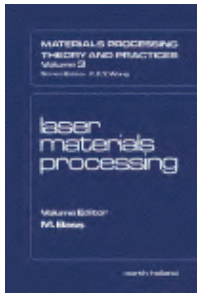
Ivan B. Divliansky
*Advances in High-Power Fiber and Diode
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Bahaa E. A. Saleh, and Malvin C. Teich,
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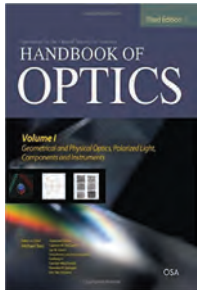


BOOKS

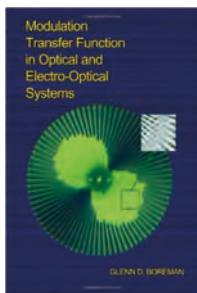


Michael Bass,

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Elsevier (1983).

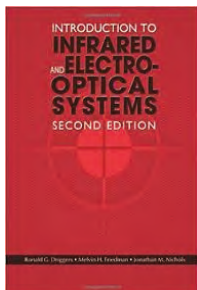


Michael Bass, Casimer DeCusatis, Jay Enoch and Vasudevan Lakshminarayana, **Guifang Li,** Carolyn MacDonald, Virenda Mahajan, and **Eric Van Stryland,**
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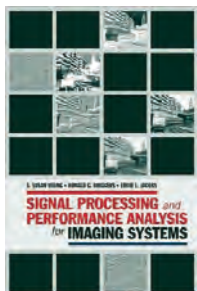
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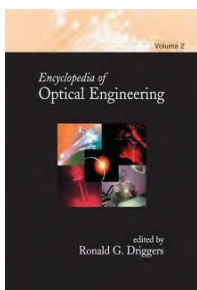
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S. Susan Young, **Ronald G. Driggers,** Eddie L. Jacobs,

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Artech House (2008).



Ronald Driggers, Editor-in-Chief

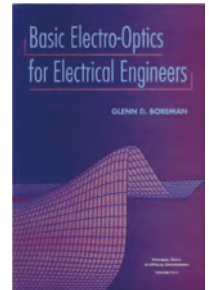
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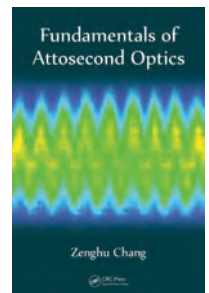
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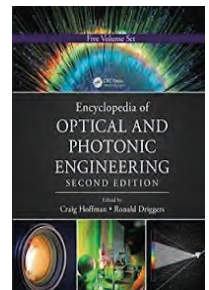
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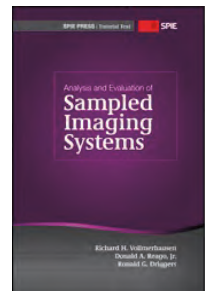
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Craig Hoffman and **Ronald Driggers,** eds.
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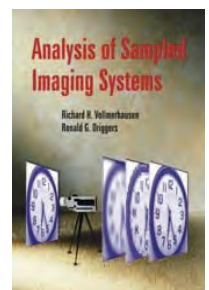


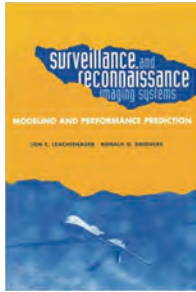
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Analysis and Evaluation of Sampled Imaging Systems,
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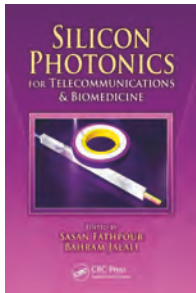
R. Vollmerhausen and **Ronald Driggers**

Sampled Imaging Systems,
SPIE Tutorial Series (2000).

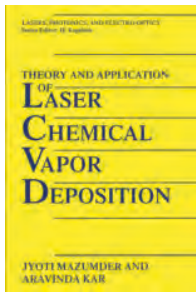




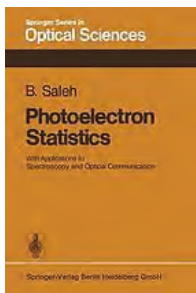
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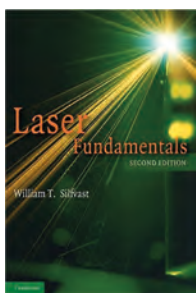
Sasan Fathpour and Bahram Jalali,
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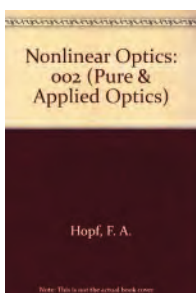
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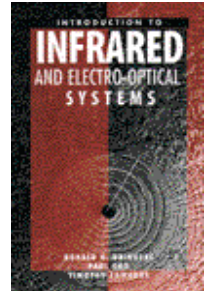
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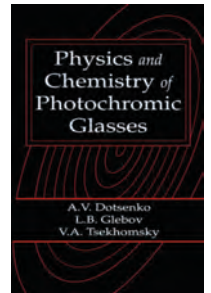
William T. Silfvast,
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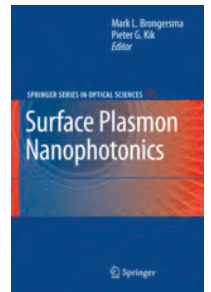
George I. Stegeman and Frederic A. Hopf,
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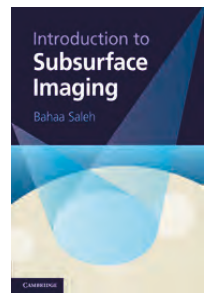
Ronald Driggers, P. Cox, and T. Edwards
Introduction to Infrared and Electro-Optical Systems
Artech House (1999).



Alexander V. Dotsenko, Leonid B. Glebov
and Victor A. Tsechomsky,
Physics and Chemistry of Photochromic Glasses,
CRC Press (1997).



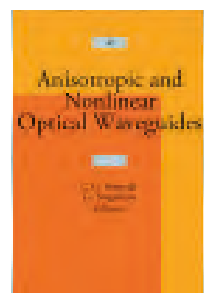
Mark L. Brongersma and Pieter G. Kik,
Surface Plasmon Nanophotonics,
Springer (2010).



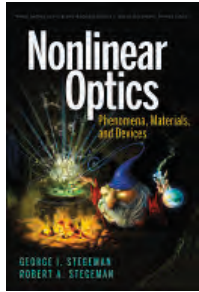
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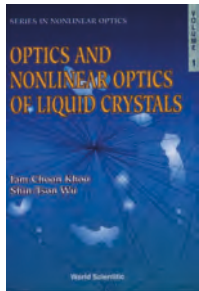
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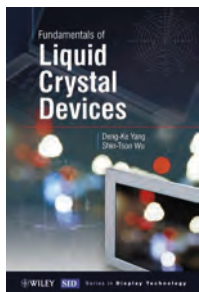
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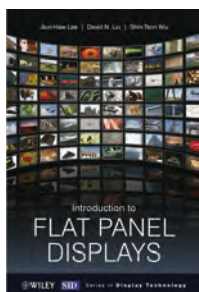
George I. Stegeman and Robert Stegeman,
Nonlinear Optics, Phenomena, Materials and Devices,
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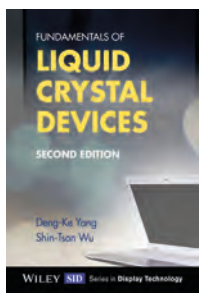
Iam-Choon Khoo and **Shin-Tson Wu**,
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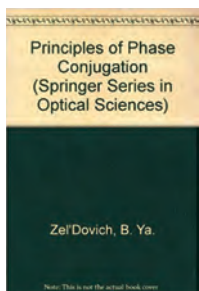
Shin-Tson Wu and Deng-Ke Yang,
Fundamentals of Liquid Crystal Devices,
Wiley (2006).



Jiun-Haw Lee, David N. Liu, **Shin-Tson Wu**,
Introduction to Flat Panel Displays,
Wiley (2009).

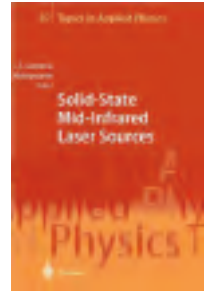


Deng-Ke Yang and **Shin-Tson Wu**,
Fundamentals of Liquid Crystal Devices
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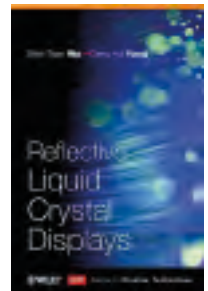


Boris Ya. Zeldovich, N. F. Pilipetsky, and
Vladimir V. Shkunov
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Edited by Irina T. Sorokina, **Konstantin L. Vodopyanov** ,
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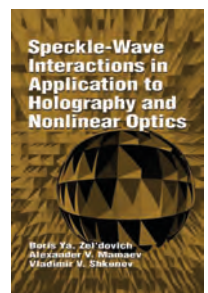
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Boris Ya. Zeldovich, Alexander V. Mamaev
and Vladimir V. Shkunov,
*Speckle-Wave Interactions in Application to
Holography and Nonlinear Optics*,
CRC Press, (1995).



RESEARCH STAFF

SENIOR RESEARCH SCIENTISTS

Robert Crabbs (TISTEF)
Ivan Divliansky (Prof. Glebov)

Scott Webster (Prof. Abouraddy)

RESEARCH SCIENTISTS

Jose Enrique Antonio Lopez (Profs. Amezcua/Schulzgen)
Robert Bernath (Prof. M. Richardson)
Bruce Berry (TISTEF)
Basanta Bhaduri (Prof. Abouraddy)
Shi Chen (Profs. Abouraddy/Gaume)
Joseph Coffaro (TISTEF)
Larissa Glebova (Prof. Glebov)
Nicholas Harris (Prof. Abouraddy)
Shikha Kalbele (Prof. Deppe)
Joshua Kaufman (Prof. Abouraddy)
Esat Kondakci (Prof. Abouraddy)
Majid Masnavi (Prof. M. Richardson)

Morgan Monroe (Prof. Abouraddy)
Andrey Muraviev (Prof. Vodopyanov)
Sarvesh Rane (Prof. Deppe)
Shermineh Rostami Fairchild (Prof. M. Richardson)
Matthew Salfer-Hobbs (TISTEF)
Frank Sanzone (TISTEF)
Soroush Shabahang (Prof. Abouraddy)
Jonathan Spsychalsky (TISTEF)
Chetan Swamy (Prof. Deppe)
Franklin Titus (TISTEF)
Absar Ulhassan (Prof. Christodoulides)
Robert Wingo (Prof. Abouraddy)

POST-DOCTORAL SCHOLARS

Alyssa Allende Motz (Prof. Abouraddy)
Melissa Beason (TISTEF)
Nathan Bodnar (Prof. M. Richardson)
Yingjie Chai (Prof. Soileau)
Matthieu Chazot (Prof. K. Richardson)
Jaehyuck Choi (Prof. Khajavikhan)
Daniel Cruz Delgado (Prof. Amezcua)
Xinpeng Du (Profs. Kar/Yu)
Asaf Farhi (Prof. Dogariu)
Claudia Goncalves (Prof. K. Richardson)
Md Selim Habib (Prof. Amezcua)
William Hayenga (Prof. Khajavikhan)
Mohammad Hokmabadi (Prof. Khajavikhan)

Myungkoo Kang (Prof. K. Richardson)
Gisela Lopez Galmiche (Prof. Christodoulides)
Amirreza Mahigir (Prof. Khajavikhan)
Julian Martinez Mercado (Prof. Amezcua)
Oussama Mhibik (Prof. Divliansky)
Natalia Munera Ortiz (Profs. Hagan/Van Stryland)
Nicholas Nye (Prof. Christodoulides)
Midya Parto (Prof. Christodoulides)
Rashi Sharma (Prof. K. Richardson)
Pavel Shirshnev (Prof. Glebov)
Qitian Ru (Prof. Vodopayanov)
Felix Tan (Prof. Abouraddy)
Manual Triana Valencia (Prof. Wu)

VISITING RESEARCH SCIENTISTS

Dante Maria Aceti (Prof. Khajavikhan)
Cristian Acevedo Caceres (Prof. Dogariu)
Mykhailo Bondar (Profs. Hagan/Van Stryland)
Enguo Chen (Prof. Wu)
Ziyang Chen (Prof. Dogariu)
Pawel Jung (Prof. Christodoulides)
Kang Taek Lee (Prof. Han)

Xiaomin Liu (Prof. Wu)
Partha Mukhopadhyay (Prof. Schoenfeld)
Armando Perez Leija (Prof. Christodoulides)
Felix Jose Salazar Bloise (Prof. Dogariu)
He Wen (Prof. Li)
Guangye Yang (Prof. Christodoulides)
Hongbo Zhu (Prof. Li)

