

Academics



Research



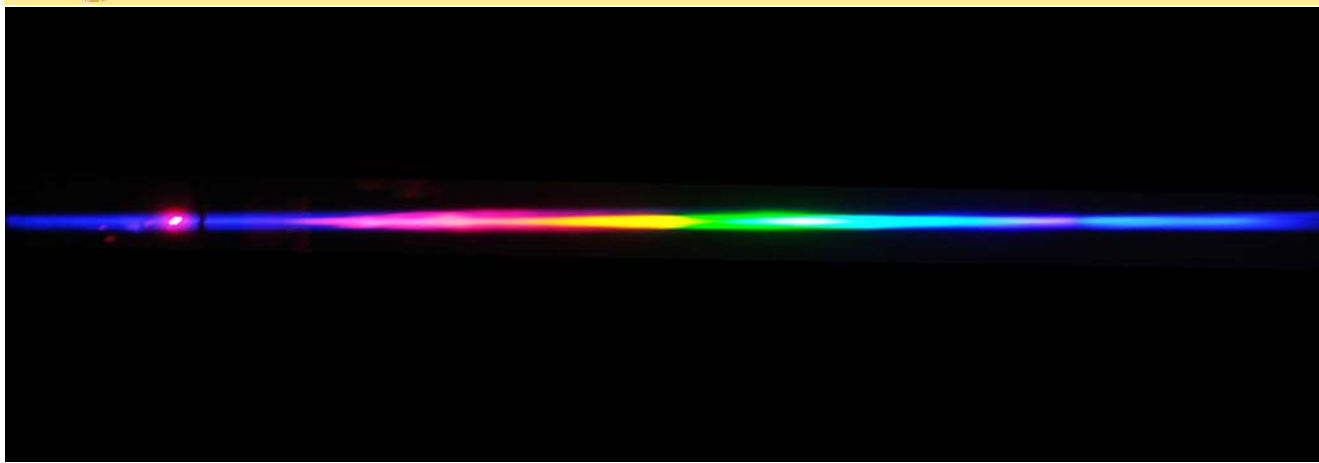
Partnerships



University of Central Florida
CREOL – The College of Optics and Photonics

Annual Report

2011



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Message from the Dean

One of the world's foremost institutions for teaching and research in optics and photonics, CREOL, The College of Optics and Photonics, started in 1987 as the *Center for Research and Education in Optics and Lasers* (CREOL) and became a College in 2004, the first such college in the US. The College houses the *Florida Photonics Center of Excellence* (FPCE) and the *Townes Laser Institute* named after Charles Townes, the co-inventor of the laser. The faculty are world-renowned for their contributions to fundamental and applied optics and photonics and are recipients of numerous awards and honors. The College is an exciting place to have an outstanding educational experience leading to the MS and the PhD degrees, and we have several international programs. A total of more than 200 PhD and 300 MS degrees have been offered here.



The College is also an exciting place to do research. We offer a broad spectrum of research programs covering materials, devices, and systems for applications ranging from THz and infrared to EUV and X-rays, including photonic technologies such as lasers; optical fibers; semiconductor and integrated photonic devices; nonlinear and quantum optic system; and imaging, sensing and display. 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 to be a principal component of the discipline, but advanced topics such as nanophotonics, attosecond optics, plasmonics, and biophotonics, are embraced as areas of strength and future growth. We are well positioned to take advantage of the revolution that is taking place in several fields enabled by optics and photonics.

CREOL was initially founded to promote growth in optics and related fields here in central Florida. We provide the well-trained workforce that keeps the industry growing. The Florida Photonics Cluster is working to coordinate this industry's efforts and needs, and we also receive strong support from the Florida High Tech Corridor Council and Enterprise Florida. Since the founding of CREOL more than 150 industrial partners were affiliated with us and the faculty produced a total of 230 patents and spun off 23 photonics-based companies involving a wide variety of technologies.

Highlights of 2011

In 2011, 113 graduate students were enrolled and 19 PhD degrees and 14 MS degrees were awarded. The research performed by the faculty, students, and scientists was disseminated nationally and internationally in two books and one book chapters, 185 journal papers published in the reviewed literature, 138 conference papers and presentations (including 18 invited), and 22 invited lectures. The College hosted 33 seminars delivered by many distinguished speakers. Research and educational programs were funded by contracts and grants totaling approximately \$7.7M, including \$5.2M of federal funding. The faculty continue to receive awards and recognitions. This year, Professor Demitrios Christodoulides received the OSA R. W. Wood Prize, Professor S.T. Wu received the SID Slotto-Owaki Prize, and Professor Peter Delfyett received the APS Edward A. Bouchet Award. Professor Winston Schoenfeld became SPIE Fellow and Professors Peter Delfyett and Eric Van Stryland became Fellows of APS.

In 2011, we received approximately \$3.4M from industry or from federal grants in collaboration with industrial partners, a connection that gives our students experience and a leg up on industry positions after they graduate. Our tradition of innovation has also continued; in 2011, the faculty were inventors or co-inventors on 19 issued patents, 34 provisional applications, and 30 patent disclosures. UCF was ranked third in the strength of U.S. patents issued to universities in 2009 (March 2010 issue of IEEE Spectrum) and the rich IP productivity in optics and photonics has contributed significantly to this ranking.

Highlights of 2011 also include the addition of two new faculty members. Dr. Rodrigo Amezcua, an expert in optical fibers formerly with the University of Southampton, was appointed Research Assistant Professor. He has helped install a new optical fiber drawing tower. Dr. Romaine Gaume, an expert in optical ceramics formerly with Stanford University, has a joint appointment with the NanoScience Technology Center at the rank of Assistant Professor. Both are active members of the Townes Laser Institute. Three faculty members left: Dr. Glenn Boreman moved on to become Chair of the Department of Physics and Optical Science at the University of North Carolina at Charlotte; Dr. James Harvey retired, and Dr. Nabeel Riza moved to Ireland to become Head of the Electrical and Electronic Engineering Department at University College, Cork.

This annual report provides a detailed description of the education, research, and partnership activities of the faculty, staff, and students during the 2011 calendar year. Key data for this year are also compared to previous years to show progress and identify trends. Information on more recent activities are regularly reported in the College's website <http://www.creol.ucf.edu/>. We hope you can find the information you need in this Annual Report or in the website. Please contact us for more information and let us know what is missing and what we can improve.

Bahaa Saleh

1. Faculty and Staff

1.1 Faculty



Ayman F. Abouraddy

Assistant Professor of Optics

PhD, 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

- Program committee member, SPIE DSS, 2009
- Subcommittee member, CLEO, 2012

Honors and Awards

- Boston University President University Graduate Fellowship, 1997
- Ralph E. Powe Junior Faculty Enhancement Award



Rodrigo Amezcua Correa

Assistant Research Professor of Optics

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, CONACYT, Mexico, 2004



Glenn D. Boreman

Trustee Chair Prof. of Optics, EECS & Physics

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

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Research

- Infrared sensors and systems - Nano-lithography to extend RF concepts to IR Band, antenna-coupled IR sensors
- Multi-color/polarization IR FPAs
- IR Frequency-selective surfaces
- Tunable IR signatures
- Infrared targets and tags; passive and active IR tags
- IR scene projection & target projection
- Millimeter-wave and Terahertz technology
- Subsurface mine detection/imaging

Other Experience

- Visiting Scholar, Imperial College London, Federal Institute of Technology (ETH) Zürich, Defense Research Agency (FOI) Sweden, Universidad Complutense Madrid
- Consultant, Licensed Professional Engineer

Professional Activities

- Editor-in-Chief, Applied Optics
- Co-author of *Infrared Detectors & Systems*
- Author of *Basic Electro-Optics for EEs and Modulation Transfer Function in Optical and Electro-Optical systems*

Honors and Awards

- Fellow, Optical Society of America and SPIE
- Fellow, Military Sensing Symposium



Zenghu Chang

Distinguished Professor of Physics & Optics

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

- Ernest & Lillian Chapin Chair Prof., Kansas State University, 2009-10
- Professor, Department of Physics, Kansas State University, 2006-09
- Associate Prof. Dept. of Physics, Kansas State University, 2001-06
- Assistant Research Scientist, University of Michigan, 1999-01

Professional Activities

- Guest editor, Journal of Physics B., Attosecond special issue, 2012
- Co-chair, 5th Intl. Symposium, Ultra-fast Phenomena and THz Waves, China, 2010
- Co-chair of the 2nd International Conference on Attosecond Physics, Kansas, 2009

Honors and Awards

- Fellow, American Physical Society
- Mercator Professorship, German Science Foundation (DFG), 2007
- Huber Schardin Gold Medal, 1996



Demetrios Christodoulides

Professor of Optics

Ph.D., Electrical Engineering, Johns Hopkins University, 1986

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Research

- Nonlinear wave propagation
- Nonlinear optics
- Beam synthesis and dynamics
- Optical solutions
- Periodic and random optical structures
- Nonlinear optics in soft matter
- Quantum transport in arrays and photonic lattices

Professional Activities

- QELS Program Chair, CLEO/QELS, May 6-11, 2012, San Jose, CA
- Committee Chair, CLEO/QELS—QELS5, May 1-6, 2011, Baltimore, MD
- Committee Chair, CLEO/IQEC-IQEC5, May 18-20, 2010, San Jose, CA
- Committee Chair, CLEO/IQEC-IQE5, May 31-June 5, 2009, Baltimore, MD

Honors and Awards

- OSA's R. W. Wood Prize, 2011
- Fellow, Optical Society of America
- Fellow, American Physical Society
- Provost Research Enhancement Position (PREP) award



Peter J. Delfyett

Trustee Chair Professor of Optics, EE & Physics

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 the 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

Honors and Awards

- NSF Presidential Early Career Award for Scientists & Engineers
- Fellow, OSA, IEEE, APS
- APS Edward Bouchet Award
- UCF Pegasus Professor



Dennis Deppe

FPCE Endowed-Chair Professor of Optics

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 of Technical Staff, AT&T Bell Laboratories, 1988-90

Professional Activities

- Guest Editor, IEEE J. Selected Topics in Quantum Electronics, 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
- IEEE Fellow, 2000; OSA Fellow, 2000
- OSA Nicholas Holonyak Award
- NSF Presidential Young Investigator Award, 1991
- ONR Young Investigator Award, 1991



Aristide Dogariu

Professor of Optics

Ph.D., Engineering, Hokkaido University, Japan 1994

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Research

- Optical Physics, waves propagation and scattering, electromagnetism
- Condensed matter and complex media
- Optical Sensing
- Near field optics
- Optical systems analysis, modeling, and design

Other Experience

- 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

- Fellow of American Physical Society
- Fellow of Optical Society of America
- Florida Photonics Center of Excellence (FPCE) Professorship



Sasan Fathpour

Assistant Professor of Optics & EE

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Research

- Silicon Photonics
- Optical Interconnects
- Electronic-Photonics Integrated Circuits
- Hybrid III-V Lasers on Silicon
- Nonlinear Integrated Optics
- Nonlinear Photovoltaic Effect in Semiconductors
- Integrated Plasmonics on Silicon

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

- Senior Member, SPIE
- Member, IEEE Photonics Society
- Member, OSA

Honors and Awards

- NSF CAREER Award, 2012
- UCLA Chancellor's Award for Postdoctoral Research, 2007
- International Graduate Student Fellowship, University of Michigan, 2000



Romain Gaume

Assistant Prof. of Optics & 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
- Consultants: Shasta Crystals, Cyanto Corporation, Silicon Light Machines

Professional Activities

- Member: SPIE, ACerS

Honors and Awards

- Dissertation Thesis Award, 2002



Leonid B. Glebov

Research Professor of Optics

Ph.D., Physics, State Optical Institute, Leningrad, 1976

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Research

- Optical properties of glasses
- Photosensitive glasses for hologram recording
- Nonlinear phenomena, including laser-induced damage
- Holographic optical elements
- High Power laser systems

Other Experience

- Founder, Vice President and CTO of OptiGrate Corporation

Professional Activities

- Member, SPIE
- Member, Optical Society of America
- Member, American Ceramic Society
- Member, Directed Energy Professional Society

Honors and Awards

- Dennis Gabor Award in Holography
- Fellow, OSA
- Fellow, American Ceramics Society
- Florida Photonics Center of Excellence (FPCE) Professorship



David J. Hagan

Associate Dean of Academic Programs, Professor of Optics & Physics

Ph.D., 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

- Editor-in-Chief, Optical Materials Express (current)
- Topical Editor, J. Opt Soc. Am B., (2006-10)
- Principal Editor, Journal of Materials Research (2001-06)
- Program Chair, Frontiers in Optics (2013)
- Senior Member, IEEE

Honors and Awards

- Fellow of OSA
- Ranked by ISI as "Highly Cited Researcher"
- College of Optics & Photonics Excellence in Research Award (2010-11)