RESEARCH ASSOCIATS

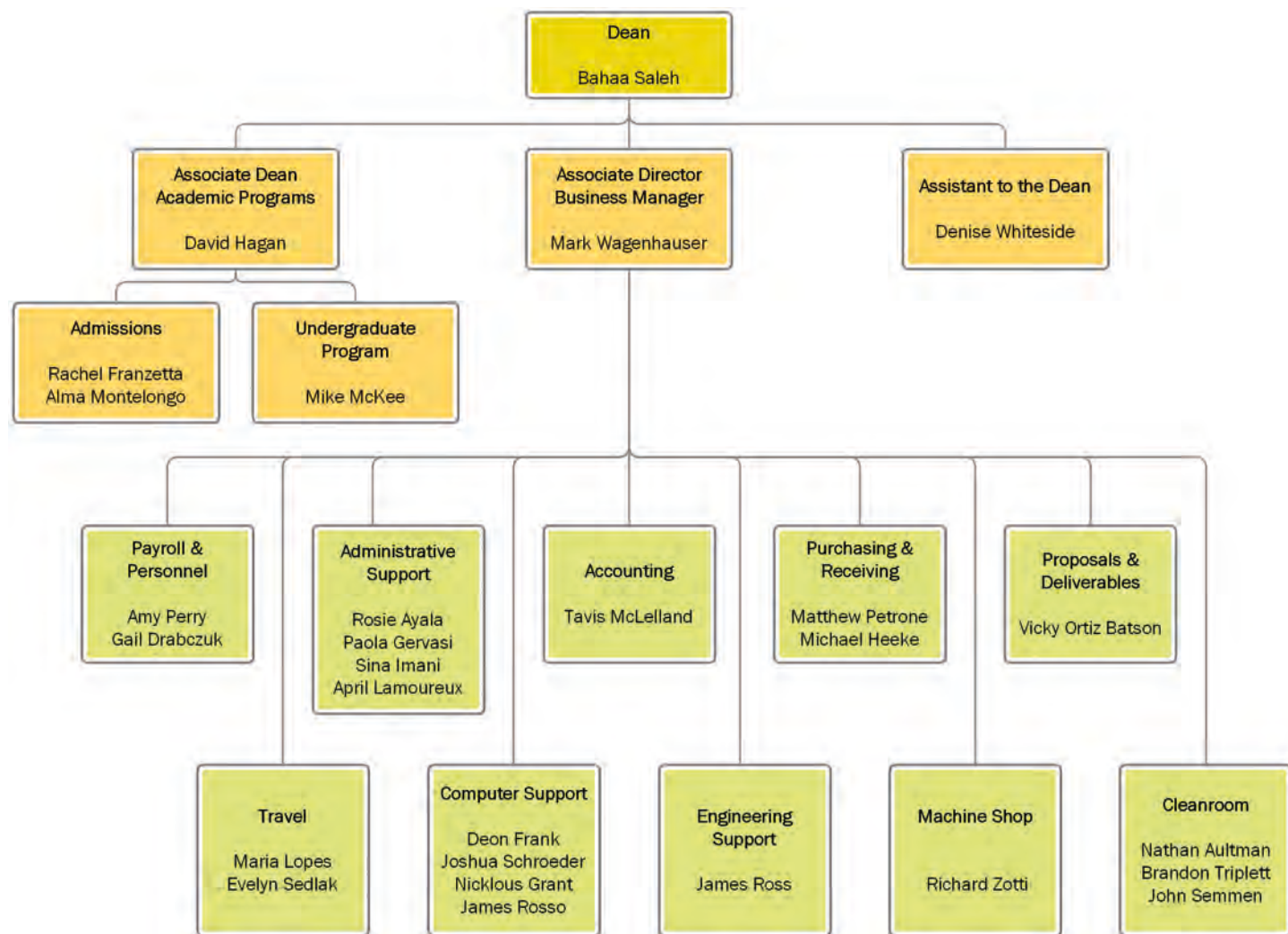
Helene Mingareev (Prof. Glebov)

LAB TECHNICIANS

Arthur Freeman (Prof. M. Richardson)

Mishal Patel (Prof. Abouraddy)

ORGANIZATIONAL CHART



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.



ACADEMIC PROGRAMS

UNDERGRADUATE PROGRAM

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.

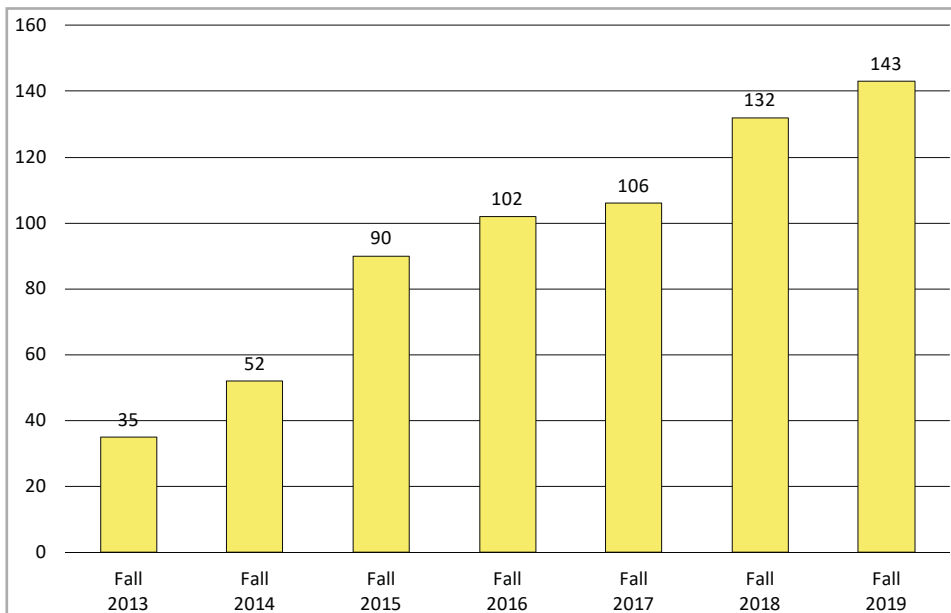
Recruiting Efforts

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



History of of Undergraduate Student Enrollment

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.

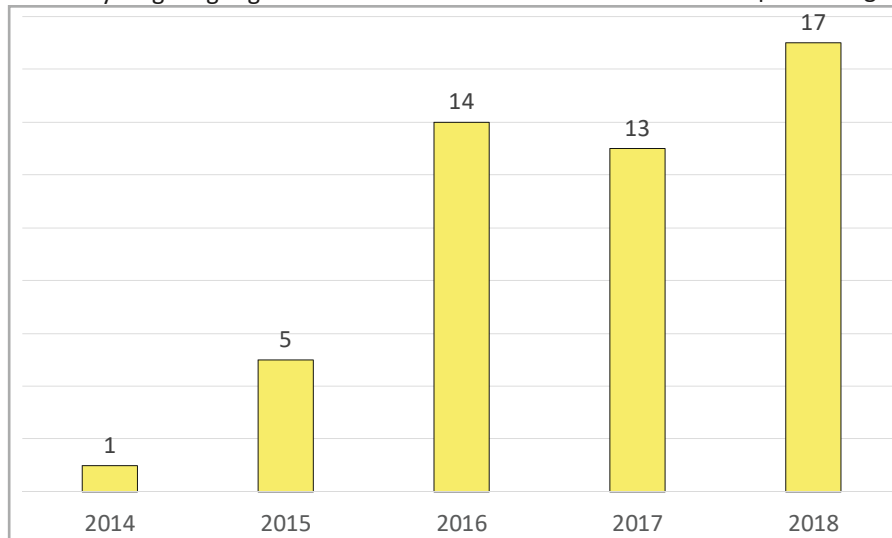
While recruiting at state colleges and UCF have an immediate impact in PSE enrollment, the impact from efforts to recruit high school students will not be seen for years. Furthermore, efforts to recruit high school students must be sustained over a long period of time. The College has invested in promotional 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.



History of Undergraduate Degrees Awarded

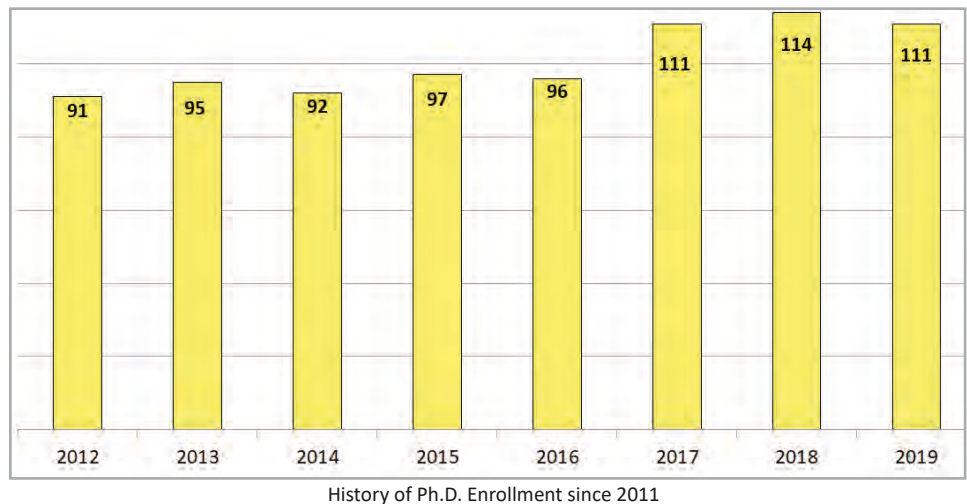
GRADUATE PROGRAM

GRADUATE RECRUITMENT AND ENROLLMENT

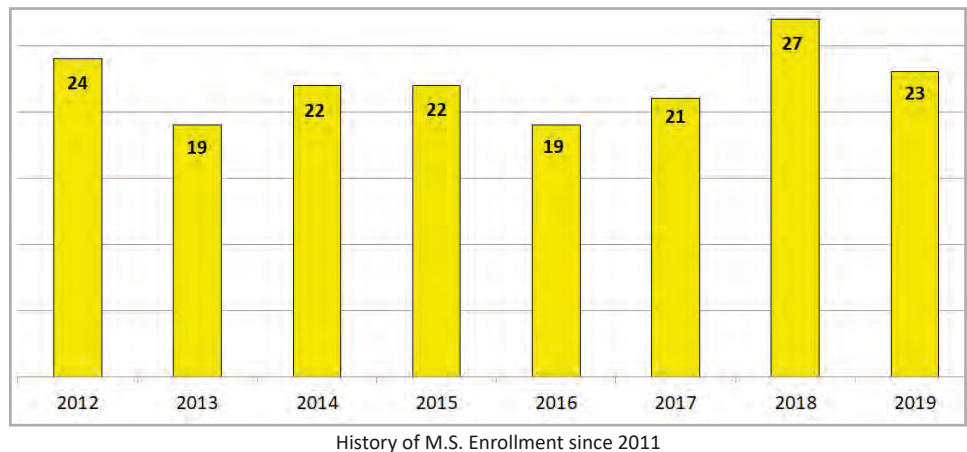
Enrollment of 111 students the Ph.D. program in Fall 2019 represents an increase over the previous eight year average of 101. This is primarily due to the hiring of new faculty, along with increase in external funding from the prior year. As new faculty increase their research funding portfolios, we 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



Undergraduate students from universities around Florida touring the Fiber Draw Tower

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.

Fall 2019 Mean GRE Scores							
		Quantitative	%	Verbal	%	Analytic Writing	%
Ph.D.	US	161	79%	156	70%	4	59%
	Intl	167	91%	151	52%	3	29%

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.

New Matriculant Demographic						Fellowships & Scholarships				
		Male	Female	FT	PT	ORC Fellowship	CREOL Fellowship	Endowed Fellowship Award	UCF Trustee	UCF Dean
Ph.D.	US	6	1	7	0	6	1	0	2	0
	Intl	9	3	12	0	11	1	1	2	0
M.S.	US	3	2	5	0	0	0	0	0	0
	Intl	0	0	0	0	0	0	0	0	0
Total New Students			26							

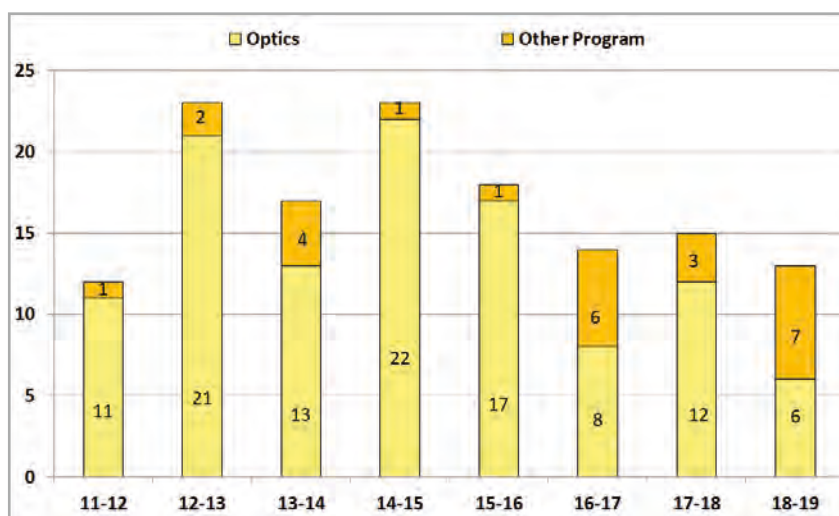
*Northrop Grumman, Schwartz, Suchoski, Frances Townes

DEGREES AWARDED

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

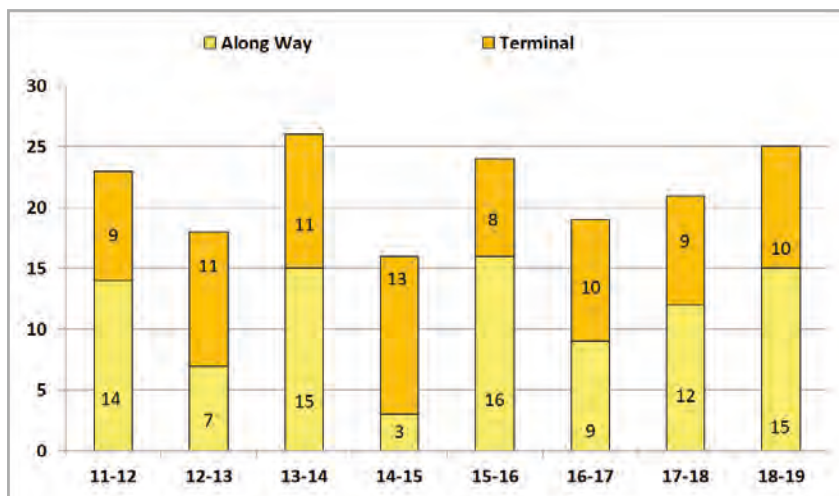
The Ph.D. chart shows that there was a decrease in the number of Ph.D. degrees awarded in the past year. A total of 146 Optics degrees plus 28 from other programs were awarded in the ten year period between 2009-10 to 2018-19, and the average number of degrees awarded is 17.4 per year.

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.

COURSE NUMBER AND NAME		SPRING 2019	SUMMER 2019	FALL 2019
CORE GRADUATE COURSES				
OSE 5115	Interference, Diffraction and Coherence	Dogariu		Dogariu
OSE 5203	Geometrical Optics and Imaging Systems		Moharam	
OSE 5312	Light Matter Interaction	Gaume		
OSE 5414	Fundamentals of Optoelectronics			Gelfand
OSE 6111	Optical Wave Propagation	Argenti		Moharam
OSE 6211	Imaging and Optical Systems	Driggers		
OSE 6265	Optical Systems Design		Curatu	
OSE 6421	Integrated Photonics	Fathpour		
OSE 6474	Optical Communication Systems	Christodoulides		
OSE 6525	Laser Engineering	Schülzgen		

COURSE NUMBER AND NAME		SPRING 2019	SUMMER 2019	FALL 2019
OTHER GRADUATE COURSES				
IDS 6416	History of Physical Science and Cultural Connections		Soileau	
OSE 5313	Materials for Optical Systems	K. Richardson		
OSE 6125	Computational Photonics	Moharam		
OSE 6143	Fiber Optics Communication	Li		
OSE 6334	Nonlinear optics			Vodopyanov
OSE 6347	Quantum Optics	Saleh		
OSE 6349	Applied Quantum Mechanics for Optics			Kik
OSE 6445	Fundamentals of Ultrafast Optics			Delfyett
OSE 6447	Attosecond Optics			Chang
OSE 6455C	Photonics Laboratory			Yu
OSE 6526C	Laser Engineering Laboratory	Vodopyanov	M. Richardson	
OSE 6527	Fiber Lasers			Schulzgen
OSE 6650	Optical Properties of Nanostructured Materials	Kik		
OSE 6820	Flat Panel Displays		Wu	
OSE 6938	ST: Infrared Systems		Driggers	
OSE 6938	ST: Quantum Cascade Lasers			Lyakh
UNDERGRADUATE COURSES				
OSE 1101	Seeing the Light	Soileau		
OSE 3043	Analytical Methods of Photonics	Gelfand		
OSE 3052	Foundations of Photonics	Amezcu-Correa		LiKamWa
OSE 3052L	Foundations of Photonics Laboratory	Divliansky		Divliansky
OSE 3053	Electromagnetic Waves for Photonics	Moharam		
OSE 3200	Geometric Optics	Han		Renshaw
OSE 3200L	Geometric Optics Laboratory	Yu		Ulseth
OSE 4240	Optics and Photonics Design	Pang		
OSE 4410	Optoelectronics	Khajavikhan		
OSE 4410L	Optoelectronics Laboratory	Kar		
OSE 4470	Fiber-Optic Communications			Amezcu-Correa
OSE 4470L	Fiber-Optic Communications Laboratory			Li
OSE 4520	Laser Engineering	Delfyett		
OSE 4520L	Laser Engineering Laboratory	LiKamWa		
OSE 4720	Visual Optics	Soileau		
OSE 4721	Biophotonics			Han
OSE 4830	Imaging and Display			Pang
OSE 4830L	Imaging and Display Laboratory			Kar
OSE 4930	Frontiers of Optics and Photonics			Kuebler
OSE 4951	Senior Design I	Hagan	Hagan	Hagan
OSE 4952	Senior Design II	Hagan	Hagan	Hagan
UNDERGRADUATE COURSES AT OTHER COLLEGES				
CHM 2046	Chemistry Fundamentals	Kuebler		
EEL 4440	Optical Engineering			LiKamWa
EMA5140	Intro to Ceramic Materials			Gaume
PHY 2048C	General Physics Using Calculus			Argenti

DOCTORAL DISSERTATIONS AND POST-GRADUATION EMPLOYMENT

Degrees granted in academic year Summer 2018 – Spring 2019



Ali Kazemi Jahromi

Ph.D. Optics & Photonics, Summer 2018

Dissertation Title: Analysis and Design of Non-Hermitian Optical Systems

Advisor: Ayman Abouraddy

Employer: California Institute of Technology

Position Title: Post-Doctoral Associate



Absar Ulhassan

Ph.D. Optics & Photonics, Summer 2018

Dissertation Title: Non-Hermitian Optics

Advisor: Demetrios Christodoulides

Employer: Facebook

Position Title: Network Optical Engineer



William Hayenga

Ph.D. Optics & Photonics, Fall 2018

Dissertation Title: Fundamental Properties of Metallic Nanolasers

Advisor: Mercedeh Khajavikhan

Employer: Intel Corporation

Position Title: Electro-Optics Engineer



Alex Sincore

Ph.D. Optics & Photonics, Fall 2018

Dissertation Title: 2 Micron Fiber Lasers: Power Scaling Concepts and Limitations

Advisor: Martin Richardson

Employer: Luminar Technologies

Position Title: Laser Engineer



Yun-Han Lee

Ph.D. Optics & Photonics, Fall 2018

Dissertation Title: Liquid Crystal Phase Modulation for Beam Steering and Near-Eye Displays

Advisor: Shin-Tson Wu

Employer: Microsoft

Position Title: Optical Engineer



Nicholas S. Nye

Ph.D. Optics & Photonics, Spring 2019

Dissertation Title: Non-Hermitian And Space-Time Mode Management

Advisor: Demetrios Christodoulides

Employer: UCF/College of Optics & Photonics

Position Title: Post-Doctoral Associates



Nathan Bodnar

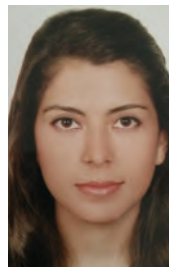
Ph.D. Electrical Engineering, Summer 2018

Dissertation Title: Design and Engineering Criteria for Optical Parametric Chirped Pulse Amplifier Systems

Advisor: Martin Richardson

Employer: UCF/College of Optics & Photonics

Position Title: Research Scientist



Sara Bakhshi

Ph.D. Electrical Engineering, Summer 2018

Dissertation Title: Excellent Surface Passivation for High Efficiency C₆₀/Si Solar Cells

Advisor: Winston Schoenfeld

Employer: Illumina

Position Title: Scientist, Nanofabrication, Optics and Photonics



Melissa Beason

Ph.D. Electrical Engineering, Fall 2018

Dissertation Title: Effects of Nonclassical Optical Turbulence on a Propagating Laser Beam

Advisor: Martin Richardson

Employer: European Research Consortium in Informatics and Mathematics, Italy

Position Title: Preeminent Postdoctoral Scholar



Eduardo Castillo

Ph.D. Mechanical Engineering, Summer 2018

Dissertation Title: Electrospray and Superlens Effect of Microdroplets for Laser-Assisted Nanomanufacturing

Advisor: Aravinda Kar

Employer: Consejero de la Sección Estudiantil ASME, CTO y Co-Founder de FLUIX LLC, y Co-Founder de Castillo Labs, Ecuador

Position Title: Professor



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

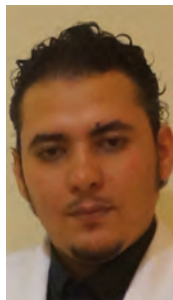
Ph.D. Material Science & Engineering, Fall 2018

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 Grant

UCF

UNDERGRADUATE

Latifah 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, Weiye
 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
 Gausmann, Stefan
 Gemar, Heath
 Ghaedi Vanani, Fatemeh
 Gholipour Vazimali, Milad
 Gou, Fangwang
 Grimming, Robert
 Guzman Sepulveda, Jose Rafael
 Hale, Evan
 Haq, A F M Saniul
 Hathaway, Dagan
 Hatipoglu, Isa
 Hayenga, William
 He, Juan "Rachel"

ADVISOR

Fathpour
 Hagan/Van Stryland
 Amezcua-Correa
 Glebov
 Schulzen
 Lyakh
 Dogariu
 Deppe
 Chanda
 Driggers
 Delfyett
 Driggers
 Fathpour
 Hagan/Van Stryland
 Dong
 Vodopyanov
 Pang
 Chang
 M. Richardson
 Hagan/Van Stryland
 Han
 Khajavikhan
 Han
 Dogariu
 Li
 Li
 Hagan/Van Stryland
 Driggers
 Schoenfeld
 Schulzen
 Driggers
 Li
 Driggers
 Wu
 Driggers
 Dogariu
 Glebov
 Yuksel
 Lyakh
 Schoenfeld
 Khajavikhan
 Wu

He, Ziqian
 Hewitt, Jennifer
 Hossain, Mohammad Jobayer
 Hsiang, En-Lin
 Hu, Xiaowen "Steven"
 Hu, Zhuoran
 Huang, Di
 Huang, Yuge
 Jayaprakash Saiji, Shruti
 Kawamori, Taiki
 Kazemi Jahromi, Ali
 Kerrigan, Haley
 Kompan, Fedor
 Konnov, Dmitrii
 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
 Mohammadian, Nafiseh
 Nicholas, Robert
 Nye, Nicholas
 Ordoie, Ehsan
 Parto, Midya
 Pena, Jessica
 Rahaman, Arifur
 Ren, Jinhan
 Roumayah, Patrick
 Ru, Qitian
 Sampson, Rachel
 Sanchez Cristobal, Enrique
 Shen, Zhean
 Shin, Dong Jin
 Shirpurkar, Chinmay
 Sincore, Alex
 Singh, Mamta
 Sjaardema, Tracy
 Smith-Dryden, Seth
 Sun, Mengdi

Wu
 K. Richardson
 Davis
 Wu
 Schulzen
 Delfyett
 Wu
 Bandres
 Vodopyanov
 Abouraddy
 M. Richardson
 Glebov
 Vodopyanov
 Saleh
 Wu
 Khajavikhan
 Gelfand
 Wu
 Li
 Khajavikhan
 Christodoulides
 Renshaw
 Abouraddy
 Fathpour
 Gelfand
 Chanda
 Driggers
 Driggers
 Christodoulides
 Fathpour
 Christodoulides
 M. Richardson
 Yu / Kar
 Khajavikhan
 M. Richardson
 Vodopyanov
 Li
 Lyakh
 Dogariu
 M. Richardson
 Delfyett
 M. Richardson
 Chini
 Fathpour
 Saleh
 Kik

Doctoral Students Continued

STUDENT

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

PROGRAM/ADVISOR

Pang
Lyakh
Wu
Abouraddy
Wu
Han
M. Richardson
Hagan/ Van Stryland
Delfyett
Christodoulides
Li
Han
Amezcu-Correa
Christodoulides
Dogariu
Wu
Kuebler
Abouraddy
Wu
Wu
Gelfand
Li / LiKamWa
Schulzgen
Yu
Chang
Wu
Pang

Croop, Benjamin
De Larosiere, Allison
Foster, Joshua
Fudala, Nicolette
Gao, Munan
Go, Rowel
Hatipoglu, Isa
Hu, Xiaowen "Steven"
Jia, Fei
Lee, Hee Cheon
Leshin, Jason
Li, Chih-Hao
Lopez Aviles, Helena
Ma, Zhao
Maloof, William
McGill, Daniel
Mohammadian, Nafiseh
Morone, Nicholas
Nergard, Christopher
Oh, Bumjin
Rolon, Lee
Rose, Roger
Ross, Brett
Saghaye Polkoo, Sajad
Shah, Tarj
Shin, Dong Jin
Sjaardema, Tracy
Singh, Mamta
Smucz, Joseph
Steele, Grayson
Suttinger, Matthew
Tang, Jialei
Tofighi, Salimeh
Venegas, Rebecca
White, Jonathon
Wittek, Steffen
Woodruff, Justin
Wu, Fan
Yang, Geng
Yin, Kun
Zhang, Yuanhang

Han

Driggers
Schoenfeld
Lyakh
Khajavikhan
Schulzgen
Amezcu-Correa

Khajavikhan
Fathpour
Christodoulides
Renshaw

K. Richardson/Gaume
Driggers

M. Richardson

Renshaw
Moharam
M. Richardson
Fathpour

Lyakh
Han
Hagan/Van Stryland

Amezcu-Correa

Christodoulides
Kuebler
Wu
Li

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
Delfyett
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
Delfyett
Dong
Pang
Han
Amezcu Correa
(none)
Khajavikhan
Fathpour
Khajavikhan
Christodoulides
Renshaw
K. Richardson
Driggers
M. Richardson
Lyakh
Moharam
M. Richardson
(none)
Fathpour
Wu
Hagan/Van Stryland
Amezcu Correa
Christodoulides
Li

*Master's Along the Way to Ph.D.