James E. Harvey

Associate Professor of Optics & ECE

Ph.D., Optical Sciences, University of Arizona, 1976

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Research

- Optical design and image analysis of advanced optical systems
- Simulation and modeling of systems performance for unconventional optical systems
- Image degradation due to Scattering Effects (optical fabrication errors)
- Sparse, Optical Array Configurations
- X-ray / EUV Imaging systems (including multilayers)
- Experimental characterization of various optical phenomena, materials & fabrication processes

Other Experience

- Senior Scientist, Perkin-Elmer Corp. in NASA astronomy programs

Professional Activities

- Member, OSA
- Board of Directors, SPIE
- Designed the Solar X-Ray Imager (SXI) for the US National Oceanographic and Atmospheric Administration's current (GOES)

Honors and Awards

- Fellow of SPIE, for contributions in areas of surface scatter phenomena and phased telescope arrays
- Three Separate papers chosen for reprint in SPIE's Milestone Series (on Scalar
- Diffraction Theory; Adaptive Optics; and Surface Scatter Phenomena)



Aravinda Kar

Professor of Optics, MMAE, EECS & Physics

Ph.D., Nuclear Engineering, University of Illinois at Urbana, 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, Laser Institute of America
- Editorials Board Member

Honors and Awards

- Fellow, Laser Institute of America
- Numerous Patents



Pieter G. Kik

Associate Professor of Optics & 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

- Editor, Optics Communications
- Member, Materials Research Society
- Member, IEEE, SPIE
-

Honors and Awards

- 2007 NSF CAREER Award



Stephen Kuebler

Associate Professor of Chemistry & Optics

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

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Research

- Laser-based patterning and material processing
- Laser beam shaping
- Nanophotonic structures and devices
- 3D nano and microfabrication
- Nonlinear optical Materials

Other Experience

- Assistant Staff Scientist, Chemistry, University of Arizona, 2001-03
- Research Associate, Chemistry, University of Arizona, 1999-01
- Post-Doctoral Researcher, California Institute of Technology, 1998-99

Professional Activities

- Editorial Board, J. of Micro/Nanolithography, MEMS, and MOEMS
- Editorial Board, Journal of Experimental Nanoscience
- Member of MRS, OSA, SPIE, and ACS
- Chair, Orlando Section of the American Chemical Society
- Marshall Scholarship Selection Committee, Atlanta Region

Honors and Awards

- NSF Career Award, January 2008
- Teaching Incentive Program Award, UCF, May 2009
- Excellence in Undergraduate Teaching Award, College of Sciences, UCF, March 2008
- Marshall Scholar, Association of Commonwealth Universities, UK, 1991
- NSF Graduate Fellowship, 1993
- Barry Goldwater Fellowship for physical sciences, 1989



Guifang Li

Professor of Optics, 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

- Deputy Editor, Optics Express
- Associate Editor, IEEE Photonics Technology Letters

Honors and Awards

- ONR Young Investigator Award, 1995
- NSF CAREER Award, 1996
- IEEE EDS Distinguished Lecturer
- Fellow of OSA and SPIE
- Florida Photonics Center of Excellence (FPCE) Professorship



Patrick L. LiKamWa

Associate Professor of Optics & ECE

Ph.D., Electronic & Electrical Engineering, University of Sheffield, UK, 1987

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Research

- Optoelectronics
- Integrated Optics Devices with Gain using resonant
- 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

- Co-founder, Optium Inc.

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

Ph.D., EE, University of British Columbia, Canada, 1978

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Research

- Diffractive holographic optics
- Integrated photonics grating based devices
- Computational photonics
- Theory and analysis of periodic structures
- Subwavelength periodic structures and devices
- Guided-waves grating resonant devices
- Analysis and design artificial metamaterial devices
- Novel integrated antireflective surfaces
- Grating based plasmonic structures

Other Experience

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

Professional Activities

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

Honors and Awards

- Fellow, Optical Society of America
- Senior Member, IEEE
- UCF Graduate Teaching Award



Martin C. Richardson

FPCE Trustee Chair; Northrop Grumman Prof. of X-ray Photonics; Prof. of Optics, Physics & ECE; Director, Townes Laser Institute

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

- Fellow, OSA; Senior Member, IEEE
- Schardin Medal



Nabeel A. Riza

Professor of Optics & EECS

Ph.D., EE; California Institute of Technology, 1989

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Research

- Photonic control systems for phased arrays
- Liquid Crystal Devices
- Acousto-optic signal processing
- Optical communications
- Photonic switching
- Interferometry

Other Experience

- Lead Scientist, General Electric, 1989-95

Professional Activities

- Vice President, Memberships, IEEE LEOS 2002-05
- Chair, IEEE LEOS Orlando Chapter and Advisor
- Editor, SPIE Milestone Series Volume on Photonic Control Systems for Phased Array Antennas
- Co-Editor, SPIE Milestone series Volume on Analog Fiber-Optic Links
- Expert panel member: DARPA, OIDA, NIST, ONR, NSF, NIH, NWO

Honors and Awards

- 2001 International ICO Prize & 2001 Ernst Abbe Medal: Carl Zeiss Foundation, Germany
- Fellow, OSA and SPIE
- Laser Focus World Technical Writings Commendation Award, 2004
- GE Gold Patent Medal, 1995



Bahaa E. A. Saleh

Dean & Director, Professor of Optics

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 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

Associate Professor of Optics

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

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Research

- MBE growth of oxide semiconductors (wurtzite and cubic)
- Binary cubic oxide semiconductor solar-blind detectors
- Hybrid homoepitaxial zinc oxide-nitride laser diodes
- cSi photovoltaics
- Passive/active photonic crystal nanocavity systems

Other Experience

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

Professional Activities

- Principal Editor, *Journal of Materials Research*
- Chair, MOEMS/MEMS Conference - Photonic West
- Executive Committee, Florida Chapter of the AVS

Honors and Awards

- Fellow of SPIE
- UCF TIP Award, 2010
- College Excellence in Graduate Teaching, 2009
- UCF Presidential Initiative Award, 2006
- Fellow, Military Sensing Symposium



Axel Schülzgen

Professor of Optics

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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

- Associate Editor, *Applied Optics*, *Ultrafast Lasers and Optics*
- Member, OSA, SPIE, German Physical Society

Honors and Awards

- Habilitation Fellowship, German Research Foundation, 1993
- Carl Ramsauer-Magnus Award, AEG Corporation, 1992
- Heinrich Gustav - Magnus Award, Humboldt University, Berlin, 1988



M.J. Soileau

Vice Pres., Research & Commercialization
and Prof. of Optics, 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

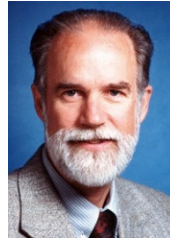
- Physicist, Naval Weapons Center Physics Div., China Lake, 1973-80
- Professor of Physics, North Texas State University, 1980-87
- Director, School of Optics/CREOL, 1987-99
- Chair of the Board, Orlando Science Center, 2002
- Technology-Based Economic Development; Technology Transfer
- Board of Directors,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

Professional Activities

- Member, SPIE, OSA, IEEE, LEOS, LIA, ASEE; President, SPIE, 1997
- International Advisory Committee on Coherent and Nonlinear Optics, 2001
- Co-Chair, OSA/SPIE Joint Task Force, 1998-99

Honors and Awards

- Director's Award, SPIE, 1999
- Fellow, OSA, IEEE, SPIE, AAAS; Senior Member, LIA
- Outstanding Engineer Award, State of Florida, 1994
- Gold Medal of SPIE
- Esther Hoffman Beller Award of OSA
- Distinguished Service Appreciation Medal, presented by the Institute of Photonic Sciences, Barcelona, Spain



Eric W. Van Stryland

Professor of Optics, Past Dean

Ph.D, Physics; Optical Sciences, University of
Arizona 1976

ewvs@creol.ucf.edu
(407) 823-6835
<http://nlo.creol.ucf.edu/>

Research

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

Other Experience

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

Professional Activities

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

Honors and Awards

- UCF Pegasus Award, 2003
- UCF Researcher of the Year, 1990 and 2009; R&D 100 Award, 2001
- ISI Highly Cited Author



Shin-Tson Wu

Pegasus Professor of Optics

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

swu@creol.ucf.edu
(407) 823-4763
<http://lcd.creol.ucf.edu>

Research

- Next-Generation Liquid Crystal Displays
- Adaptive Lenses
- Adaptive Optics
- Biosensors
- Laser Beam Steering
- New Photonic Materials

Other Experience

- Senior Research Scientist, Hughes Research Labs

Professional Activities

- SID Honors and Awards Committee
- SPIE G.G. Stokes Award Committee
- Vice Chair, OSA Publication Council
- Founding Editor-In-Chief, IEEE/OSA Journal Display Technology

Honors and Awards

- 2011 SID Slottow-Owaki Prize
- 2010 OSA Joseph Fraunhofer Award
- 2008 SPIE G.G. Stokes Award
- 2008 SID Jan Rajchman Prize
- Florida Photonics Center of Excellence (FPCE) Professorship
- Provost Research Enhancement Position (PREP) award



Boris Y. Zeldovich

Professor of Optics & Physics

Ph.D., Physics, Institute of Theoretical and
Experimental Physics, Moscow, 1969

boris@creol.ucf.edu
(407) 823-6831

Research

- Physical optics and propagation
- Wave propagation in multimode optical waveguides and irregularly inhomogeneous media
- Beam clean-up and combining via nonlinear-optical processes
- Nonlinear optics, including liquid crystals

Other Experience

- Vice President, Beam Engineering for Advanced Measurements Co., Winter Park, FL
- Head of Joint Nonlinear Optics Laboratory, Electrophysics Institute of the Russian Academy of Sciences and Chelyabinsk Technical University, Russia, 1987-94
- Principal Senior Scientific Researcher, Institute for Problems in Mechanics, Moscow, 1981-87
- Lecturer on Nonlinear & Statistical Optics, Moscow Institute for Physics and Technology, 1969-1987

Professional Activities

- Editorial Board Member, Optics Communications; Pure & Applied Optics; Optical and Quantum Electronics; International Journal of Nonlinear Optical
- Physics & Materials Topical Editor, J. of Optical Society of America B

Honors and Awards

- Max Born Award, OSA, 1997
- Fellow, OSA
- Member of the Russian Academy of Sciences
- USSR State Prize for the discovery of optical phase conjugation, 1983

Emeritus Faculty



Larry C. Andrews

Emeritus Professor of Mathematics & Optics

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

Larry.andrews@ucf.edu
407-823-2418

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

Professor Emeritus of Optics, Physics & ECE

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

bass@creol.ucf.edu
(407) 823-6977
<http://bass.optics.ucf.edu/>

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

- Fellow, Optical Society of America (OSA)
- Fellow, IEEE



Ronald L. Phillips

Emeritus Professor of EECS & Optics

PhD, 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

Ph.D., Physics, University of Utah, 1965

silfvast@creol.ucf.edu
(407) 823-6855
<http://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
- Board of Directors, OSA. 1986-00
- Program Committee Member, LEOS, 1994-00
- Author, Textbook: "Laser Fundamentals," Cambridge University Press

Honors and Awards

- Fellow, Optical Society of America, American Physical Society, 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



George I. Stegeman

Emeritus Professor of Optics, Physics & EECS

Ph.D, Physics, University of Michigan, 1964

george@creol.ucf.edu
(407) 629-2944

Research

- Discrete optics, linear and nonlinear, solitons

Other Experience

- Distinguished Professor, University of Toronto

Professional Activities

- Editor-in-Chief, Journal of the OSA B
- Organizing Committee, NOA 2011, Torun Poland, June 2011
- Editorial Board, Physics Reports, Responsible for Optics, 2005-present
- Chair Professor, College of Engineering, King Fahd University, Saudi Arabia

Honors and Awards

- Cobb Family Chair, UCF
- Fellow, Optical Society of America
- Fellow, American Physical Society
- Hertzberg Medal for Achievement in Physics
- R. W. Wood Prize for the Optical Society of America (2003)
- Bluto Award of the Polish Photonics Society, 2011
- Doctor Honoris Causa, Instituto Nacional de Astrofisica, Optica y Electronica (INAE), 2011

Visiting Faculty



ANGELA GUZMAN

Visiting Associate Research Professor

Dr.SC., Ludwig Maximilian University

Quantum Optics

angela.guzman@creol.ucf.edu



MALVIN C. TEICH

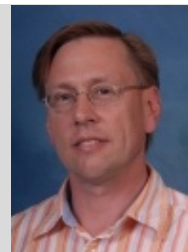
Visiting Research Professor

PhD, Cornell University

Quantum Optics

teich@creol.ucf.edu

Joint Appointments



KEVIN D. BELFIELD

Department Chair & Prof. of Chemistry and Optics

PhD, Syracuse University

Multiphoton Absorbing Materials

Belfield@ucf.edu



LOUIS CHOW

Prof. and Univ. Chair of MMAE

PhD, University of California, Berkeley

Heat Transfer Issues in Electro-Optics

Louis.chow@ucf.edu



ANDRE GESQUIERE

Asst. Prof., Nanoscience Technology Center, Chemistry, and Optics

PhD, University of Leuven

Optoelectronic Materials, Nanobiology

andre@ucf.edu



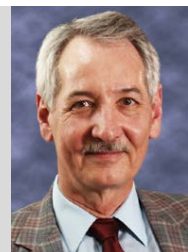
FLORENCIO E. HERNANDEZ

Assoc. Prof. of Chemistry & Optics

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

Optical Materials

Florencio.hernandez@ucf.edu



DAVID KAUP

Provost Distinguished Research Prof. of Math and Optics

david.kaup@ucf.edu



MICHAEL LEUENBERGER

Assistant Prof. of Physics and Optics

Ph.D., University of Basel

Quantum Information

Michael.leuenberger@ucf.edu



ROBERT E. PEALE

Professor of Physics and Optics

Ph.D., Cornell University

Defects in Semiconductors

Robert.peale@ucf.edu



ALFONS SCHULTE

Prof. of Physics and Optics

Dr. rer. Nat, Technical University of Munich

Near-IR Raman Spectroscopy

Alfons.schult4e@ucf.edu



MUBARAK A. SHAH

Agere Chair Professor of Computer Science and Optics

PhD, Wayne State University

Computer Vision

Mubarak.shah@ucf.edu



MICHAEL SIGMAN

Associate Professor of Chemistry and Optics

PhD, Florida State University

Explosives, Chemistry & Forensics

Michael.sigman@ucf.edu



THOMAS X. WU

Associate Professor of EECS & Optics

Ph.D., University of Pennsylvania

Numerical Techniques in Electromagnetics

Thomas.wu@ucf.edu



CYNTHIA YOUNG

Professor of Math and Optics

Ph.D., University of Washington

Laser Propagation in Random Media

Cynthia.young@ucf.edu

Courtesy Appointments



KURT BUSCH

Prof. of Physics, Univ. Karlsruhe

PhD, University of Karlsruhe

kurt@tfp.uni-karlsruhe.de



BRUCE H. CHAI

President, Crystal Photonics

Ph.D., Yale University

chai@crystalphotonics.com



HANS P. JENSSEN

AC Materials

Ph.D., MIT

h.jenssen@ac-materials.com



JANNICK ROLLAND

Brian J. Thompson Prof. of Optical Engineering, Prof. of Biomedical Engineering, University of Rochester

PhD, University of Arizona

Optical Diagnostics & Applications

rolland@optics.rochester.edu



ERIC G. JOHNSON

Professor of Physics & Optical Science

University of North Carolina Charlotte

Ph.D., University of Alabama

egjohnso@uncc.edu



KATHLEEN A. RICHARDSON

Professor of Materials Science and Engineering, Clemson University

Ph.D., Alfred University

richar3@clemson.edu



CRAIG W. SIDERS

ARES Program Element Leader, Lawrence Livermore Lab

Ph.D., University of Texas at Austin

Photon Science and Applications

prof.craig.siders@gmail.com



EMIL WOLF

Wilson Professor of Optical Physics

Ph.D., Bristol University, England

Optical Coherence

ewlupus@pas.rochester.edu

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

Boris Zeldovich
 Dennis Deppe
 Bahaa Saleh
 M.J. Soileau
 Bahaa Saleh
 Shin-Tson Wu
 George Stegeman
Demetrios Christodoulides



Connecting minds.
 Advancing light.
SPIE is the international society
 for optics and photonics

1995 Kingslake Medal and Prize
 2004 Bacus Award
 2008 Dennis Gabor Award
 2008 G. G. Stokes Award
 2008 Gold Medal Award

Glenn Boreman
 Bahaa Saleh
 Leonid Glebov
 Shin-Tson Wu
 M.J. Soileau



2003 Engineering Achievement
 2009-10 Distinguished Lecturer Award

Dennis Deppe
 Nabeel Riza



2008 Jan Rajchman Prize
 2011 Slotto-Owaki Prize

Shin-Tson Wu
 Shin-Tson Wu



2011 Edward A. Bouchet Award

Peter Delfyett



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)

Peter Delfyett
 Dennis Deppe
 Sasan Fathpour
 Pieter Kik
 Stephen Kuebler
 Guifang Li



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

Dennis Deppe
 Guifang Li



Ralph E. Powe Junior Faculty Award (2009)

Ayman Abouraddy

John Simon Guggenheim
 Memorial Foundation

Guggenheim Fellow (1984)

Bahaa Saleh

International Awards

Foreign Member, Russian Academy of Science (1994)	Michael Bass
Hubert Schardin Gold Medal Medal (1996)	Zenghu Chang
ICO International Prize In Optics (2001)	Nabeel Riza
Ernst Abbe Medal, Carl Zeiss, Germany (2001)	Nabeel Riza
Erasmus Mundus Scholar Award, European Union (2007)	Nabeel Riza
Berthold Leibinger Innovation Prize, Germany (2008)	Nabeel Riza
T. S. Walton Visitor Award, Ireland (2010)	Nabeel Riza
Hubert Schardin Gold Medal Medal (1976)	Martin Richardson
Kuwait Prize (2006)	Bahaa Saleh
Habilitation Grant, German Research Foundation (1993)	Axel Schülzgen
Carl-Ramsauer-Award of the AEG AG (1992)	Axel Schülzgen
USSR Academy of Sciences (1987)	Boris Zeldovich
USSR State Prize (1983)	Boris Zeldovich

Fellows of Professional Societies



Michael Bass	David Hagan	William Silfvast
Glenn Boreman	Guifang Li	M.J. Soileau
Demetrios Christodoulides	M.G. Moharam	George Stegeman
Peter Delfyett	James Pearson	Eric Van Stryland
Dennis Deppe	Martin Richardson	Shin-Tson Wu
Aristide Dogariu	Nabeel Riza	Boris Zeldovich
Leonid Glebov	Bahaa Saleh	



Michael Bass	Bahaa Saleh
Peter Delfyett	William Silfvast
Dennis Deppe	M.J. Soileau
James Pearson	Eric Van Stryland
Nabeel Riza	Shin-Tson Wu



Glenn Boreman	Bahaa Saleh
Leonid Glebov	Winston V. Schoenfeld
James Harvey	M.J. Soileau
Guifang Li	Eric Van Stryland
James Pearson	Shin-Tson Wu
Nabeel Riza	



Zenghu Chang
Aristide Dogariu
Demetrios Christodoulides
Peter Delfyett
Eric Van Stryland



Shin-Tson Wu



**Laser Institute
of America**

Aravinda Kar



Leonid Glebov

Presidents, Directors and Officers of Professional Societies



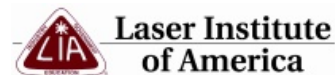
Eric Van Stryland	President (2006)
Michael Bass	Board of Directors Member (1989-1992)
Peter Delfyett	Board of Directors Member (2004-2006)
Bahaa Saleh	Board of Directors Member (1998-2005)
Eric Van Stryland	Board of Directors Member (1998-2001)



M.J. Soileau	President (1997)
Glenn Boreman	Board of Directors Member (1997-1999)
James Harvey	Board of Directors Member (2001-2003)



Shin-Tson Wu	Board of Govenors (2003-present)
Peter Delfyett	Board of Govenors (2000-2002)
Jim Moharam	Vice-President (1997-1999)
Nabeel Riza	Vice-President (2003-2005)



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- present)
Eric Van Stryland	Board of Directors Member (1992-1994)



**National Society of
Black Physicists**

Peter Delfyett	President (2008-2011)
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Journal Editors & Associate Editors

Journal Editors

Journal of the Optical Society of America B (1984-1987)
Applied Optics (2000-2005)
Applied Optics/Optical Technology (1998-2003)
IEEE Journal of Selected Topics in Quantum Electronics (2001-2006)
IEEE/LEOS Newsletter (1995-2000)
Optics Communications (2011-present)
Optical Materials Express (2010-present)
Journal of the Optical Society of America A (1991-1997)
Advances in Optics & Photonics (2008-present)
IEEE/OSA Journal of Display Technology (2004-2008)

Michael Bass
Glenn Boreman
Glenn Boreman
Peter Delfyett
Peter Delfyett
Pieter Kik
David Hagan
Bahaa Saleh
Bahaa Saleh
Shin-Tson Wu

Associate/Topical Editors

Optics Express (2001-2001)
Optical Engineering (Radiometry & Detectors) (1998-1999)
Applied Optics (Radiometry & Detectors) (1992-1997)
Optics Express (2009-present)
International Journal of Optics (2008-present)
IEEE Photonics Technology Letters (1995-2003)
IEEE J. of Quantum Electronics (1996-2001)
Journal of the Optical Society of America B (2001-2003)
Journal of the Optical Society of America B (2007- 2013)
Journal of Materials Research (2000 - 2007)
Optics Express (2007-present)
Photonics Technology Letters (2007-present)
Journal of the Optical Society of America A (1998-2004)
Journal of Quantum Electronics (1980-1986)
International Journal of OptoMechatronics (2009-present)
Journal of the Optical Society of America A (1984-1990)
Journal of the Optical Society of America (1980-1983)
Journal of Materials Research (2007-present)
Applied Optics (2008-present)
Optics Letters: Nonlinear Optics (1995-1998)
Reviews of Scientific Instruments (1978-1981)
IEEE/OSA Journal of Display Technology (2008-present)
Liquid Crystals (2009-present)

Michael Bass
Glenn Boreman
Glenn Boreman
Glenn Boreman
Glenn Boreman
Peter Delfyett
Demetrios Christodoulides
Demetrios Christodoulides
David Hagan
David Hagan
Guifang Li
Guifang Li
Jim Moharam
Martin Richardson
Nabeel Riza
Bahaa Saleh
Bahaa Saleh
Winston Schoenfeld
Axel Schülzgen
Eric Van Stryland
Eric Van Stryland
Shin-Tson Wu
Shin-Tson Wu

Authors & Editors of Books

Michael Bass, *Laser Materials Processing (Materials Processing, Theory and Practices, Vol. 3)* Elsevier (1983).

Walter Koechner and **Michael Bass**, *Solid-State Lasers: A Graduate Text*, Springer (2003).

Michael Bass, Casimer DeCusatis, Jay Enoch and Vasudevan Lakshminarayanan, Guifang Li, Carolyn MacDonald, Virenda Mahajan, and **Eric Van Stryland**, *Handbook of Optics*, 3rd ed., McGraw-Hill (2009).

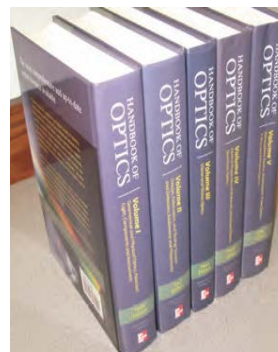
Volume I: *Geometrical and Physical Optics, Polarized Light, Components and Instruments.*

Volume II: *Design, Fabrication and Testing, Sources and Detectors, Radiometry and Photometry.*

Volume III: *Vision and Vision Optics.*

Volume IV: *Optical Properties of Materials, Nonlinear Optics, Quantum Optics.*

Volume V: *Atmospheric Optics, Modulators, Fiber Optics, X-Ray and Neutron Optics.*



Glenn D. Boreman, *Basic Electro Optics for Electrical Engineers* (SPIE Tutorial Texts in Optical Engineering Vol. TT31), SPIE (1998). Translated to Spanish, “Fundamentos de ElectroOptica para Ingenieros”, SPIE Tutorial Texts in Optical Engineering Vol. TT37 (1999).

Glenn D. Boreman, *Modulation Transfer Function in Optical and Electro Optical Systems*, SPIE Tutorial Texts in Optical Engineering Vol. TT52 (2001).

Zenghu Chang, *Fundamentals of Attosecond Optics*, CRC Press (2011).

Sasan Fathpour and Bahram Jalali, *Silicon Photonics for Telecommunications and Biomedicine*, CRC Press (2012).

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

J. Mazumder and **Aravinda Kar**, *Theory and Application of Laser Chemical Vapor Deposition*, Springer (1995).

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

Bahaa E. A. Saleh, *Photoelectron Statistics*, Springer (1977).

Bahaa E. A. Saleh, and Malvin C. Teich, *Fundamentals of Photonics*, Wiley 2nd ed. (2007). German edition, *Grundlagen Der Photonik*, Wiley-VCH (2008).

Bahaa E. A. Saleh, *Introduction to Subsurface Imaging*, Cambridge University Press (2011).

William T. Silfvast, *Laser Fundamentals*, Cambridge University Press, 2nd ed. (2008).

Gregory J. Exarhos, Arthur H. Guenther, Mark R. Kozlowski, Keith L. Lewis and **M. J. Soileau**, *Laser-Induced Damage in Optical Materials*, SPIE, 1997.

Arthur H. Guenther, Mark R. Kozlowski, **M.J. Soileau** and Gregory J. Exarhos (Eds.) *Laser-Induced Damage in Optical Materials*, SPIE, 1999.

Frederic A. Hopf and **George I. Stegeman**, *Applied Classical Electrodynamics*, Vol. 1: *Linear Optics*, Wiley (1985).

George I. Stegeman and Frederic A. Hopf, *Applied Classical Electrodynamics*, Vol. 2: *Nonlinear Optics*, Wiley (1986).