Bahaa Saleh (l) presents the Student of the Year award to Jose Rafael Guzman-Sepulveda at the Industrial Affiliates Symposium in March.

COLLOQUIA AND SEMINARS

DATE	SPEAKER	TITLE
1/15/2019	Charmaine Gilbreath NRL (retired)	Stereoscopy for Combining Science and Art for 3D Visualization and Volumetrics
1/17/2019	Gaurav Bahl	Non-Reciprocal Photonics with Optomechanical Resonator Systems
1/23/2019	SotY Finals Rafael Guzman Jian Zhao Zheyuan Zhu	Optical Monitoring of Blood Coagulability during Cardiovascular Surgery via Coherence-Gated DLS Deep Learning Cell Imaging through Anderson Localizing Optical Fiber Accelerating X-Ray Diffraction Tomography: Challenges and Solutions
1/24/2019	Giancarlo C. Righini Francesco Enrichi	Glasses and Guided-Wave Optics: More Than 50 Years of History
1/24/2019	Ivan Divliansky CREOL/UCF	Complex Holographic Elements and Laser Development based on PTR Glass (Candidate Talk)
1/29/2019	Yanlei Yu Fudan University	Liquid Crystal Polymers and Bioinspired Applications (SID Student Chapter Seminar)
1/29/2019	Rebecca Dylla-Spears Lawrence Livermore National Laboratory	Additive Manufacturing of Glass Optics
2/14/2019	Per Niklas Hedde University of California, Irvine	Optical Imaging with Super-resolution and Light Sheet Microscopy to Unravel Transient Processes in Live Cells, Tissues and Organisms (Biophotonics Faculty Candidate Seminar)
2/18/2019	Arthur Dogariu Princeton University	Nonlinear Optics for Remote Sensing
2/22/2019	Filiz Yesilkoy EPFL/STI-IBI-BIOS, Switzerland	Nanophotonic Biosensors: from Plasmonics to Dielectric Metasurfaces (Biophotonics Faculty Candidate Seminar)
2/28/2019	Peter Marasco AFRL	Science and Technology Opportunities at Air Force Research Lab for Engineers and Scientists
3/05/2019	Denis Seletskiy Polytechnique Montreal	Time-Domain Quantum Electrodynamics
4/01/2019	Melik Demirel Center for Advanced Fiber Technologies (CRAFT)	Protein based Photonic and Phononic Material
4/03/2019	Haizheng Zhong Beijing Institute of Technology	In-situ Fabricated Perovskite Quantum Dots for Display Applications (SID Student Chapter Seminar)
4/08/2019	Paul McManamon Exciting Technology LLC	A Hyper Data Center using Very High Data Rate Lasercom
4/18/2019	Andreas Vasdekis University of Idaho	Looking at Cellular Noise, as a Matter of Fat
4/19/2019	Joseph A. Izatt Duke University	New Optical Technologies for Real-Time Volumetric Biomedical Imaging and Image-Guided Robotic Microsurgery
4/23/2019	Richard Vollmerhausen St. Johns Optical Systems	Silicon Waveguide Imaging and Image Fusion
4/25/2019	Arash Mafi University of New Mexico	Anti-Stokes Fluorescence Cooling of Fiber Lasers
5/01/2019	Qitian Ru Guanjun Tan CREOL/UCF	The Appealing Features of Subharmonic OPOs for Achieving Mid-Infrared Frequency Combs Optical Challenges in AR/VR Displays (OSA Student Section Graduate Research Symposium)
5/20/2019	Utpal Das Indian Institute of Technology	InGaAsP/InP Embedded Ring Modulators and Switches
6/20/2019	Kirsten Howley Benjamin T. Grover	Lawrence Livermore National Laboratory (LLNL) Information Session
7/11/2019	Tien-Chang Lu National Chiao Tung University	One-dimensional Surface Plasmon Polariton Nanolasers and Arrays (SID & IEEE Joint Student Chapter Seminar)
7/18/2019	Grover Swartzlander Rochester Institute of Technology	Flying on a Rainbow with a Diffractive Solar Sail (SID Student Chapter Seminar)

7/22/2019	Yves Bellouard Ecole Polytechnique Fédérale de Lausanne (EPFL) Switzerland	Femtosecond Laser Three-Dimensional Exposure of Silica Substrate in the Non-Ablative regime: From Laser-Induced Modifications to Applications
7/25/2019	Michael Horodyski Vienna University of Technology (TU Wien)	Optimal Wave Fields for Micromanipulation in Complex Scattering Environments
8/23/2019	Eric Van Stryland CREOL/UCF	Faculty Research Seminar
9/06/2019	Ryan Gelfand Kyu Young Han CREOL/UCF	Introduction to Research at CREOL
9/12/2019	Alvaro Casas Bedoya University of Sydney	Silicon, Chalcogenides, and Brillouin Scattering: An approach for Integrated Microwave Photonics (OSA Student Chapter Seminar)
9/13/2019	Axel Schulzgen Kyle Renshaw CREOL/UCF	Introduction to Research at CREOL
9/18/2019	Pieter Kik Martin Richardson CREOL-UCF	Introduction to Research at CREOL
9/25/2019	Peter Delfyett Miguel Bandres CREOL-UCF	Introduction to Research at CREOL
10/04/2019	Sasan Fathpour Michael Chini CREOL/PS-UCF	Introduction to Research at CREOL
10/07/2018	David Hagan CREOL/UCF	Ultrafast Nonlinear Refraction and Absorption in Semiconductors
10/09/2019	Xiaoming Yu Debashis Chanda CREOL/NSTC-UCF	Introduction to Research at CREOL
10/10/2019	Bernard Kippelen Georgia Tech	Organic Optoelectronics Rhapsody
10/14/2019	Nathaniel Kinsey Virginia Commonwealth University	Applications for Emerging Materials in Nonlinear Optics and Integrated Photonics
10/15/2019	Liam Barry Dublin City University	Advanced Optical Sources for Spectrally Efficient Photonic Systems (IEEE Student Chapter Seminar)
10/21/2019	Demetri Psaltis Ecole Polytechnique Fédérale de Lausanne	Learning, Neural Networks and Optics
10/24/2019	Diana Huffaker Cardiff University	Application Driven Optoelectronics based on III-V Nanostructures and Plasmonics
11/13/2019	Brian T. Cunningham University of Illinois at Urbana-Champaign	Biosensing with Digital Resolution for Ultrasensitive Diagnostics (IEEE Student Chapter Seminar)
11/18/2019	Juan-Carlos Alvarado Steffen Wittek CREOL/UCF	Connecting the World - Submarine Fiber Links (OSA Student Chapter Seminar)

RESEARCH

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)

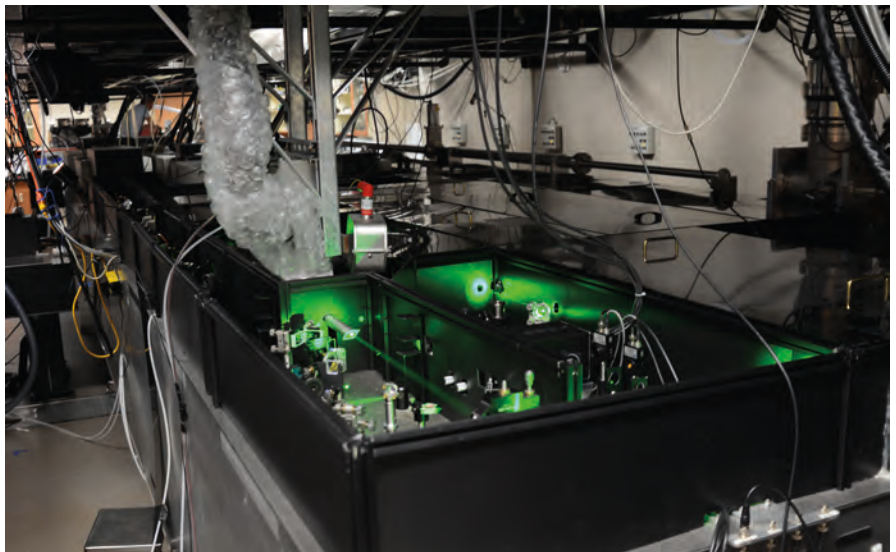
The FPCE was established with a \$10 million grant from the State of Florida to create a new center of excellence within The College of Optics and Photonics at the University of Central Florida. The program began in 2003 with three primary goals: Advance excellence in research and graduate education 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.



Zenghu Chang's Attosecond Laboratory.

AREAS OF RESEARCH



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, atto-second 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



Laser and Plasma Laboratory

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



One of two fiber draw towers in the college.

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



Molecular Beam Epitaxy Laboratory

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



Demonstration of white light continuum generated by high power laser.

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 scribe 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, scribe, 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.



Graduate student Matt Julian is inspecting a transparent laser ceramic after vacuum sintering.

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 Divliansky.

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 ATTOWECOND 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 Divliansky.

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 foreveated imaging and zoom lens, and 4) bio-inspired tunable optical filters using cholesteric liquid crystals. Shin-Tson Wu.

MID-INFRARED COMBS GROUP (MIR)

Broadband mid-infrared ($\lambda > 2.5 \mu\text{m}$) frequency combs generation based on subharmonic optical parametric oscillators. Trace molecular sensing and coherent dual-comb spectroscopy using octave-wide MIR combs. Biomedical applications of frequency combs. Photonic THz wave generation and THz imaging. Nano-IR spectroscopy. Konstantin Vodopyanov.

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 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

Developing nanoscale emitters using metallic structures, study the dynamic response of nanoscale lasers. Generation and characterization of non-classical light. Mercedeh Khajavikhan.

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.



Qitian Ru (l) and Zach Loparo perform spectroscopic experiments with mid-infrared frequency combs.

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.

RESEARCH HIGHLIGHTS

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 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) 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.



Zenghu Chang

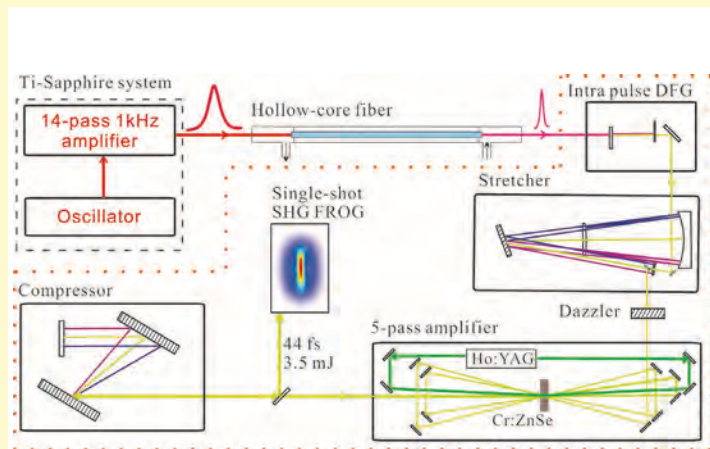


Fig. 1. Layout of Cr²⁺:ZnSe CPA system.

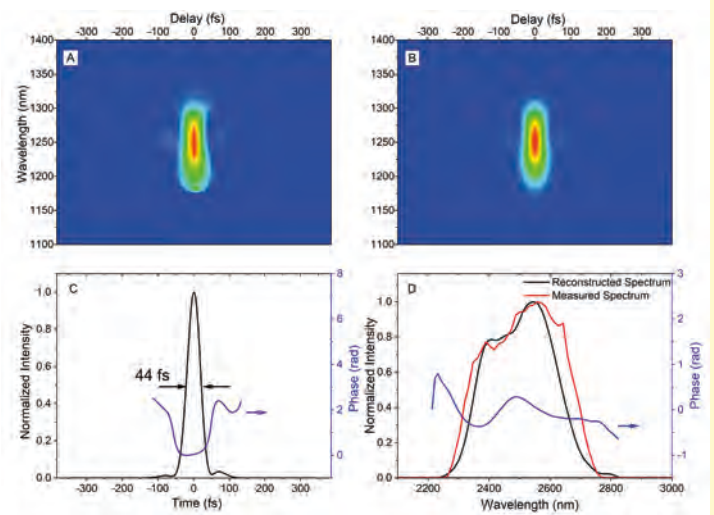


Fig. 2. FROG measurement and retrieval.

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Light Guiding by Artificial Gauge Fields

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,

We demonstrate two mechanisms for waveguiding with artificial gauge fields. In our first realization, by tilting the waveguides in

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.