Carlo G. Someda and **George I. Stegeman**, *Anisotropic and Nonlinear Optical Waveguides*, Elsevier (1992).

Robert Crane, Monte Khoshnevisan, Keith Lewis, **Eric Van Stryland**, Eds., *Materials for Optical Limiting: Volume 374 (MRS Proceedings)*, 1995

Iam-Choon Khoo and **Shin-Tson Wu**, *Optics and Nonlinear Optics of Liquid Crystals*, Wiley (1993).

Shin-Tson Wu and Deng-Ke Yang, *Reflective Liquid Crystal Displays*, Wiley (2001).

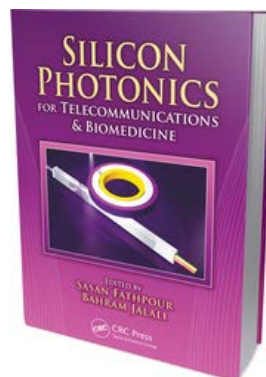
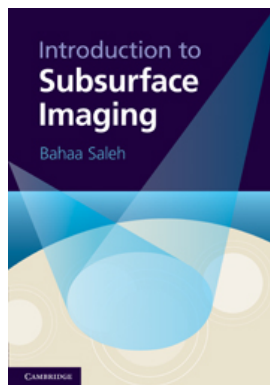
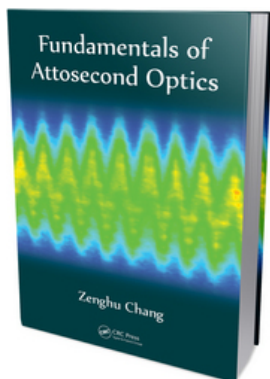
Shin-Tson Wu and Deng-Ke Yang, *Fundamentals of Liquid Crystal Devices*, Wiley (2006).

David Armitage, Ian Underwood and **Shin-Tson Wu**, *Introduction to Microdisplays*, Wiley (2006).

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

Zhibing Ge and **Shin-Tson Wu**, *Transflective Liquid Crystal Displays*, Wiley (2010).

Boris Ya. Zeldovich, Alexander V. Mamaev and Vladimir V. Shkunov, *Speckle-Wave Interactions in Application to Holography and Nonlinear Optics*, CRC Press, (1995).



Awards & Honors (2011)

National/International

OSA R. W. Wood Prize
SID Slottow-Owaki Prize
APS Edward A. Bouchet Award.
APS Fellow
APS Fellow
SPIE Fellow
DEPS Fellow

Demetrios Christodoulides
S.T. Wu
Peter Delfyett
Peter Delfyett
Eric Van Stryland
Winston Schoenfeld
Martin Stickley

University

Teaching Incentive Program Award	Jim Moharam
Research Incentive Award	Shin-Tson Wu
Excellence in Graduate Teaching Award (college level)	Jim Moharam
Excellence in Research Award (college & university level)	Shin-Tson Wu

1.2 Research Staff

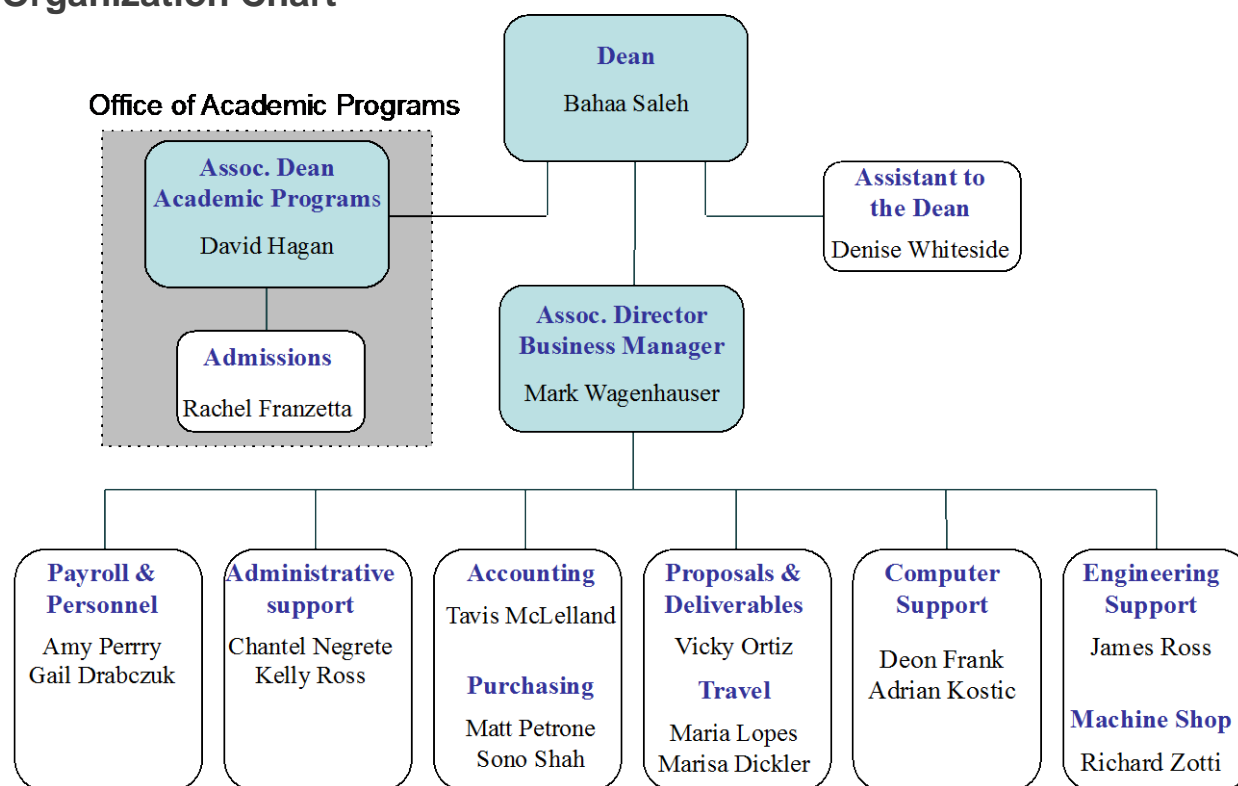
NAME	TITLE	ADVISOR
Larry Shah	Senior Research Scientist	Richardson
Matthieu Baudalet	Senior Research Scientist	Richardson
Ivan Divliansky	Senior Research Scientist	Glebov
Sabine Freisem	Senior Research Scientist	Deppe
Julien Lumeau	Senior Research Scientist	Glebov
George Venus	Senior Research Scientist	Glebov
Ilja Mingareev	Senior Research Scientist	Richardson
Ying Chen	Research Scientist	Bass
Andrey Krywonos	Research Scientist	Harvey
Bill Franklin	Research Scientist	Boreman
Daniel Mullally	Research Scientist	Boreman
Guy Zummo	Research Scientist	Boreman
Haiqing Xianyu	Research Scientist	Wu
Igor Ciapurin	Research Scientist	Glebov
Larissa Glebova	Research Scientist	Glebov
Scott Webster	Research Scientist	Hagan/Van Stryland
Sergey Sukhov	Research Scientist	Dogariu
Vadim Smirnov	Research Scientist	Glebov
Vasile Rotar	Research Scientist	Glebov
Hong Shu	Research Scientist	Bass
Karima Chamma	Research Scientist	Glebov
Christine Spiegelberg	Research Scientist	Glebov
Giorgio Turri	Research Scientist	Glebov
James Ginn	Research Scientist	Boreman
Yeong-Ren Lin	Research Scientist	Chow
Dmitry Fishman	Post Doctoral Research Associate	Hagan/Van Stryland
Jeffrey Bean	Post Doctoral Research Associate	Boreman
Edward Kinzel	Post Doctoral Research Associate	Boreman
Narayanan Ananthakrishna	Post Doctoral Research Associate	Kuebler
Ibrahim Ozdur	Post Doctoral Research Associate	Li
Majid Masnavi	Post Doctoral Research Associate	Richardson
Arthur Freeman	Laboratory Technician	Richardson
Lorrene Denney	Laboratory Technician	Dogariu
Somsak (Tony) Teerawattanasook	Senior Electrical Engineer	Richardson

Visiting Scientists

NAME	TITLE	HOST
Brian Lail	Visiting Lecturer	Boreman
Olga V. Przhonska	Visiting Research Scientist	Hagan/Van Stryland
Sven Schröder	Visiting Research Scientist	Harvey
Bruno Bousquet	Visiting Research Scientist	Richardson
Nikolai Vorobiev	Visiting Research Scientist	Glebov
Harby Ahmed	Visiting Research Scientist	Richardson
Giovanni Di Giuseppe	Visiting Research Scientist	Saleh
Ruiyi Chen	Visiting Research Scientist	Fathpour
Gihwan Lim	Visiting Research Scientist	Wu
Haiqing Xianyu	Visiting Research Scientist	Wu

1.3 Organization and Administrative Staff

Organization Chart



Administrative Staff



MARISA DICKLER

Office Assistant
Marisa.Dickler@creol.ucf.edu



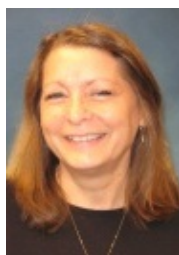
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RACHEL FRANZETTA

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JAMES ROSS

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SONO SHAH

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MARK C. WAGENHAUSER

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DENISE WHITESIDE

Assistant to the Dean
denise@creol.ucf.edu



RICHARD ZOTTI

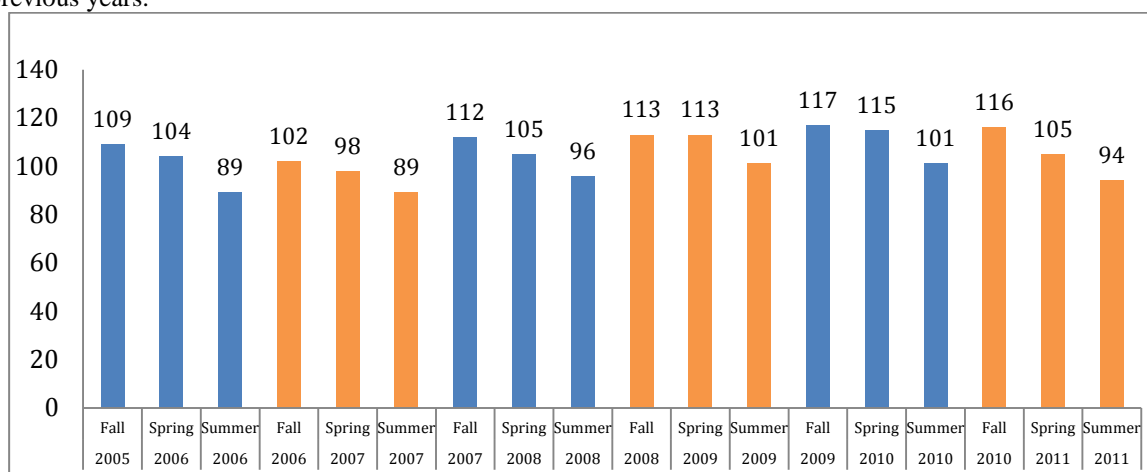
Engineer
rzotti@creol.ucf.edu

2. Academic Programs

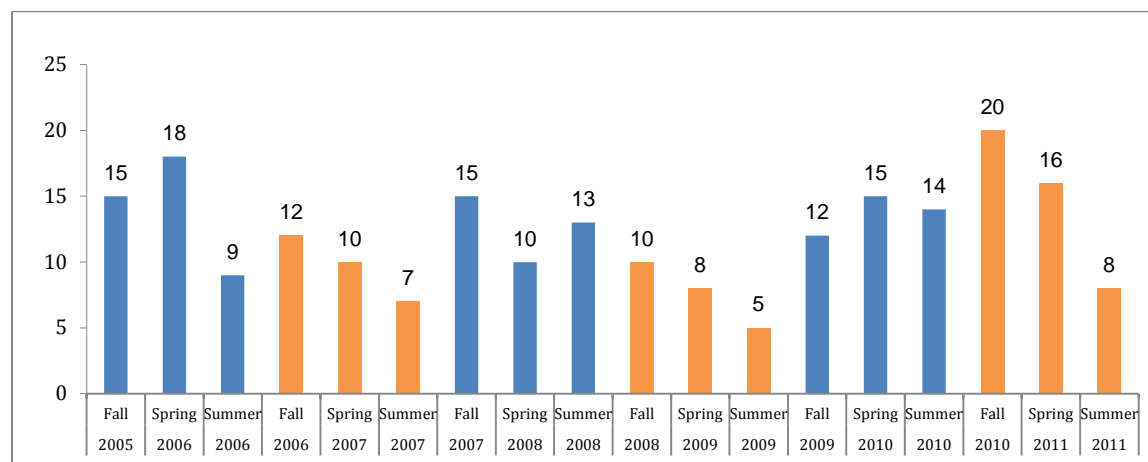
The College has a strong focus on education at the MS and PhD levels through both coursework and research. Our graduates are highly educated and well prepared for the modern-day work force and consequently our graduates are highly sought after in both the private sector and in top research universities. We also contribute to the undergraduate teaching mission of the university by teaching optics and photonics courses for undergraduates in other programs.