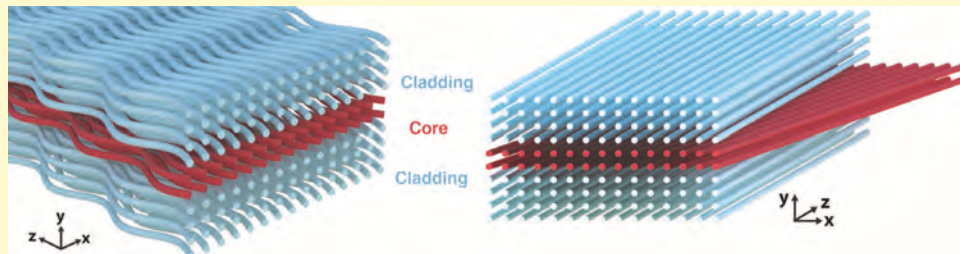


Figure 1

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

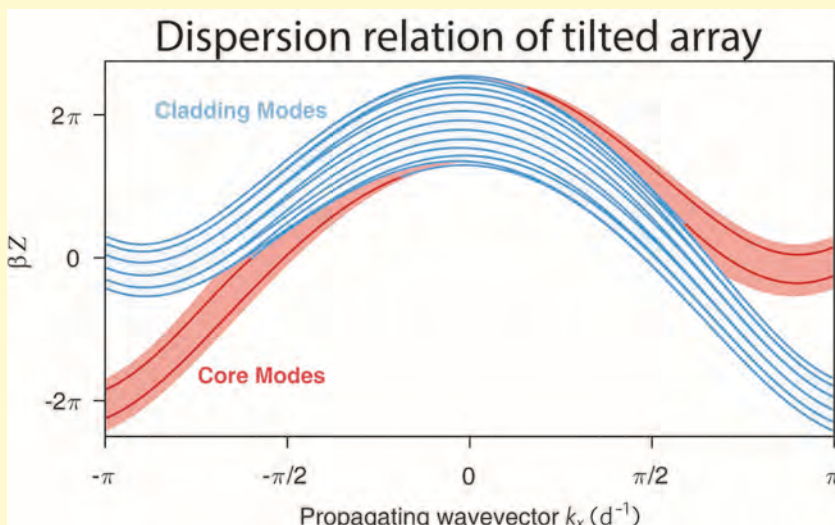


Figure 2

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.

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.

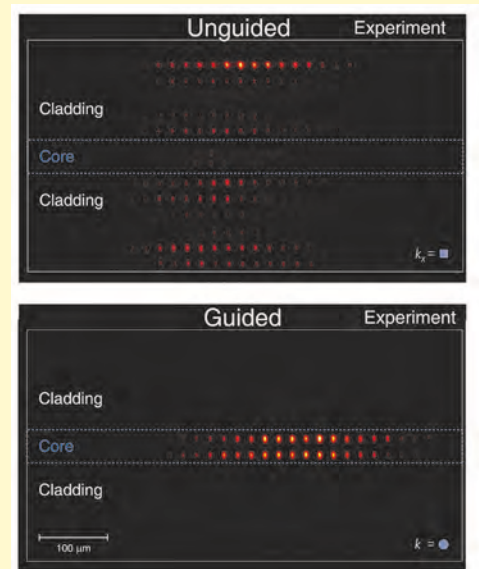
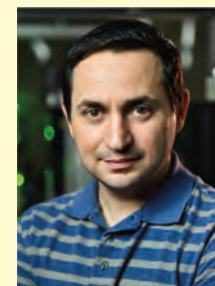


Figure 3

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M. Kang, T. Malendevych, M.C. Richardson, **K.A. Richardson**, G. Yin, J. Hu, I. Mingareev, and I. Murray, *Photothermally-induced Ge-As-Pb-Se chalcogenide glass-ceramic films with infrared function towards a*

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B. Bhaduri, M. Yessenov, D. Reyes, M. Meem, S. Rostami-Fairchild, **M.C. Richardson**, R. Menon, and **A.F. Abouraddy**, *Broadband space-time wave*

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

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C. French, M. Julian, R.I. Grigorev, **A. Schülzgen**, and **R.M. Gaume**, *Fabrication of Transparent Magneto-Optic YIG Ceramics*, 43rd International Conference and Exposition on Advanced Ceramics and Composites (ICACC2019), ICACC-S14-006-2019 (2019).

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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**

A.I. Adamu, M.S. Habib, C.R. Petersen, J.E. Antonio-Lopez, B. Zhou, **A. Schülzgen**, M. Bache, **R. Amezcua-Correa**, O. Bang, and C. Markos, *Multi-octave supercontinuum generation from deep-UV to mid-IR in a noble gas-filled fiber*, SPIE Photonics West Fiber Lasers XVI: Technology and Systems, 10897-57) (2019). **Invited**

M.S. Habib, J.E. Antonio-Lopez, C. Markos, **A. Schülzgen**, and **R. Amezcua-Correa**, *Single mode, low-loss 5-tube nested hollow-core anti-resonant fiber*, Optical Fiber Communications Conference (OFC), W2A.12 (2019).

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Yingjie Chai, **M.J. Soileau**, *Electron dynamic analysis of few-cycle laser-induced damage (Conference Presentation)*, Proceedings Volume 11173, Laser-induced Damage in Optical Materials (2019).

S. Vasilyev, I.S. Moskalev, V.O. Smolski, J.M. Peppers, M. Mirov, A.V. Muraviev, **K.L. Vodopyanov**, S.B. Mirov, and V.P. Gapontsev, *5-octave laser source based on Cr:ZnS-GaSe tandem*, Conference on Lasers and Electro-Optics (CLEO): Science and Innovations, STh4E.3 (2019).

Q. Ru, P.G. Schunemann, S. Vasilyev, S.B. Mirov, and **K.L. Vodopyanov**, *A 2.35- μ m pumped subharmonic OPO reaches the spectral width of two octaves in the mid-IR*, Conference on Lasers and Electro-Optics (CLEO), SF1H.1. (2019).

T. Tomberg, A. Muraviev, Q. Ru, and **K.L. Vodopyanov**, *Background-free mid-infrared absorption spectroscopy based on interferometric suppression with a sign-inverted waveform*, Conference on Lasers and Electro-Optics (CLEO), SF1I.2 (2019).

Q. Ru, T. Kawamori, S. Vasilyev, 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).

S. Vasilyev, I.S. Moskalev, V.O. Smolski, J.M. Peppers, M. Mirov, A.V. Muraviev, K. Zawilski, P.G. Schunemann, S.B. Mirov, **K.L. Vodopyanov**, and V.P. Gapontsev, *Octave-spanning mid-infrared intrapulse difference frequency generation with a few-cycle Cr:ZnS laser*, Conference on Lasers and Electro-Optics (CLEO): Science and Innovations, STh4E.6 (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, *Augmented reality & virtual reality displays*, OSA IONS Conference at Orlando (2019).

Y. Huang, G. Tan, M.C. Li, S.L. Lee, and **S.T. Wu**, *Emerging high-dynamic-range mini-LED displays*, Proceedings SPIE 10942, Advances in Display Technologies IX, 1094205 (2019).

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G. Tan, T. Zhan, Y.H. Lee, J. Xiong, and **S.T. Wu**, *Near-eye light field display with polarization multiplexing*, SPIE Proceedings 11040, Optical Design Challenge, 110400E (2019).

X. Yu, *Exploiting novel multi-pulse induced physics for fabrication*, Frontiers in Optics (FIO) (2019).

X. Yu, *Introduction to Ultrafast Laser Processing Laboratory*, Mini-Workshop on Attosecond Physics (UCF) (2019).

S. Lei, X. Zhao, **X. Yu**, A. Hu, S. Vukelic, M.B.G. Jun, H.E. Joe, Y.L. Yao, and Y.C. Shin, *Ultrafast laser applications in manufacturing processes: a state of the art review*, MSEC2019-2968, V002T03A074 (2019).

X. Yu, *Ultrafast laser material processing: From a technological niche to an enabling manufacturing tool*, 11th International Conference on Information Optics and Photonics (CIOP) (2019).

Invited Lectures and Tutorials

D.J. Hagan, *An introduction to ultrafast nonlinear refraction and absorption.*, Seminar: Chandigarh University, Tuesday, December 11 (2019).

K.A. Richardson, *Engineering novel materials for optical systems: basics and applications*, OSA Siegman School, University of Rochester, 26 July - 2 August (2019).

K.A. Richardson, *Materials for optical systems*, 1st North American Summer School on Photonic Materials (NASSPM) at Laval University 16-22 June (2019).

M.C. Richardson, *Thulium fiber lasers*, MIT, Lincoln Labs (2019).

S.T. Wu, *Emerging augmented reality (AR) & virtual reality (VR) displays*, CREOL Industrial Affiliates Day Short Course, March, 14 (2019).

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

S.T. Wu, *Mini-LED/LCD, OLED, and Micro-LED: Who wins?*, BOE Technology, Hefei, China (2019).

S.T. Wu, *Mini-LED/LCD, OLED, and Micro-LED: Who wins?*, 3rd International Conference on Display Technology, Suzhou, China (2019).

Patents

R. Vaidyanathan and **A. Kar**, *System and method for surface modification by laser diffusion*, US 10 , 358 , 723 B2 (2019).

C. Rivero-Baleine, **K.A. Richardson**, M. Kang, and G. Love, *Optical aberration compensation lens using glass-ceramics and method of making*, Provisional patent, USSN 62/877,523 (2019).

H. Chen, **S.T. Wu**, W. Duan, M.C. Li, and S.L. Lee,, *Display devices and related methods involving patterned phase retarding*, U.S. patent 10,268,076 (2019).

Provisional/Utility

K.Y. Han and J. Tang, *Highly inclined swept tile (HIST) imaging apparatus, methods, and applications*, Patent Pending; U.S. Patent Application No. 16/398,463 (2019).

K.Y. Han and J. Tang, *Multiple inclined beam line-scanning imaging apparatus, methods, and applications*, Patent Pending; U.S. Patent Application No. 16/398,630 (2019).

R. Sampson, **G.F. Li**, H. Liu, R. Stegeman, H. Wen, P. Zhang, and Y. Zhang, *Few-mode amplified receiver for LIDAR*, Patent application submitted (ID: 33950) (2019).

Disclosures

C. Rivero-Baleine, M. Kang, G. Love, and **K.A. Richardson**, *Method for dispersion and refractive index engineering and broadening using glass-ceramics*, UCF patent disclosure #11423, (disclosure filed at UCF 030619; LMCO 121318) (2019).

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).

M. Bayat, *Cryogenic performance projections for ultra-small oxide-free vertical-cavity surface-emitting lasers*, 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).

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N. Fudala, *A comparison of MW vs LW UAV signatures forIRST*, 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).

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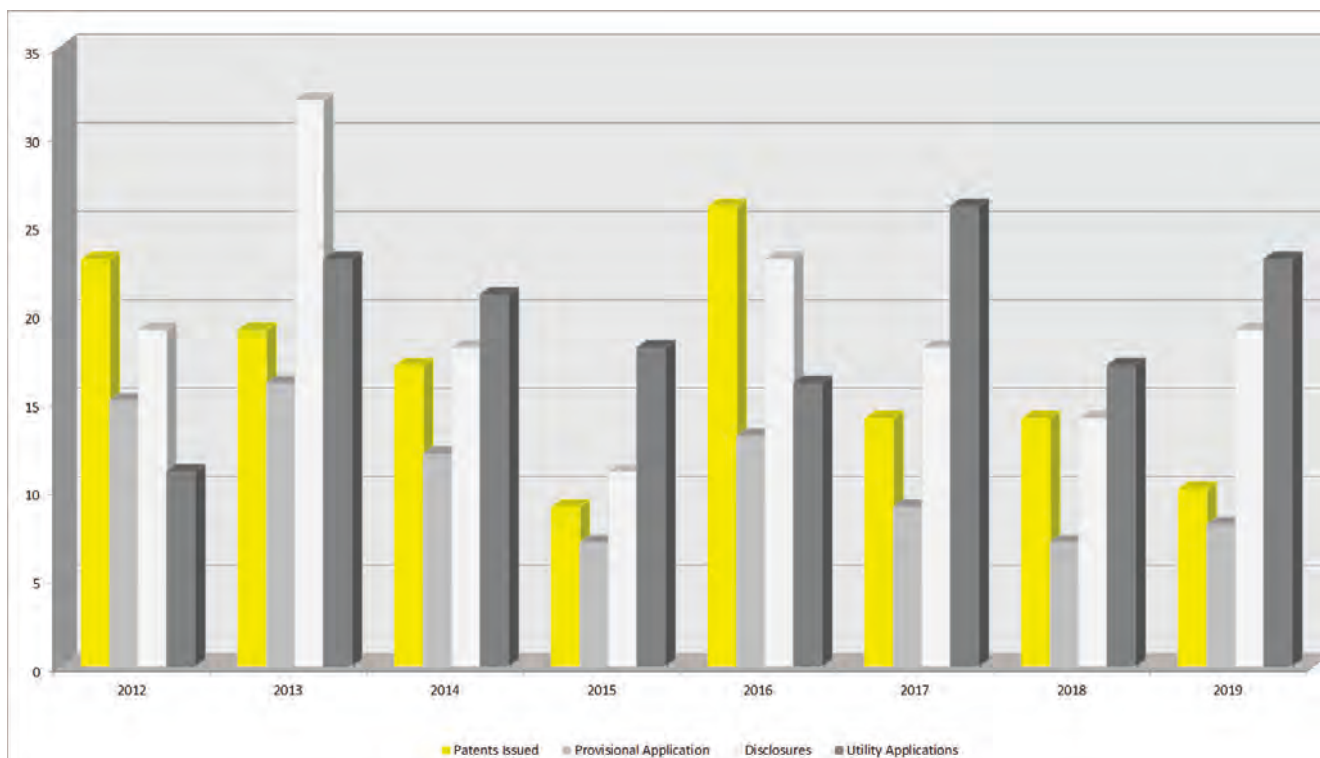
F. Kompan, *Holographic optical elements for visible light applications in photo-thermo-refractive glass*, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando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

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Y. Alahmadi, *Mode conversions in active semiconductor mqw 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.