2.1 Graduate Recruitment and Enrollment

Enrollment in both MS and PhD programs has remained approximately constant at about 125 (Approx. 105 in the PhD and 10 – 20 in the MS.) A total of 35 new students (26 Ph.D. and 9 MS) enrolled in the 2010-11 academic year. The GRE scores of our admitted students were similar to 2009-10 and higher than in previous years. Overall, we received 394 pre-applications and 249 full applications to the graduate programs, which is an increase over previous years.



History of PhD Enrollment since 2005



History of MS Enrollment since 2005

We received a total of 364 pre-applications to our graduate programs in Fall 2010, which resulted in 201 official applications submitted through the graduate school. The pre-application is a preselecting tool run through our own web site that allows us to make contact with applicants early and to help advise international students as to whether to apply officially, which is an expensive undertaking for many international students. These numbers are similar to previous years.

New Matriculants for Fall 2010 - Summer 2011										
		Male	Female	FT	PT	CREOL Fellow	UCF Award*	UCF Trustee	UCF Dean	UCF Provost
PHD	US	11	0	11	1	7	1	1	3	1
	Intl	15	0	15	0	12	0	0	0	0
MS	US	4	0	2	2	0	0	0	0	0
	Intl	5	0	5	0	1	0	0	0	0

Total New Students 35

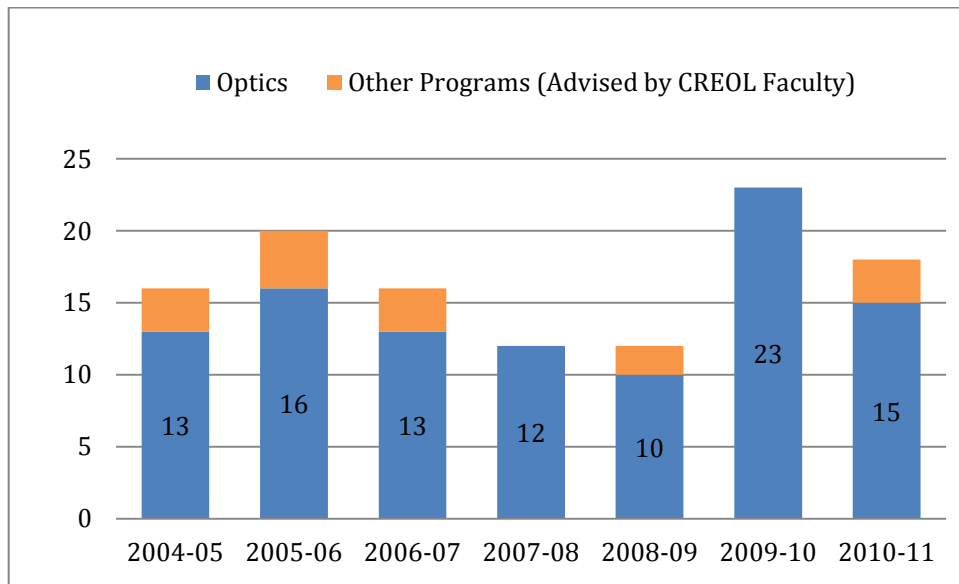
* Northrop Grumman, Schwartz, Suchoski, Frances Townes

Fall 2010 Mean GRE Scores							
		Quantitative	%	Verbal	%	Analytic Writing	%
PHD	US	755	84%	536	70%	4	51%
	Intl	792	92%	407	68%	3	17%
MS	US	665	64%	380	28%	3.25	14%
	Intl	768	87%	360	24%	2.87	11%
Mean		745		421		3	

Spring 2011 Mean GRE Scores							
		Quantitative	%	Verbal	%	Analytic Writing	%
PHD	US	-		-		-	
	Intl	670	63%	370	27%	3	10%
MS	US	745	82%	635	82%	4.8	69%
	Intl	760	86%	310	11%	2.5	8.0%
Mean		725		438		3	

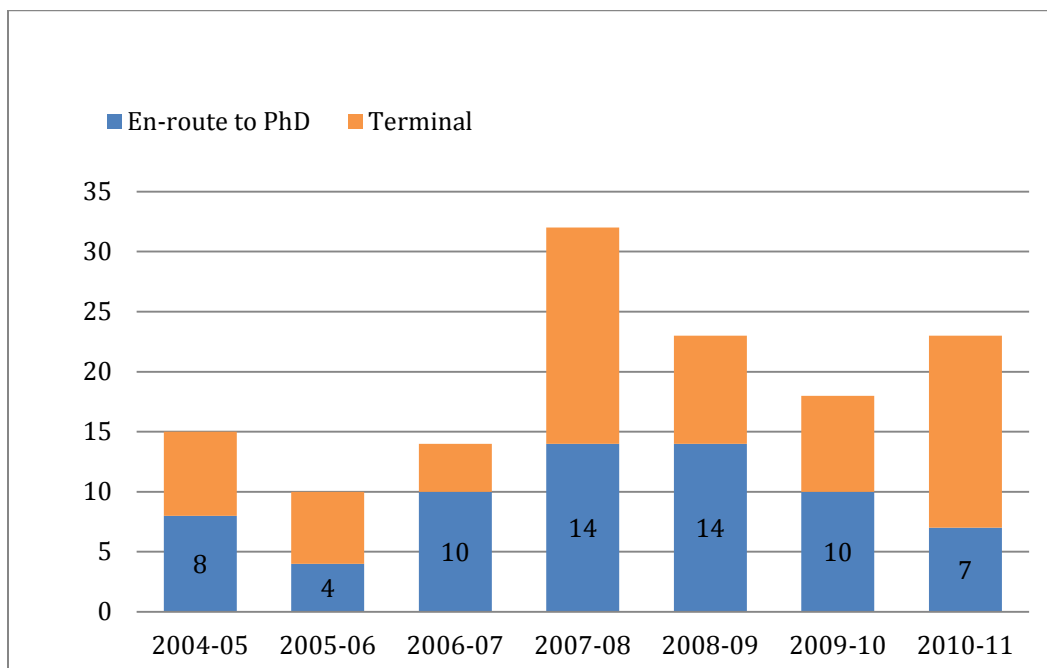
2.2 Degrees Awarded

As shown in the chart below,[†] there was a slight decrease in the number of PhD degrees awarded in the past year. This does not appear to be related to any particular trend, as the recruitment rate has remained constant over the past few years. A higher than normal graduation rate last year may be partly responsible. Overall, we have a continuing trend of students achieving PhD candidacy status sooner in the program that has been historically the case. This may be related to a new advising database that the college has implemented to monitor student progress. This is also resulting in students passing their proposal examinations sooner.



PhD 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 degrees awarded in academic year 2010-2011 (23) is roughly similar to previous years. This number tends to fluctuate on a year to year basis.



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”).

[†] Data on enrollment and awarded degrees are taken from UCF's official reports, which consider Summer 10, Fall 10 and Spring 10 as the Academic year 2010-11.

2.3 Ph.D. Dissertations

Academic Year Fall 2010 – Summer 2011

Student	Advisor	Dissertation Title
Hubert Seigneur	Winston Schoenfeld	Modeling and Design of a Photonic Crystal Chip Hosting A Quantum Network Made of Single Spins in Quantum Dots That Interact Via Single Photons
Meizi Jiao	Shin-Tson Wu	Fast-Response Liquid Crystal Displays
Panomsak Meemon	Jannick Rolland	Development of Optical Coherence Tomography for Tissue Diagnostics
Wilson Caba	Glenn Boreman	Application of Antenna Synthesis and Digital Signal Processing Techniques For Active Millimeter-Wave Imaging Systems
Claudiu Cirloganu	Dave Hagan/ Eric Van Stryland	Experimental and theoretical approaches to characterization of electronic nonlinearities in direct-gap semiconductors
Peter Olszak	Dave Hagan/ Eric Van Stryland	Nonlinear Absorption and Free Carrier Recombination in Direct Gap Semiconductors
Gero Nootz	Dave Hagan/ Eric Van Stryland	Experimental and Theoretical Study of the Optical Properties of Semiconductor Quantum Dots
Michael Hemmer	Martin Richardson	Few-cycle pulses amplification for attosecond science applications: modeling and experiments
Clarisse Mazuir	Winston Schoenfeld	Design, Fabrication, and Testing of High-Transparency Deep Ultra-Violet Contacts Using Surface Plasmon Coupling In Subwavelength Aluminum Meshes
Ibrahim Ozdur	Peter Delfyett	Low Noise, Narrow Optical Linewidth Semiconductor-Based Optical Comb Source And Low Noise RF Signal Generation
Brian Slovick	Glenn Boreman	Infrared Phased-Array Antenna-Coupled Tunnel Diodes
Ty Olmstead	Martin Richardson	Photodisruption In Ocular Tissue Near And At The Boundary Between The Anterior Chamber and Crystalline Lens
Christopher Brown	Martin Richardson	Laser induced breakdown spectroscopy for detection of organic residues : impact of ambient atmosphere and laser parameters
Joshua Lentz	James Harvey	Perceptual Image Quality of Launch Vehicle Imaging Telescopes
Dimitrios Mandridis	Peter Delfyett	Low Noise and Low Repetition Rate Semiconductor-Based Mode-Locked Lasers

Sergiy Mokhov	Boris Zeldovich	Theoretical Study of Beam Transformations by Volume Diffraction
Alessandro Salandrino	Demetrios Christodoulides	Electromagnetic Propagation Anomalies in Waveguiding Structures and Scattering Systems
Samuel Wadsworth	Glenn Boreman	Multilayered Planar Periodic Subwavelength Microstructures for Generating and Detecting Circularly Polarized Thermal Infrared Radiation



2011 Student-of-The-Year Dimitrios Mandridis (left) receiving the award from Dr. Bahaa Saleh.

2.4 Courses Taught

Core Graduate Courses		Fall 2010	Spring 2011	Summer 2011
OSE 5203	GEOMETRICAL OPTICS AND IMAGING SYSTEMS	Harvey	Boreman	
OSE 5312	LIGHT MATTER INTERACTION	Kik	Van Stryland	
OSE 6111	OPTICAL WAVE PROPAGATION	Moharam	Christodoulides	
OSE 6115	INTERFERENCE, DIFFRACTION AND COHERENCE	Dogariu	Kar	
OSE 6432	GUIDED WAVES AND OPTOELECTRONICS		LiKamWa	Moharam
OSE 6525	LASER ENGINEERING	Hagan	Schulzgen	
Other OSE Graduate Courses		Fall 2010	Spring 2011	Summer 2011
OSE 5041	INTRODUCTION TO WAVE OPTICS	Christodoulides		
OSE 5414	FUNDAMENTALS OF OPTELECTRONICS	LiKamWa		
OSE 5630	THIN FILM OPTICS	Boreman		
OSE 6143	FIBER OPTICS COMMUNICATION		Li	
OSE 6211	FOURIER OPTICS		Dogariu	
OSE 6234L	APPLIED OPTICS LABORATORY		Harvey	
OSE 6265	OPTICAL SYTEMS DESIGN	Harvey		
OSE 6314	OPTICS OF LOW DIMENSIONAL SEMICONDUCTORS		Schoenfeld	
OSE 6319	OPTICAL WAVES AND MATERIALS			Zeldovich
OSE 6120	THEORETICAL FOUNDATIONS OF OPTICS	Zeldovich		
OSE 6125	COMPUTATIONAL PHOTONICS		Moharam	
OSE 6334	NONLINEAR OPTICS	Van Stryland		
OSE 6335	NONLINEAR GUIDED WAVE OPTICS	Christodoulides		
OSE 6349	APPLIED QUANTUM MECHANICS FOR OPTICS	Abouraddy		
OSE 6445	HIGH SPEED PHOTONICS	Delfyett		
OSE 6455L	PHOTONICS LABORATORY	Li		
OSE 6526C	LASER ENGINEERING LABORATORY			Richardson
OSE 6615L	OPTOELECTRONIC DEVICE FABRICATION LABORATORY	Schoenfeld		

Undergraduate Courses		Fall 2010	Spring 2011	Summer 2011
OSE 4052	INTRODUCTION TO PHOTONICS	Riza		
OSE 4470	OPTICAL FIBER COMMUNICATION SYSTEMS		Fathpour	
OSE 4830	INTRODUCTION TO IMAGING SYSTEMS		Saleh	
Other Courses		Fall 2010	Spring 2011	Summer 2011
IDS 6938	ST: HISTORY OF PHYSICAL SCIENCE, CULTURAL CONNECTIONS AND OTHER ISSUES		Bass	
PHY 5937	ST: ATTOSECOND LASER PHYSICS		Chang	
PHY 4424	OPTICS		Soileau	
IDS 6938	ST: HISTORY OF PHYSICAL SCIENCE, CULTURAL CONNECTIONS AND OTHER ISSUES		Bass	

2.5 Course and Program Development

Graduate Education

In 2010-2011, there were few changes to the curriculum, which had already been significantly overhauled the year before. These changes to the PhD core in 2009-2010 necessitated changes to be made to the PhD qualifying exam in 2010-2011. In addition to changes in content, the qualifying exam was also modified so that problems are more integrated across disciplines, instead of being tied to individual course. Thanks to the hard work of the examination committee, these changes were successfully implemented for the August 2010 and January 2011 examinations. One new graduate course, *Fiber Lasers*, was taught by Dr. Axel Schülzgen. This was taught as a Special Topics course and it is planned to be developed into a regularly scheduled course in 2012.