D.J. McGill, *Processing of advanced infrared materials*, 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).

J. Peña, *Filament plasma density enhancement using two co-propagating beams*, 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).

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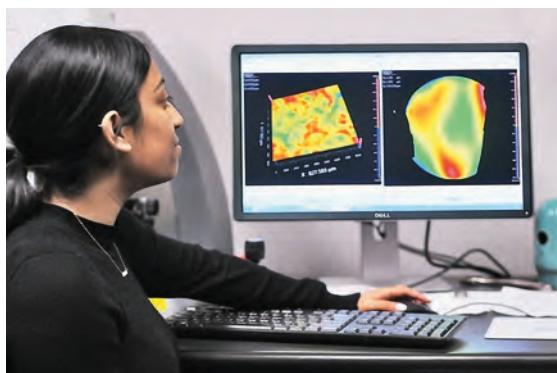
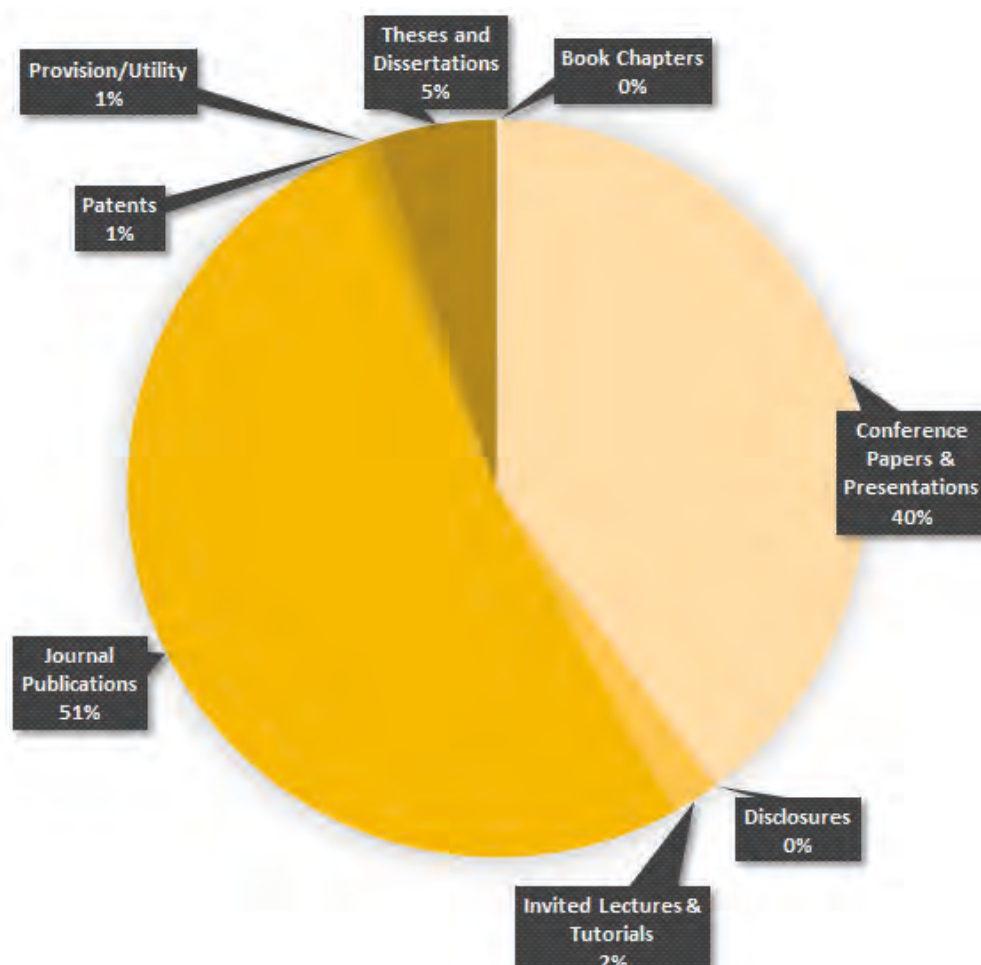
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Q. Ru, *Broadband mid-infrared frequency combs generated via frequency division*, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).

M.J. Rouf Talukder, *High performance liquid crystal devices for augmented reality and virtual reality*, 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).

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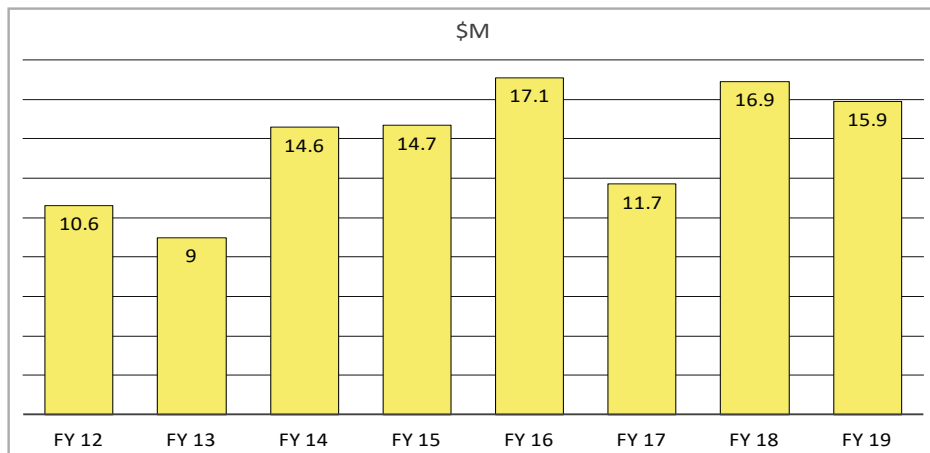
J. He, *Stable, highly luminescent perovskite-polymer composites for photonics applications*, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in CREOL, The College of Optics and Photonics at the University of Central Florida Orlando (2019).



RESEARCH FUNDING

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.

Federal	\$11,422,615
Federal Through Industry	\$1,500,256
Industry R&D	\$1,814,597
International	\$255,000
Foundation	\$970,444
Total	\$15,962,912



History of External Research Funding

RECEPIENT	SOURCE	TITLE OF AWARD	BEGIN	END	AWARDED
PI: Abouraddy, Ayman	Massachusetts Institute of Technology	Electrically Controlled Color-Changing Fabrics	2/16/2018	12/30/2019	\$239,063
PI: Abouraddy, Ayman	Massachusetts Institute of Technology	Harnessing in-fiber fluid instabilities for scalable and universal multidimensional nanosphere design, manufacturing, and applications	12/1/2014	10/31/2019	\$96,367
PI: Abouraddy, Ayman; CoPI: Atia	Office of Naval Research	Development of Diffraction-Free Space-Time Optical Beams	7/1/2017	6/30/2021	\$146,000
PI: Abouraddy, Ayman; CoPI: Bai, Li	Harris Corporation	Strong Ultra-Small Highly Integrated (SUSHI) Phase 2 Fiber Optic Cable (Prime 1)	4/30/2017	12/20/2018	\$33,104
PI: Abouraddy, . Ayman	Harris Corporation	Mako Prime 1	3/5/2018	6/30/2019	\$224,367
PI: Abouraddy, Ayman; CoPI: Webster	Office of Naval Research	Investigation of the limits of Diffraction-Free Space-Time Optical Beams	3/1/2019	2/28/2023	\$399,520
PI: Amezcua Correa, Rodrigo	Harris Corporation	19 Fibers Photonics Lantern	4/19/2018	5/31/2019	\$20,000
PI: Amezcua Correa, Rodrigo; CoPI: Li, Schulzgen	Harris Corporation	Multi-Core Fiber True-Time Delays for Ultra-Wide-band Analog Signal Processing Systems	8/15/2018	2/28/2019	\$220,676
PI: Argenti, Luca	National Science Foundation (NSF)	Attosecond photoemission dynamics: novel ab initio methods for atomic and molecular ex-situ spectroscopies	8/1/2019	7/31/2022	\$55,003
PI: Argenti, Luca	National Science Foundation (NSF)	Theoretical atomic attosecond spectroscopy: Monitor and control of electron correlation in real time	9/1/2016	8/31/2020	\$44,342
PI: Chang, Zenghu	National Science Foundation (NSF)	Collaborative Research: Probing Attosecond Charge Dynamics in Atoms and Molecules	8/1/2018	7/31/2021	\$68,600

PI: Chang, Zenghu	US Army Research Office	DURIP: Single-cycle, carrier-envelope phase locked lasers at 8 micron	4/1/2019	3/31/2020	\$175,569
PI: Chang, Zenghu	The Regents of The University of California	Post-Born-Oppenheimer Dynamics Using Isolated Attosecond Pulses	7/21/2014	10/20/2019	\$107,566
PI: Chang, Zenghu	US Air Force Office of Scientific Research (AFOSR)	Studying Ultrafast Electron Dynamics in Condensed Matter with Next Generation Attosecond X-ray Sources	12/15/2014	12/14/2019	\$551,250
PI: Chang, Zenghu	University of Ottawa	Tabletop Ultrafast X-rays for Metrology of Magnetic Materials	7/1/2018	12/31/2019	\$50,843
PI: Christodoulides, Demetrios N	Georgia State University	Novel Nonlinear Optical Processes in Active, Random, and Nanostructures Systems	6/1/2017	8/31/2020	\$127,134
PI: Christodoulides, Demetrios N	Office of Naval Research	Parity-Time Symmetric and Non-Hermitian Photonic Structures	6/1/2018	5/31/2020	\$150,000
PI: Christodoulides, Demetrios N	The Texas A&M University System	Self-generated spatiotemporal nanostructuring of laser light applied to energy transport and reconfigurable guiding networks in nanophotonics, plasmonic, and hybrid nanoparticles metacolloids	12/31/2016	12/31/2019	\$59,165
PI: Christodoulides, Demetrios N	Pennsylvania State University	MRSEC - Center for Nanoscale Science	11/1/2014	10/31/2020	\$60,000
PI: Christodoulides, Demetrios; CoPI: Abouraddy, Khajavikhan	US Air Force Office of Scientific Research (AFOSR)	MURI: PT-Symmetric Optical Materials and Structures	10/15/2013	7/14/2020	\$700,000
PI: Christodoulides, Demetrios; CoPI: Khajavikhan	Wesleyan University	Advanced Symmetry Concepts and their Violation in Composite Photonic Structures	8/6/2018	2/5/2020	\$199,695
PI: Christodoulides, Demetrios; CoPI: Amezcua Correa, Schulzgen	US Air Force Research Laboratory (AFRL)	Generating optical pulses with time-varying polarization states	2/2/2018	11/1/2021	\$250,000
PI: Christodoulides, Demetrios; CoPI: Khajavikhan	United States-Israel Binational Science	RF: Non-Hermitian Topological Photonics	9/1/2017	8/31/2021	\$33,000
PI: Christodoulides, Demetrios; CoPI: Khajavikhan, Moharam	University of California, San Diego	Programmable Universal Multifunctional Apertures (PUMA)	8/6/2018	2/6/2020	\$137,235
PI: Crabbs, Robert F	Office of Naval Research	Modeling of the lower atmosphere to facilitate improved laser propagation	12/1/2017	11/30/2022	\$125,131
PI: Crabbs, Robert F	Inertial Labs, Inc	Testing Support for Next Gen MILES	10/28/2017	10/27/2019	\$297,600
PI: Crabbs, Robert F	UTC Aerospace Systems	UTC Aerospace Testing at SLF	5/1/2018	6/1/2018	\$14,080