Undergraduate Education

The faculty of the college reached the decision to implement a full undergraduate degree in *Photonic Science and Engineering*. Currently, there are discussions within the university administration as to how this will be administered.

2.6 Instructional Laboratories

OSE 6234C Applied Optics Laboratory

Prerequisite Course: Graduate standing and OSE 5203 or consent of the instructor. Laboratory Techniques for observing optical phenomena and quantitative experimental study of geometrical optics, optical interferometry, diffraction, and image processing.

OSE 6455C Photonics Laboratory

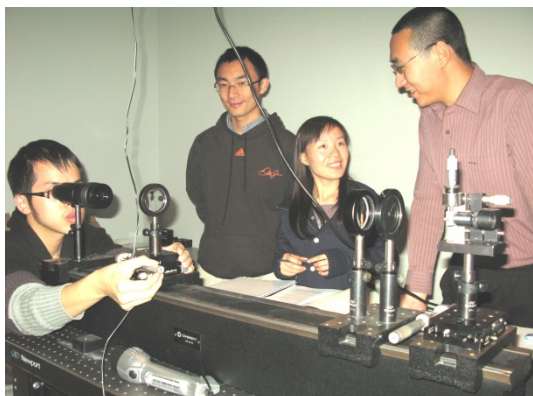
Prerequisite Course: Graduate standing and OSE 6432 or consent of the instructor. Experimental study of photonic devices and systems including liquid crystal displays, fiber-optic sensors, laser diodes, electro optic modulation, acousto-optic modulation, lightwave detection, optical communications, and photonic signal processing.

OSE 6526C Laser Engineering Laboratory

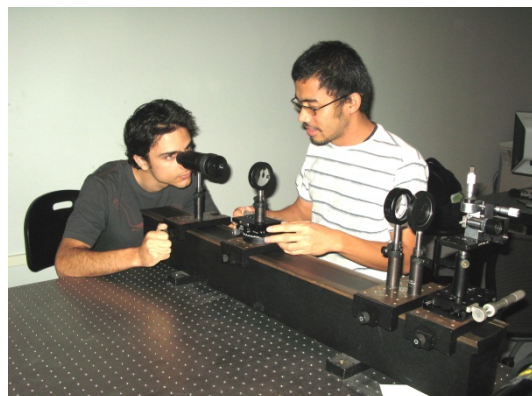
Prerequisite Course: Graduate standing and OSE 6525 or consent of the instructor. Designing and device implementation of diode pumped solidstate lasers, nonlinear frequency conversion, Q-switching, mode locking, and pulse second harmonic generation.

OSE 6615L Optoelectronic Device Fabrication Laboratory

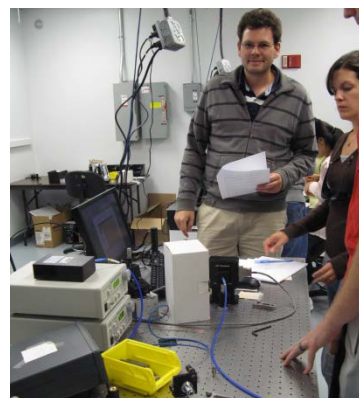
Prerequisite Course: Graduate standing or C.I. Design and micro-fabrication of semiconductor optoelectronics devices including passive waveguides, light emitting diodes (LEDs), laser diodes (LDs), photodetectors.



Students in the Applied Optics Laboratory.



Students in the Laser Engineering Laboratory.





Students in the Optoelectronic Device Fabrication Laboratory.

2.7 Colloquia and Seminars

DATE	SPEAKER	TITLE
1/31/2011	Angela Duparré, Fraunhofer Institute for Applied Optics and Precision Engineering Albert-Einstein- Strasse Jena, Germany	Roughness, Scatter and Functional Properties of Optical Surfaces and Thin Films.
2/1/2011	Michael Duparré Institute of Applied Optics, Friedrich-Schiller-University, Jena, Germany	Field Characterization for Large-Mode-Area Optical Transport Fibers by Modal Decomposition.
2/8/2011	Charles Lee AFOSR	Organic Materials Chemistry.
2/21/2011	Moti Segev Physics Department, Technion - Israel Institute of Technology, Haifa, Israel	Sparsity-Based Sub-Wavelength Imaging and Super-Resolution in Time and Frequency.
2/23/2011	A. Douglas Stone Yale University	Lasers, Anti-lasers and PT-symmetric Laser-Absorbers.
3/1/2011	Hui Cao Department of Applied Physics, Yale University	Complex Photonic Nanostructures and Phenomena.
3/15/2011	Timothy Bunning Materials Research Engineer- Air Force Research Laboratory	Photosensitive and Polymer Templated Cholesteric Liquid Crystals.
3/16/2011	John C. Stover The Scatter Works Tucson, AZ	Light Scatter Metrology: Selected Events over the Last Quarter Century.
3/31/2011	Laura Marcu Biomedical Engineering University of California, Davis	Fluorescence Lifetime Techniques for Biomedical Diagnostics.
4/4/2011	Norman Tolk Department of Physics and Astronomy, Vanderbilt University	Ultra-Fast Carrier and Coherent Phonon Dynamics Using Coherent Acoustic Phonons.

4/4/2011	Andreas Eisele Institute of Photonics & Quantum Electronics (IPQ), Karlsruhe Institute of Technology	Photon-Counting Laser Rangefinder.
4/6/2011	Srinivas Sridhar Electronic Materials Research Institute & Department of Physics, Northeastern University, Boston, MA.	Nanoscale Optics with Negative Metamaterials.
4/6/2011	Husain Imam NKT Photonics	Fiber Lasers and Fiber Technology.
4/7/2011	Andreas Mandelis Center for Advanced Diffusion-Wave Technologies, University of Toronto, Toronto, Canada	Novel Biomedical Photoacoustic and Thermophotonic Imagers and Biosensors: State-of-the-art and science.
4/27/2011	Sarath Gunapala NASA - Jet Propulsion Laboratory, California Institute of Technology	III-V Quantum Structures for Infrared Detection. IEEE Student Chapter Seminar Series
4/28/2011	Mary Potasek Simphotek, Inc.	Simulating Photonic Interactions with Graphical Methods: Numerical Modeling without Writing Software.
4/29/2011	Michael C. Dudzik Vice President, Science & Technology Washington Operations Lockheed Martin Corporation	Far Infrared and Terahertz Technology-- at the turning point of change! Industrial Affiliates Day talk
4/29/2011	Ronald Driggers Optical Sciences Division, Naval Research Laboratory	Infrared Imaging in the Military: Status and Challenges. Industrial Affiliates Day talk
4/29/2011	Dwight L. Woolard U.S. Army Research Office	Novel Nano-Architectural Concepts for THz/IR Based Bio-Sensing. Industrial Affiliates Day Guest Speaker
6/1/2011	Markus B. Raschke Department of Physics, Department of Chemistry, and JILA University of Colorado at Boulder	Ultrafast Nano-optics.
6/16/2011	Jesus Fernando TRUMF Inc.	Ultra-Short Pulse Lasers and Applications.
7/7/2011	Nathaniel Fried Department of Physics and Optical Science UNC- Charlotte	Novel Therapeutic and Diagnostic Applications of Lasers in Medicine.
7/8/2011	Sven Schröder Fraunhofer Institute for Applied Optics and Precision Engineering (IOF), Jena, Germany	Roughness-induced scattering of EUV/Soft-X-ray optical components.
7/11/2011	Zhongping Chen Biomedical Engineering,	Multimodality Endomicroscopic Imaging: Fiber Based OCT, PAT, MPM, and CARS Imaging.

University of California, Irvine		
8/5/2011	Jin U. Kang Department of Electrical & Computer Engineering, Johns Hopkins Univ.	Ultra-Fast Real-Time Optical Coherence Tomography Guided Microsurgery.
8/29/2011	Prof. Yan-qing Lu College of Engineering and Applied Sciences, Nanjing University, China	Optical Sensing with Microstructured Fibers. SID Student Chapter Seminar Series
9/12/2011	Chris Sapiano Photonics Group University of Toronto	Modelling DC-Induced Nonlinearity in Optical Fiber.
10/14/2011	Yi-Hsin Lin National Chiao Tung University, Taiwan	Electrically switchable surface of a liquid crystal and polymer composite film and its applications. SID Student Chapter Seminar Series
10/28/2011	Dietmar Kracht Laser Zentrum Hannover e.V., Germany	Single-frequency and ultrafast fiber lasers
11/29/2011	P. Mauchien, J.-B. Sirven, J.- L. Lacour, G. Moutiers CEA, Nuclear Energy Division, Department of Physical Chemistry	Laser-induced breakdown spectroscopy for online elemental analysis
12/07/2011	Mohamed Abdel Harith NILES, Cairo University	Making Use Of Molecular Bands In LIBS Spectra In Recent Applications At NILES, Cairo University
12/09/2011	Timothy Day Daylight Solutions	Recent Results from both High Power and Broadly Tunable External Cavity Quantum Cascade Lasers
12/13/2011	Tony Valenzuela	Overview of ARL-WMRD USPL Activities

2.8 International Collaboration

International REU Program

Research Experiences for Undergraduates in Optics, Lasers, Photonics and Optical Materials

The NSF International REU Program in Optics, Lasers, Photonics & Optical Materials, directed by UCF, is a special program that seeks to provide promising undergraduates in physics, engineering, materials science and other related disciplines, an opportunity to fast track into the research world in these areas. The NSF-sponsored International REU program in Optics, Lasers Photonics and Optical Materials will again run in 2011. This program offers students a comprehensive introduction into the research area of lasers, optics, and photonics, new engineering modalities with lasers, including ultra-fast lasers, and the development of new optical materials. Students are associated with an international research collaboration that usually results in research publications and presentations at international conferences.



The program is a two-summer internship. The first summer is usually spent in a research group at UCF or Clemson University's School of Material Science & Engineering. Throughout the following semester, the student stays engaged with the research project. The second summer the student spends 12 weeks working in the laboratories of

our international collaborators in Europe (France, Germany or Italy) in institutes and universities in cities that include, Bordeaux, Berlin, Paris, Turin, Lyon, Jena.

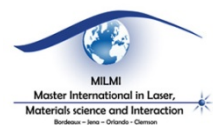
2010 REU students: Kristina Bagnell, Jeffrey Chia, Chelsea Guy, Samantha Hutcheson, Julian Leland, Shoshana Levi, Izabella Lipnarski, Annam Nguyen, Edward Romero, Danielle Simmons, Lionel Gigant, Christophe Gombaudo.

The Atlantis- MILMI Program

The Atlantis-MILMI Program is a Masters Degree program, offering dual Masters degrees in the interdisciplinary field of Lasers, Photonics and Material Science by a consortium of four institutions, the Physics and Chemistry departments of the University of Bordeaux, France; the Friedrich Schiller University in Jena, Germany; CREOL, the College of Optics & Photonics of the University of Central Florida; and the School of Material Science & Engineering, Clemson University in South Carolina. Twelve scholarships are offered each year to allow students in this dual Masters degree program to take courses and perform research for up to 12 months at institutions across the Atlantic. Six different choices of Dual Masters are offered under the Atlantis-MILMI Program and unique opportunities to work with different professors are available.

Resulting from a long history of scientific collaboration between these institutions, this advanced degree program creates individualized education and training in optics, lasers, photonics, optical materials and the interaction of light with matter, drawing on their unique expertise, research programs, and educational curricula. CREOL, The College of Optics & Photonics at UCF, provides comprehensive education and research training in optics, photonics and lasers. Friedrich Schiller University is renowned for its expertise in advanced lasers and laser material processing. The University of Bordeaux will introduce non-linear science and the optical properties of materials. A foundation in chemistry and physics is complemented by dedicated programs in organic and inorganic materials science and engineering at Clemson University.

Each semester, the students attend existing selected technical courses taught in English at all four institutions. The latest technology in teleconferencing and "podcasting" solutions is used to accompany the mobility of students. First class training facilities will be offered to participants along with strong tutorship. Special (existing) intensive language classes in the national languages of the consortium (German, French and English) are made available to participants along with particular courses that will foster mutual integration of the scientific community. The students are also involved in research activities and exposed to research seminars and courses. Faculty exchanges also support a summer school each year in Europe or the US. To encourage entrepreneurship experience, every effort is made to match each student's program to a technical project having scientifically and technologically maturity in his home university.



Fraunhofer-Townes Collaboration

Research and academic collaboration between the Townes Laser Institute, UCF and the Fraunhofer Institute for Laser Technology, RWTH Aachen University (Germany) has been established in August 2009. Under this collaboration agreement a joint research program in the fields of laser development, material processing, novel system technology, and life sciences is being created, including the exchange of scientist and students.

The Fraunhofer Institute for Laser Technology (ILT) located in Aachen, Germany is the leading industrial laser and laser applications facility in Europe. For more than 20 years, ILT has stood for concentrated expertise in the field of laser technology. The innovative solution to manufacturing and production problems, the development of new technical components, competent consultancy and training, highly specialized personnel, the latest technology as well as an international reputation: all these factors make for long-term partnerships.

Fraunhofer ILT's interdisciplinary research activities cover a wide range of areas such as the development of new laser beam sources and components, the use of modern laser measurement and testing technology and laser-supported manufacturing. This includes for example laser cutting, caving, drilling, welding and soldering as well as surface treatment, micro-processing and rapid-prototyping. Furthermore, ILT's research involves laser plant technology and versatile system technology including process control. Besides solving questions of laser technology, the institute develops high-energy sources for soft X-rays for use in semiconductor production and in X-ray microscopy.

The close contact to the Department of Laser Technology at the RWTH Aachen University ensures that a continuous access to a wide knowledge base in the field of laser technology is ensured. RWTH Aachen University has achieved international recognition in several fields of engineering and science, currently ranked the first place in Germany in

the fields of mechanical engineering, electrical engineering, and computer science. Several scientists affiliated with RWTH Aachen have won world-wide acclamations, including Nobel Prizes in physics and chemistry.

Research Topics:

- Laser-assisted fabrication of graphene
- Selective laser etching of dielectrics and semiconductors
- Mid-IR optical phase microscopy
- Manufacturing of biocompatible substrates
- Ultrafast laser materials processing



Martin Richardson, Director of the Townes Laser Institute (left), UCF President John Hitt (Center) and Reinhart Poprawe, Director of the Fraunhofer Institute for Laser Technology (right), at the signing of the collaboration agreement between the Townes Laser Institute, UCF and the Fraunhofer Institute for Laser Technology, RWTH Aachen University (Germany)

3. 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, two centers are also active:

Florida Photonics Center of Excellence (FPCE)

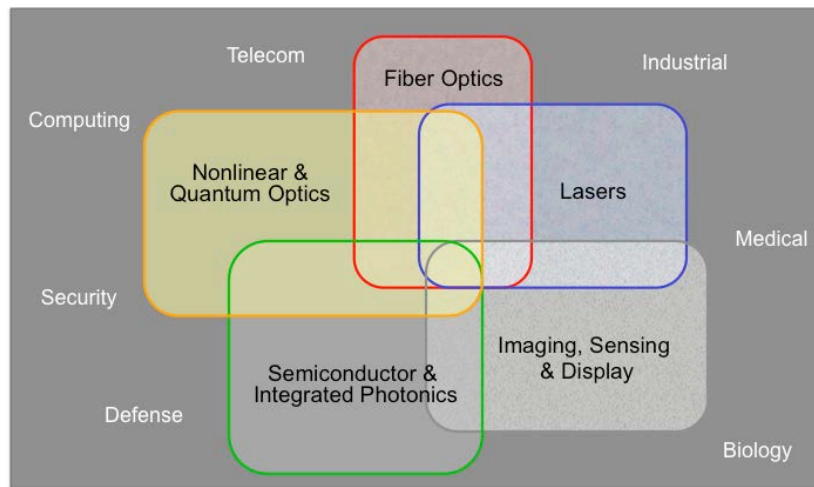
The FPCE was established with a \$10 million grant from the State of Florida to create a new center of excellence within The College of Optics and Photonics at the University of Central Florida. The program began in 2003 with three primary goals: Advance excellence in research and graduate education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

3.1 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/ResearchArea.aspx>



Areas of research and applications

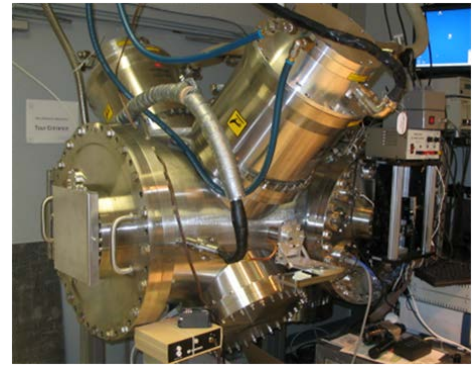
Lasers

Science & Technology

- Solid State Lasers
- Ceramic Lasers
- Semiconductor Lasers
- EUV & X-ray Lasers
- High Power Lasers
- Ultrafast Lasers
- Optical Frequency Combs

Applications

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



Laser and Plasma Laboratory

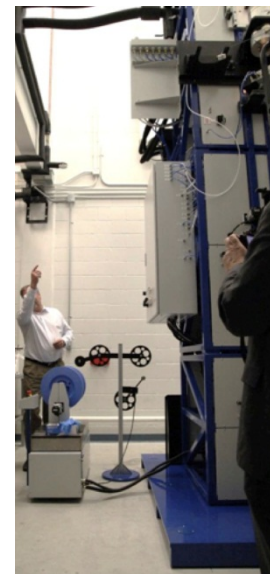
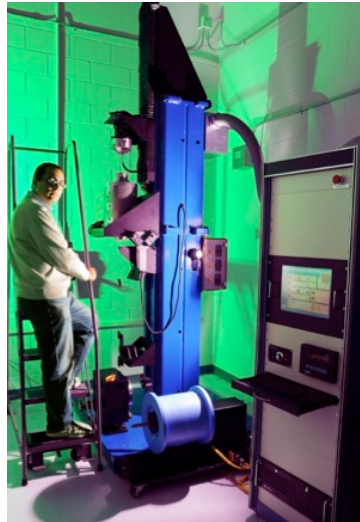
Fiber Optics

Science & Technology

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

Applications

- Fiber Optic Communication
- Fiber Optic Networks
- Fiber Optic Sensing



Fiber Drawing Towers

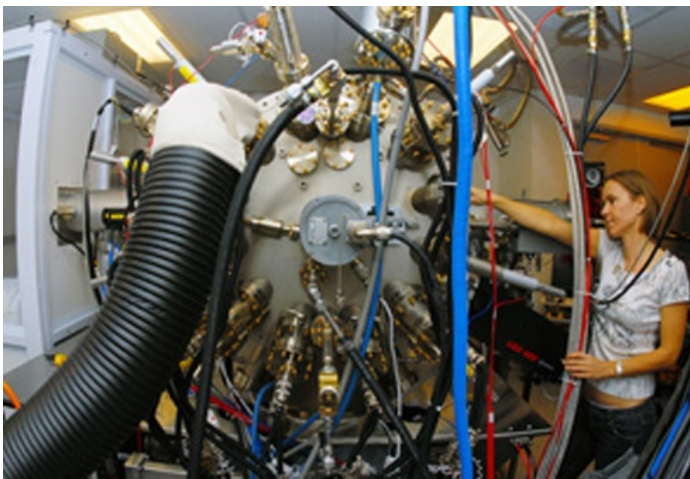
Semiconductor & Integrated Photonics

Science & 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



MBE Facility



Nanophotonics Fabrication Facility

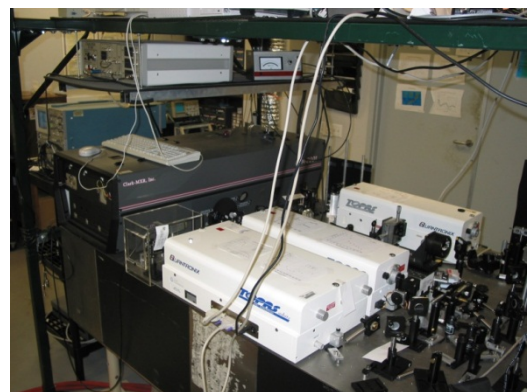
Nonlinear & Quantum Optics

Science & 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



Femto-second Nonlinear Optics Laboratory

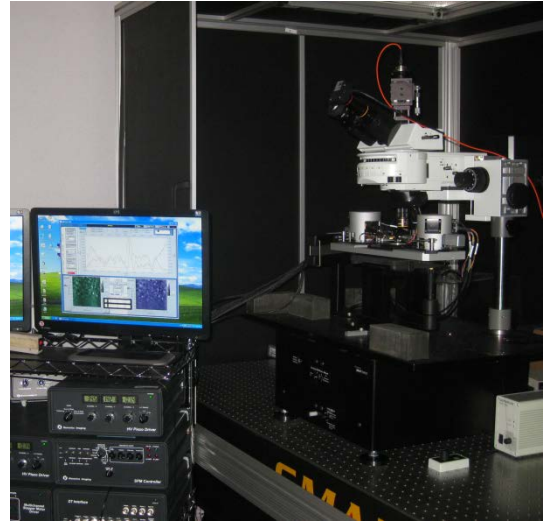
Imaging, Sensing & Display

Science & 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

- Optical Sensing & Imaging
- Biological & Medical Imaging
- Microscopy
- Optical EUV & X-ray Astronomy
- Optical EUV & X-ray Lithography
- Displays
- Optical Signal Processing



Near field microscope in the Photonic Diagnostic of Random Media Laboratory

3.2 Laboratories & 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.

Shared Facilities

Nanophotonics Systems Fabrication Facilities. A 3,000 ft² 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 Laboratory is designed and operated as a multi-user facility, with availability to companies and other outside users. Rm 180.

Optoelectronic Fabrication Cleanroom. 800 sq. ft. multiuser facility consisting of class 100 and class 10,000 cleanrooms. Used in the development of optoelectronic semiconductor devices. The facility equipment includes a Suss MJB-3 aligner, a Plasma-Therm 790 RIE/PECVD, an Edwards thermal evaporator, along with a bonder, a 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

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](#).

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](#).



Photolithographic and device packaging equipment in the Optoelectronic Fabrication Cleanroom

Faculty Labs

Northrup Grumman EUV Photonics Laboratory. Also referred to as the **Laser Plasma Laboratory**. Conducting research on X-ray and EUV optics and sources, X-ray microscopy, laser-aided material processing, and laser generated plasmas. [Martin Richardson](#).

Laser Aided Materials Processing Laboratories. 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 System Development Laboratories. 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](#).

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](#).

Diffraction and Holographic Optics Laboratory. Conducting rigorous analysis, design, and demonstration of diffractive and holographic optical elements, subwavelength grating structures and their applications, E-M theory of grating diffraction, holographic optical information processing and storage, volume holography. [Leonid Glebov](#).

Optical Glass Sciences & Photo-Induced Processing Laboratory. 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 Ceramics Laboratory. 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](#).

Ultrafast Photonics Laboratory. Conducting research on ultrafast high power optical pulses from semiconductor diode lasers, for applications in applied photonic networks and laserinduced materials modification. [Peter Delfyett](#).

Florida Attosecond Science and Technology Lab. Generation of attosecond (10^{-18} s) and zeptosecond (10^{-21} s) X-ray pulses. [Zenghu Chang](#).

Fiber Optics Lab. Research in fiber fabrication technology, nano-structured fibers, nonlinear fiber materials, fiber lasers, and fiber sensing applications. [Axel Schülzgen](#), [Rodrigo Amezcua](#).

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](#).

Optical Communication Laboratory. 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](#).

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](#).

Nanophotonic Devices Laboratory. Research in epitaxial growth and properties of oxide semiconductors, oxide and nitride-semiconductor light emitting diodes, self-assembled quantum dots, and e-beam nano-lithography. [Winston Schoenfeld](#).

Nanophotonics Characterization Laboratory. 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](#).

Multiple Quantum Wells Laboratory. 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](#)

Integrated Photonics & Energy Solutions Lab. Specializing in fundamental and technological aspects of silicon-based optoelectronic devices and chips, including their energy efficiency issues. The lab encompasses near- and mid-infrared setups for characterizing the devices fabricated in CREOL's Nano Fabrication Facility. [Sasan Fathpour](#).

Nonlinear Optics Laboratories. Conducting research on a variety of nonlinear optical effects, materials, and devices including nonlinear interactions in waveguides, nonlinear signal processing, optical power limiting, and characterizing materials response at picosecond and nanosecond scales. [Eric Van Stryland](#) and [David Hagan](#)

Nonlinear Waves Laboratory. Research in nonlinear optics, spatial and spatio-temporal solitons, discrete solitons in photonic lattices, and curved beams. [Demetrios Christodoulides](#).

Quantum Optics Laboratory. 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](#), [Ayman Abouraddy](#).

Infrared Systems Laboratory. Conducting research on infrared detector and focal-plane analysis, optics of random media, infrared scene projection, and transfer-function techniques. [Glenn Boreman](#).

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](#).

Optical Design & Image Analysis Laboratory. Conducting research on Optical Design and Image Analysis, Simulation and Modeling of Optical Systems, and characterization of optical phenomena. [James Harvey](#).