PI: Crabbs, Robert F	Office of Naval Research	Atmospheric Propagation for High Energy Lasers, Supporting APSHEL Program	1/1/2017	12/31/2019	\$250,000
PI: Crabbs, Robert F	University of Florida Board of Trustees	Operations Support for CHOMPTT CubeSat Mission	10/1/2018	12/31/2019	\$50,608
PI: Crabbs, Robert F	NASA Kennedy Space Center	Optical Testing and Modeling of antenna dish	11/29/2018	8/31/2019	\$55,754
PI: Crabbs, Robert; CoPI: Driggers	US Air Force	SWIR Telescope System	4/29/2019	4/28/2022	\$301,212
PI: Deppe, Dennis G	US Army Research Office	Scalable High Speed Laser Diode for Silicon Integration	10/1/2015	9/30/2019	\$116,742
PI: Deppe, Dennis G	University of Texas at Austin	Research and Development of Nanocavity Lasers for Integration with Single Mode Silicon Waveguides	12/1/2016	11/30/2019	\$160,127
PI: Dogariu, Aristide	Sherwin Williams Company	Rheology Measurement and Impact on Hide	6/1/2018	7/31/2019	\$105,508
PI: Dogariu, Aristide	Office of Naval Research	Stochastic Electromagnetics for Active Sensing	4/1/2018	3/31/2022	\$150,297
PI: Dogariu, Aristide; CoPI: Han	Defense Advanced Research Projects Agency (DARPA)	Electrodynamically mediated energy transduction in cytoskeleton	10/1/2017	12/31/2019	\$382,574
PI: Driggers, Ronald	IMEC	IPA: Ron Driggers IMEC Support	8/8/2017	5/31/2020	\$98,880
PI: Driggers, Ronald G	Fibertek, Inc.	ASD SME Support	5/21/2019	3/8/2020	\$32,729
PI: Driggers, Ronald G	DRS Network & Imaging Systems, LLC	Longwave Infrared Pitch-Well-Processing (PWP) Proof of Concept	11/9/2017	12/30/2019	\$119,000
PI: Driggers, Ronald G	IMEC	mmW and Thz Imaging System Performance	1/1/2018	12/31/2020	\$154,000
PI: Driggers, Ronald G	IMEC	Research Support for IMEC in the Area of Time-of-Flight Technologies	9/1/2018	2/21/2022	\$146,966

PI: Driggers, Ronald G; CoPI: Mahalanobis, Shah	General Technical Services	Machine Learning/Artificial Intelligence for Combat Vehicle Navigation and UAV Scout Operations	4/26/2019	10/31/2019	\$117,878
PI: Driggers, Ronald; CoPI: Crabbs, Renshaw	General Technical Services	Multi-UAS/Multi-Sensor Scout Operations	4/26/2019	10/31/2019	\$155,839
PI: Fathpour, Sasan	Northwestern University	Integrated Optics for Single-Photon Nonlinear Interactions	6/1/2017	5/31/2020	\$175,808
PI: Gaume, Romain; CoPI: Baudelet	Engi-Mat Co.	LIBS Characterization of Ceramic Powders	6/28/2019	9/30/2020	\$904
PI: Gaume, Romain	US Air Force Office of Scientific Research (AFOSR)	Optical Ceramic Science for High-Power Lasers	12/22/2017	12/21/2020	\$159,621
PI: Glebov, Leonid CoPI: Divliansky	IPG Photonics	Holographic optical elements in photo-thermo-refractive glass for laser parameters control	2/1/2019	10/31/2019	\$500,000
PI: Hagan, David J	University of Michigan	Measurement of Magneto-Electric Susceptibilities	12/1/2015	2/14/2020	\$44,899
PI: Hagan, David J	Lawrence Livermore National Laboratory Federal	Non-Linear Measurements	5/24/2019	7/31/2019	\$25,000
PI: Hagan, David; CoPI: Van Stryland	US Army Research Laboratory	Characterization of Novel Nonlinear Optical Materials	7/27/2015	7/26/2020	\$200,000
PI: Han, Kyu Young CoPI: Khajavikhan	National Science Foundation (NSF)	High-speed and minimally photo-damaging STED microscopy using nanolaser arrays	7/15/2018	6/30/2021	\$600,000
PI: Khajavikhan, Mercedeh	US Army Research Office	DURIP: Acquisition of an Advanced Plasma Etcher for III-V Nano-structures	7/17/2018	7/16/2019	\$250,000
PI: Khajavikhan, Mercedeh	Office of Naval Research	DURIP: Time Resolved Micro-Photo-Luminescence Measurement Station	6/1/2019	6/14/2020	\$299,870
PI: Khajavikhan, Mercedeh	Defense Advanced Research Projects Agency (DARPA)	YFA: Topological Phenomena in Active Photonic Platforms	7/2/2018	7/1/2021	\$500,000
PI: Khajavikhan, Mercedeh; CoPI: LiKamWa	US Army Research Office	Design fabrication and characterization of Electrically Pumped Coaxial Nanoscale Lasers	11/16/2015	8/15/2019	\$40,000

PI: Kim, Yoon-Seong; CoPI: Han, Bossy-Wetzel	National Institute of Neurological Disorders and Stroke (NINDS)	Pum2-dependent translational regulation of a-SYN near mitochondria and contribution to the pathogenesis of Parkinson's disease	9/15/2018	5/31/2023	\$32,594
PI: Kim, Yoon-Seong; CoPI: Han, Tatulian	National Institute of Neurological Disorders and Stroke (NINDS)	Contribution of transcriptional mutagenesis of oxidative DNA lesions to generating new mutant alpha-synuclein species and aggregation toward the pathogenesis of Parkinson's disease	12/15/2017	4/30/2020	\$10,912
PI: Kuebler, Stephen M	US Air Force Research Laboratory (AFRL)	Fundamental Study of Lens-Embedded Spatially-Variant Photonic Crystals	5/13/2019	8/13/2020	\$18,058
PI: Kuebler, Stephen M	Academy of Applied Science	2018 High School Summer Research Experience in the Kuebler-Group at UCF with the REAP/AEOP Program	10/1/2017	9/30/2019	\$600
PI: Li, Guifang	National Science Foundation (NSF)	NSF/ENG/ECCS-BSF: Collaborative Research: Random Channel Cryptography	9/1/2018	8/31/2021	\$225,000
PI: Li, Guifang	US Army Research Office	Acquisition of Coherent Transceivers	8/1/2018	1/31/2020	\$93,000
PI: Li, Guifang	US Army Research Laboratory	High-Speed Frequency-Hopping Free-Space Optical Communication	3/18/2019	3/17/2020	\$151,196
PI: Li, Guifang	Skyloom Global Corporation	High-Speed Laser Communication Systems	9/14/2018	11/30/2019	\$64,991
PI: Li, Guifang: CoPI: Amezcua Correa	US Army Research Office	Beamforming Techniques for Focusing Light Through Atmospheric Turbulence - Topic 4.2 Optoelectronics	9/26/2017	9/25/2020	\$396,766
PI: Pang, Shuo	Aqueti	Parallel Camera	5/30/2018	6/25/2018	\$5,587
PI: Raghavan, Seetha; CoPI: Schulzgen, O'Neal	National Science Foundation (NSF)	PFI:AIR - TT: Multi-scale and in-situ sensing technology for structural integrity	7/15/2017	3/31/2020	\$1,889
PI: Richardson, Kathleen A.	Lockheed Martin Missiles and Fire Control	Advanced Materials IRAD – Broadband Gradient Index (GRIN) Optics Characterization (Broadband GRIN #5)	1/26/2018	12/1/2018	\$35,000
PI: Richardson, Kathleen A.	The Charles Stark Draper Laboratory, Inc.	ATLIS: All-in-one Tunable Long-wave Infrared Spectral Imager	2/1/2018	6/30/2020	\$59,836
PI: Richardson, Kathleen A.	Massachusetts Institute of Technology	Large-scale Reconfigurable and Multifunctional 2.5-D Conformal Optics	4/1/2017	3/31/2020	\$227,455
PI: Richardson, Kathleen A.	LightPath	RF K. Richardson Equipment Use Account	1/1/2015	12/31/2019	\$956
PI: Richardson, Kathleen A.	Savannah River National Laboratory	RF K. Richardson Equipment Use Account	1/1/2015	12/31/2019	\$1,309
PI: Richardson, Kathleen A.	Massachusetts Institute of Technology	RF: K. Richardson Equipment Use Account -2	1/1/2018	12/31/2019	\$7,769

PI: Richardson, Kathleen A.	Various	RF: K. Richardson Equipment Use Account -2	1/1/2018	12/31/2019	\$2,889
PI: Richardson, Martin C	EoL Co., Ltd.	High Power Thulium Laser Marking System Development for Visibly Transparent Polymers	9/1/2017	12/31/2019	\$75,000
PI: Richardson, Martin C	US Army Research Office	Light Filamentation Science Add on (Topological photonic structures based on light filamentation)	5/20/2016	10/30/2019	\$121,514
PI: Richardson, Martin, CoPI: Amezcua Correa, Schulzgen, Shah	US Air Force Office of Scientific Research (AFOSR)	Fundamental Fiber Laser Science for High Powers	8/1/2015	7/31/2020	\$1,199,090
PI: Saleh, Bahaa	US Air Force Research Laboratory (AFRL)	Coded-Aperture-Polarization Quantum Optical Metrology	11/6/2018	10/7/2019	\$50,000
PI: Saleh, Bahaa	UCF Foundation, Inc	CREOL - UCF Foundation Gifts	7/1/2014	6/30/2020	\$969,844
PI: Schepler, Kenneth; CoPI: Richardson, M., Richardson, K	US Air Force Office of Scientific Research (AFOSR)	Iron Fiber Laser	4/15/2019	4/14/2022	\$796,032
PI: Schoenfeld, Winston V	Qrona Technologies	Low-cost production of ultra-low-defect GaN-based power electronics	4/25/2018	10/25/2018	\$40,000
PI: Schulzgen, Axel	Pennsylvania State University	Anti-resonant Hollow Core Fiber (ARHCF) for High Power and MWIR	9/1/2019	8/31/2021	\$23,098
PI: Schulzgen, Axel; CoPI: Schepler	Northrop Grumman Corporation Aerospace Systems	RF: Pilot Study on New Fiber Material	12/10/2018	12/31/2019	\$110,000
PI: Vodopyanov, Konstantin L	University of California, Los Angeles	Fundamental Studies of Nonlinear Optics and Laser-plasma Phenomena in Gases and Solids Using High-Power LWIR Lasers	8/1/2017	7/31/2020	\$100,000
PI: Wu, Shin-Tson	Microsoft Corporation	Broadband Optical Shutter	10/16/2018	7/31/2019	\$65,000
PI: Wu, Shin-Tson	Intel Research Council	Fast-response liquid crystal devices for light field displays	11/15/2016	11/14/2019	\$75,000
PI: Wu, Shin-Tson	Shadevision GmbH	Smart Windows for Automotive Applications	6/1/2018	5/31/2021	\$180,000
PI: Wu, Shin-Tson	US Air Force Office of Scientific Research (AFOSR)	Submillisecond-response liquid crystal spatial light modulators	9/1/2014	8/31/2020	\$168,000
PI: Yu, Xiaoming	National Science Foundation (NSF)	CAREER: Scalable Nanolithography Using Ultra-short Laser Pulse Trains Enabled by Avalanche-Assisted Photoabsorption	4/1/2019	3/31/2024	\$500,000
PI: Yu, Xiaoming; CoPI: Kar	Elsner Engineering Works	Laser Beam Engineering for high speed perforation of composite materials	8/10/2018	6/30/2020	\$375,000

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.



Cleanroom at the BRIDG facility in Osceola County.

PARTNERSHIP AND OUTREACH

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.

Jeff Crystal - Elbit Systems	Chrys Panayiotou- Indian River State College
Richard DeSalvo - L3/Harris	Clara Rivero-Baleine - Lockheed Martin
Orges Furxhi - IMEC	Al Symmons - LightPath
Zhibing Ge	Matt Weed - Luminar
Alexei Glebov - Optigrate	David Hagan - CREOL
Carl Kutsche - Idaho National Laboratory	Jim Moharam - CREOL
Brian Lawrerence - Hill Rom Holdings	Bahaa Saleh - CREOL
Teresa Pace - L3/Harris	



Members of the Undergraduate Advisory Board tour labs during their annual meeting at CREOL.

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 Eletronics
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

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

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

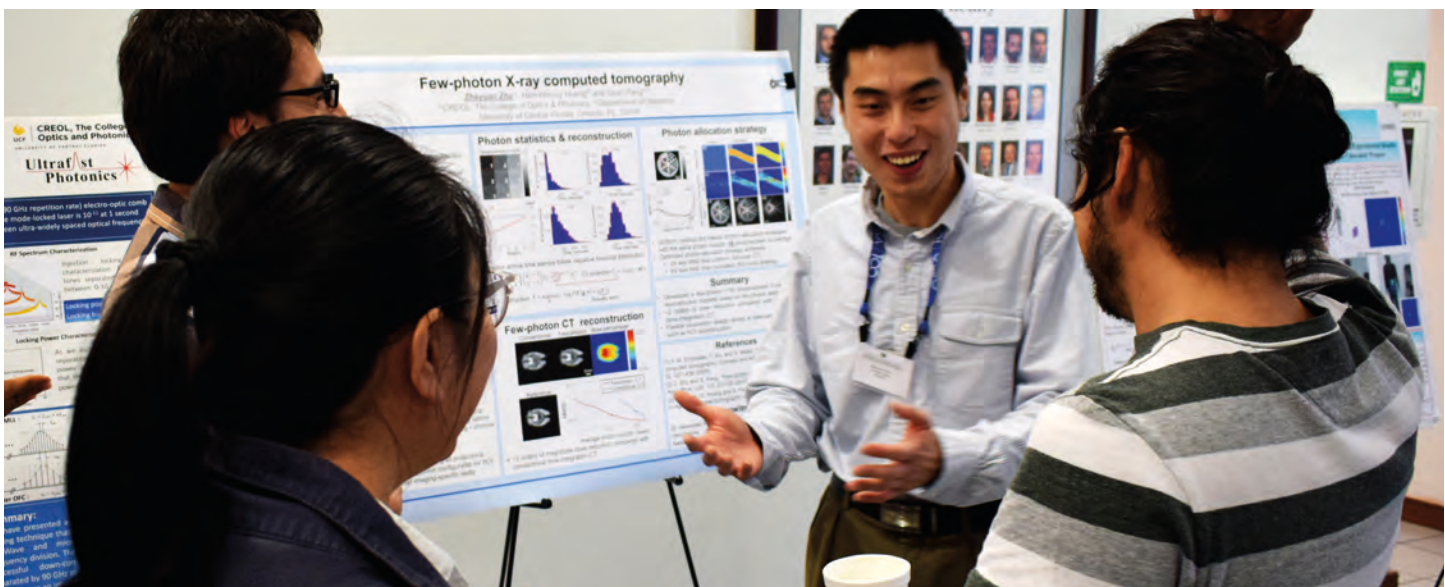
Clara Rivero Baleine	Lockheed Martin	Distinguished Alumni Award
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Tribute to Dr. Boris Zeldovich by Nelson Tabirian

STUDENT POSTERS AT THE INDUSTRIAL AFFILIATES SYMPOSIUM

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



Zheyuan Zhu (center) explains his research at the Industrial Affiliates Symposium poster session.

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.

RECEIPT	SOURCE	TITLE OF AWARD	BEGIN	END	AWARDED
PI: Pang, Shuo	Aqueti	Parallel Camera	5/30/2018	6/25/2018	\$5,587
PI: Driggers, Ronald G	DRS Network & Imaging Systems, LLC	Longwave Infrared Pitch-Well-Processing (PWP) Proof of Concept	11/9/2017	12/30/2019	\$119,000
PI: Yu, Xiaoming; CoPI: Kar	Elsner Engineering Works	Laser Beam Engineering for high speed perforation of composite materials	8/10/2018	6/30/2020	\$375,000
PI: Gaume, Romain; CoPI: Baudalet	Engi-Mat Co.	LIBS Characterization of Ceramic Powders	6/28/2019	9/30/2020	\$904
PI: Richardson, Martin C	EoL Co., Ltd.	High Power Thulium Laser Marking System Development for Visibly Transparent Polymers	9/1/2017	12/31/2019	\$75,000
PI: Driggers, Ronald G	Fibertek, Inc.	ASD SME Support	5/21/2019	3/8/2020	\$32,729
PI: Driggers, Ronald G; CoPI: Mahalanobis, Shah	General Technical Services	Machine Learning/Artificial Intelligence for Combat Vehicle Navigation and UAV Scout Operations	4/26/2019	10/31/2019	\$117,878
PI: Driggers, Ronald; CoPI: Crabbs, Renshaw	General Technical Services	Multi-UAS/Multi-Sensor Scout Operations	4/26/2019	10/31/2019	\$155,839
PI: Abouraddy, Ayman; CoPI: Bai, Li	Harris Corporation	Strong Ultra-Small Highly Integrated (SUSHI) Phase 2 Fiber Optic Cable (Prime 1)	4/30/2017	12/20/2018	\$33,104
PI: Abouraddy, . Ayman	Harris Corporation	Mako Prime 1	3/5/2018	6/30/2019	\$224,367
PI: Amezcua Correa, Rodrigo	Harris Corporation	19 Fibers Photonics Lantern	4/19/2018	5/31/2019	\$20,000
PI: Amezcua Correa, Rodrigo; CoPI: Li, Schulzgen	Harris Corporation	Multi-Core Fiber True-Time Delays for Ultra-Wideband Analog Signal Processing Systems	8/15/2018	2/28/2019	\$220,676
PI: Driggers, Ronald	IMEC	IPA: Ron Driggers IMEC Support	8/8/2017	5/31/2020	\$98,880
PI: Driggers, Ronald G	IMEC	mmW and Thz Imaging System Performance	1/1/2018	12/31/2020	\$154,000

PI: Driggers, Ronald G	IMEC	Research Support for IMEC in the Area of Time-of-Flight Technologies	9/1/2018	2/21/2022	\$146,966
PI: Crabbs, Robert F	Inertial Labs, Inc	Testing Support for Next Gen MILES	10/28/2017	10/27/2019	\$297,600
PI: Wu, Shin-Tson	Intel Research Council	Fast-response liquid crystal devices for light field displays	11/15/2016	11/14/2019	\$75,000
PI: Glebov, Leonid CoPI: Divliansky	IPG Photonics	Holographic optical elements in photo-thermo-refractive glass for laser parameters control	2/1/2019	10/31/2019	\$500,000
PI: Richardson, Kathleen A.	LightPath	RF K. Richardson Equipment Use Account	1/1/2015	12/31/2019	\$956
PI: Richardson, Kathleen A.	Lockheed Martin Missiles and Fire Control	Advanced Materials IRAD – Broadband Gradient Index (GRIN) Optics Characterization (Broadband GRIN #5)	1/26/2018	12/1/2018	\$35,000
PI: Abouraddy, Ayman	Massachusetts Institute of Technology	Electrically Controlled Color-Changing Fabrics	2/16/2018	12/30/2019	\$239,063
PI: Richardson, Kathleen A.	Massachusetts Institute of Technology	RF: K. Richardson Equipment Use Account -2	1/1/2018	12/31/2019	\$7,769
PI: Wu, Shin-Tson	Microsoft Corporation	Broadband Optical Shutter	10/16/2018	7/31/2019	\$65,000
PI: Schulzgen, Axel; CoPI: Schepler	Northrop Grumman Corporation Aerospace Systems	RF: Pilot Study on New Fiber Material	12/10/2018	12/31/2019	\$110,000
PI: Schoenfeld, Winston V	Qrona Technologies	Low-cost production of ultra-low-defect GaN-based power electronics	4/25/2018	10/25/2018	\$40,000
PI: Wu, Shin-Tson	Shadevision GmbH	Smart Windows for Automotive Applications	6/1/2018	5/31/2021	\$180,000
PI: Dogariu, Aristide	Sherwin Williams Company	Rheology Measurement and Impact on Hide	6/1/2018	7/31/2019	\$105,508
PI: Li, Guifang	Skyloom Global Corporation	High-Speed Laser Communication Systems	9/14/2018	11/30/2019	\$64,991
PI: Richardson, Kathleen A.	The Charles Stark Draper Laboratory, Inc.	ATLIS: All-in-one Tunable Long-wave Infrared Spectral Imager	2/1/2018	6/30/2020	\$59,836
PI: Richardson, Kathleen A.	Various	RF: K. Richardson Equipment Use Account -2	1/1/2018	12/31/2019	\$2,889

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.

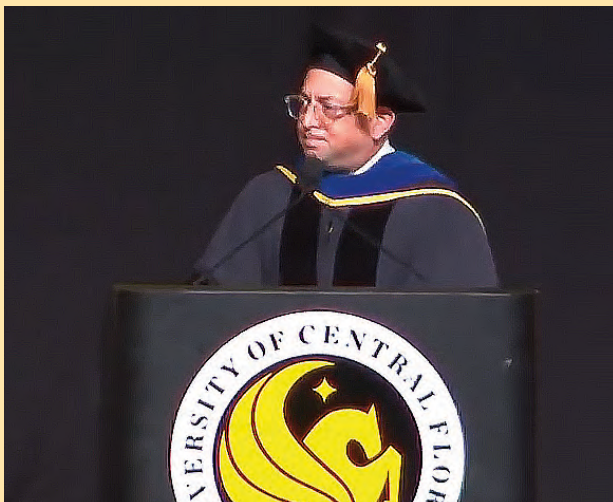
“I am excited to learn as much as I can about the legislative process and how science policy is crafted,” says the UCF alumna, who graduated with both her master’s degree and doctorate in optics. “I look forward to expanding my skill set by working on a broad range of technical topics, especially the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



Christina C.C. Willis serves a congressional fellowship in Washington.



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 Photonics.

COLLEGE EVENTS

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 McKee 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 Uffer, 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. Uffer wanted to learn more about CREOL and investigate potential partnerships between his university and CREOL. The meeting with Dean 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 UEFL, 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 Aeronautica, 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 Delfyett provided an overview of CREOL. September 16.

VISITORS

Industry Visitors

- ▲ Juha Purmonen, Jyrki Saarinen, Sara Peltola, Tuukka Pakarinen , Jaakko Rintamäki, Photonics Finland, January 29
- ▲ Jihua Du, Changgeng (Chris) Ye, Loren Eyres, Lumentum, January 30
- ▲ Carlos Lee, European Photonics Industry Consortium (EPIC), February 1
- ▲ Glafkos 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

University and Research Center Visitors

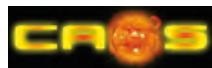
- ▲ Gaurav Bahl, University of Illinois at Urbana-Champaign, January 17
- ▲ Per Niklas Hedde, University of California, Irvine, February 14
- ▲ Filiz Yesilkoy, EPFL/STI-IBI-BIOS, Switzerland, February 22
- ▲ Denis Seletskiy, Polytechnique Montreal, March 5
- ▲ David Messinger, RIT, March 12
- ▲ Melik 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 Vasdekis, University of Idaho, April 16
- ▲ Arash Mafi, University of New Mexico, April 25
- ▲ Juuso Uusimäki, Jesse Korhonen, Eero Häggroth, 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

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
- ▲ Kirsten Howley, Ben Grover, Lawrence Livermore National Laboratory, June 20
- ▲ Carlos Gutierrez, Sandia National Labs, October 25

STUDENT ORGANIZATIONS

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.



CAOS, the CREOL Association of Optics Students, is a student organization founded in 1999 to bring together the diverse population of graduate students of CREOL, The College of Optics and Photonics. CAOS also facilitates communication and integration of the six optics and photonics society student chapters.

President: Charles Volz
Vice President: Kendra Kordack
Treasurer: Nicolas Bonduce
Event Manager: Cesar Lopez Zelaya
Webmaster: Qian Yang
Secretary: Anthony Badillo
Faculty Advisor: David Hagan



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.

President: Isa Hatipoglu
Vice President: Sajad Saghaye-Polkoo
Treasurer: Alireza Fardoost
Secretary: Fatemeh Ghaedi Vanani
Webmaster: Qian Yang
Faculty Advisor: Kyle Renshaw



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.

President: Daniel Thul
Vice President: Cesar Lopez-Zelaya
Treasurer: Charles Volz
Secretary: Alireza Fardoost
Webmaster: Ahmed Yousif
Faculty Advisor: Eric Van Stryland



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.

President: Sanaz Faryadras
Vice President: Kamal Abdelsalam
Treasurer: Patrick Roumayah
Secretary: Sajad Saghaye-Polkoo
Webmaster: Weiyu Chen
Faculty Advisor: M.J. Soileau



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.

President: Charles Volz
Vice President: Kendra Kordack
Treasurer: Teodor Malendevych
Secretary: Yajaira Varillas Perez
Outreach: Marcos Berrios
Faculty Advisors: Stephen Kuebler
Mike McKee



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.

President: Jianghao Xiong
Vice President: Zhiyong Yang
Treasurer: Yannanqi Li
Secretary: En-lin Hsiang
Webmaster: Qian Yang
Faculty Advisor: S.T. Wu



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.

President: Jessica Peña
Vice President: Kendra Kordack
Treasurer: Fatemeh Ghaedi Vanani
Secretary: Sanaz Faryadras
Webmaster: Yajaira Varillas Perez
Faculty Advisor: Kathleen Richardson

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.



CREOL students Wesley Norris, Charles Volz, and Zheyuan Zhu (left to right) volunteered as judges for 2019 Seminole County Science Fair

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 Photoinduced 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.

SPIE/OPTIKS Workshop

The OPTIKS workshop (Outreach for Professionals who Teach in Informal environments and K-12 Schools) attracted industry professionals with the goal to learn how to effectively present activities in optics and photonics that will maximize engagement among participants. August 14.

CREOL Student Projects Showcased at Maker Faire Orlando

Maker Faire Orlando is a venue for Central Florida Engineers, Scientists, and Artists (“makers”) to network and showcase their projects, experiments, and hobbies to the public during this two-day event. CAOS and SOS were invited to host an exhibition booth on the application of optics and photonics. CREOL student volunteers Charles Volz, Zheyuan Zhu, Ryan Ellis and Christie Miller presented selected Optics Day demonstrations including a Michelson’s Interferometer and a computer-generated hologram projector, as well as a laser speckle contrast imaging device—a senior design project built by Ryan, Christie and their team members. The exhibition reached more than 300 visitors, and received positive feedbacks from other maker groups, exhibitors



Students and visitors attend the CREOL Optics Day in April.

and the general public. Participation in Maker Faire Orlando fosters connection between CREOL student organizations and local professional communities. November 9, 10.

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 Guanjuan 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.

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

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.



Students attend the annual holiday party hosted in December.



CREOL



UCF

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