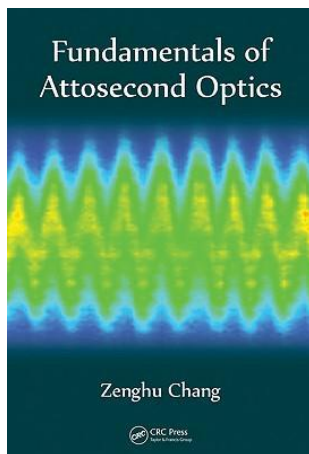
Photonic Information Processing Systems Laboratory. Exploring the principles of optics and information processing for solving important problems in system science relevant to academia, government, and industry. [Nabeel Riza](#).

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 forevated imaging and zoom lens, and 4) bio-inspired tunable optical filters using cholesteric liquid crystals. [Shin-Tson Wu](#).

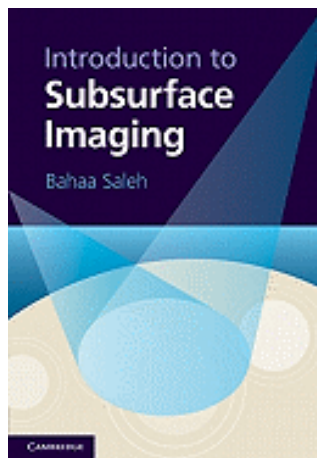
3.3 Publications

Books

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B. E. A. **Saleh**, "*Introduction to Subsurface Imaging*," Cambridge University Press (2011).



Book Chapters

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Note: The preceding list includes journal papers co-authored by full-time CREOL faculty, with the faculty names highlighted in black. Also included are papers co-authored by faculty with joint and courtesy appointments who listed CREOL as one of their affiliations, with the names highlighted in blue. Papers published by CREOL scientists and students, with no faculty co-authors, are also listed with the names highlighted in green.

Conference Papers and Presentations

A. F. **Abouraddy**, "Multi-material optical fibers fabrication and applications," Advanced Photonics: OSA Optics & Photonics Congress, Specialty Optical Fibers, Toronto, Canada, 12–15 June (2011). (*Invited*)

A. F. **Abouraddy**, "Multi-material optical fibers: Fabrication and applications," SPIE DSS, Orlando, FL, April 25-29 (2011). (*Invited*)

S. Shabahang, J. Kaufman, and A. F. **Abouraddy**, "Scalable fabrication of micro- and nano-particles utilizing the Rayleigh instability in multi-material fibers," Proceedings SPIE 8031, 80312O (2011).

E. Banaei and A. F. **Abouraddy**, "Design and optimization of a fiber-based luminescent solar concentrator," SPIE DSS, Orlando, FL, April 25-29 (2011).

E. Banaei and A. F. **Abouraddy**, "Design of a Fiber-based Luminescent Solar Concentrator Fabric," TechConnect World, Clean Technology 2011, Boston, MA, June 13-16 (2011).

J. Kaufman, S. Shabahang, G. Tau, and A. F. **Abouraddy**, "Fabrication of glassy nano-spheres via Rayleigh instabilities in multi-material fibers," TechConnect World, Nanotech 2011, Boston, MA, June 13-16 (2011).

J. J. Kaufman, G. Tao, and A. F. **Abouraddy**, "Lithographic inscription of micro-optical devices on a multi-material optical fiber tip," SPIE DSS, Orlando, FL, April 25-29 (2011)

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A. F. **Abouraddy**, Di Giuseppe, G., D. N. **Christodoulides**, and B.E.A **Saleh**, "Anderson co-Localization of Spatially Entangled Photons," FiO 2011, Talk FThS1, Jan Jose, California, October 16-20 (2011).

L. Martin, G. Di Giuseppe, A. Perez-Leija, R. Keil, A. Szameit, A. F. **Abouraddy**, D. N. **Christodoulides**, and B. E. A. **Saleh**, "Anderson Localization in Optical Waveguide Arrays with Off-Diagonal Coupling Disorder," Lasers and Electro-Optics (CLEO) Conference, 1-6 May (2011).

A. F. **Abouraddy** and B. E. A. **Saleh**, "Encoding qubits into the spatial distribution of single photons and entangled photon pairs," SPIE DSS, Orlando, FL, April 25-29 (2011).

K. Kagalwala, G. Di Giuseppe, A. F. **Abouraddy**, and B. E. A. **Saleh**, "Implementing an optical CNOT gate

using spatial parity qubits," SPIE DSS, Orlando, FL, April 25-29 (2011).

D. N. **Christodoulides**, "Airy Beams and Bullets," Asymptotics, phases and chaos, Optical and Quantum Conference in Honor of Michael Berry's 70th Birthday, Universidad Nacional Autónoma de México, Cuernavaca, México, September 7th to 9th (2011). (*Invited*)

D. N. **Christodoulides**, "Discrete solitons," talk NTuC1, 2011 Nonlinear Optics (NLO), July 17-22, Kauai (2011). (*Invited*)

D. N. **Christodoulides**, "PT symmetry in optics," Physics of Quantum Electronics 2011, Snowbird Utah, January2-6 (2011). (*Invited*)

D. N. **Christodoulides**, "PT-symmetric optics and applications," PTQM (PT-Quantum Mechanics) Symposium, Heidelberg University, Sept. 25-28, 2011, Germany (2011). (*Invited*)

J. Prakash, W. Man, Z. Zhang, P. Zhang, D. N. **Christodoulides**, and Z. Chen, "'Air-Bubble'-Type Nonlinear Nano-Suspensions," FiO 2011, Talk FThA7, Jan Jose, California, October 16-20 (2011).

N. K. Efremidis, D. N. **Christodoulides**, I. Chremmos, and Z. Chen, "Abruptly autofocusing waves," QThS1, CLEO 2011, Baltimore, Maryland, May 1-6 (2011).

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I. Kaminer, M. Segev, and D. N. **Christodoulides**, "Can Quadratic Solitons Self-Accelerate," QFF7, CLEO 2011, Baltimore, Maryland, May 1-6 (2011).

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A. Demir, G. Zhou, S. Freisem, X. Lia, Y. Zhang, and D.G. **Deppe**, "Scaling properties of lithographic VCSELs," 2011 Photonics West, Feb. 3, 2011, San Francisco, CA (2011).

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T. Kohlgraf-Owens, S. Sukhov, and A. **Dogariu**, "Exploiting Optical Forces to Characterize Electromagnetic Fields," FIO/OSA Annual Meeting, San Jose (2011).

T. Kohlgraf-Owens and A. **Dogariu**, "Imaging Spectroscopy Without A Spectrometer," FIO/OSA Annual Meeting, San Jose (2011).

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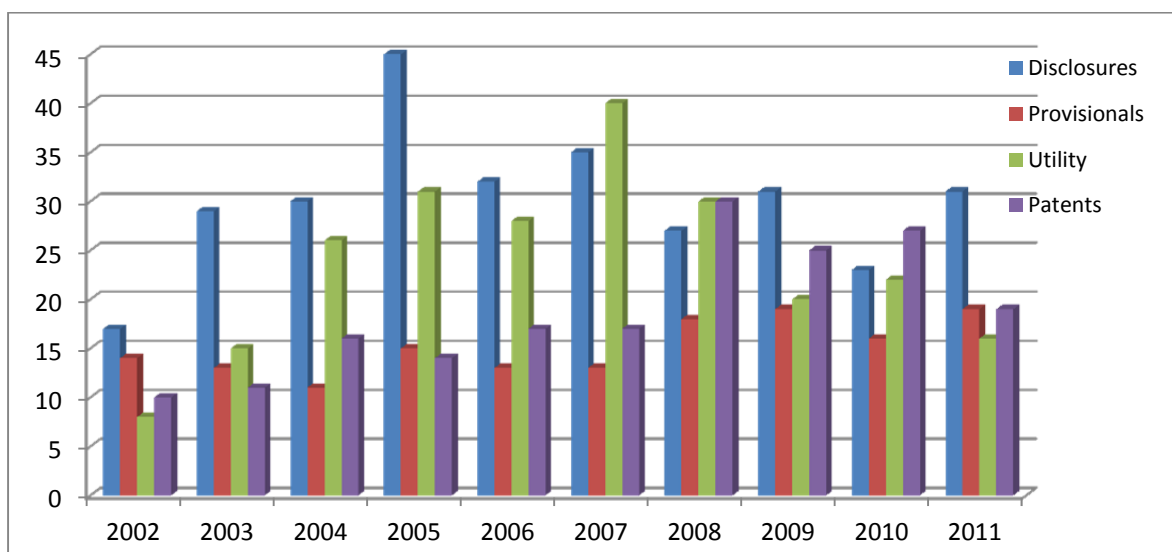
A. Santhanam, S. Meeks, **J. Rolland** “Simulating 3D Lung Dynamics Using an iPad.”

S.T. Wu, Y. Li, Y.R. Chuang, C.H. Lin, “Liquid crystal display devices with patterned electrodes.”

S.T. Wu, L. Rao, Y. P. Chang, C.C. Tsai, “Low Voltage Optically Isotropic Liquid Crystal Displays.”

S.T. Wu, H.C. Cheng, J. Yan, Y.R. Chuang, C.H. Lin, “Vertical Field Switching for Optically-Isotropic Liquid Crystal Displays.”

S.T. Wu, M. Jiao, Y. Li, “Liquid crystal display devices with patterned electrodes”



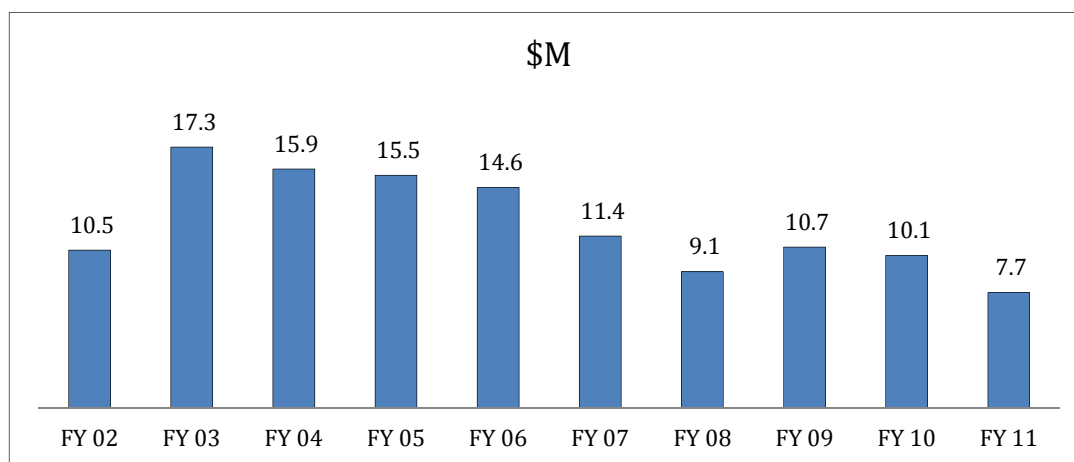
History of disclosures, applications, and issued patents by FY

3.4 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. These include a \$10M fund 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	Industry	Educational	International	Total
\$4,275,248	\$2,838,673	\$370,983	\$174,250	\$7,659,154

Grants received in FY 2011



History of funding from various sources since 2002

New Projects

Recipient	Source	Title of Award	Begin	End	Awarded 2010	Cumulative Funding
Abouraddy, A, Richardson, M, Schulzgen, A	DOD/Army/Army Research Office	Workshop on Next-Generation Optical Fiber Technology	8/9/2010	2/8/2012	\$20,000	\$20,000
Abouraddy, A, Richardson, M, Schulzgen, A	National Science Foundation	Workshop on Next-Generation Optical Fiber Technology	10/1/2010	3/31/2011	\$15,000	\$15,000
Abouraddy, A	LightPath	Chalcogenide Glass Recycling and Extrusion	7/30/2010	2/28/2011	\$30,000	\$30,000
Abouraddy, A	National Science Foundation	Mid-infrared, wide-bandwidth, stable coherent optical sources generated by multi-material, nonlinear chalcogenide-glass fibers	4/15/2010	3/31/2012	\$89,480	\$183,822
Bass, M	Naval Air Warfare Center WPN Division	Laser Calorimetry	8/14/2010	2/29/2012	\$209,000	\$209,000
Bass, M	Sandia National Laboratories	Modeling Diode Pumped Nd:YAG and Cr,Nd:GSGG Solid State Lasers	9/9/2010	9/8/2011	\$99,542	\$99,542
Boreman, G	ERC, Incorporated	Antenna-Coupled Laser Detection Sensors	5/1/2011	7/10/2011	\$110,000	\$110,000
Boreman, G	Plasmonics, Inc	CREOL Support for STTR AF103-BT35: Tunable Fresnel-Zone Lens for Agile Wavefront Control	4/22/2011	1/21/2012	\$50,000	\$50,000
Boreman, G	Lockheed Martin	Infrared Metamaterial Antennas: A Path to Miniaturization of EO Systems	11/1/2009	5/31/2011	\$50,000	\$250,000
Boreman, G	Polaris Sensor Technologies, Inc	Polarizing IR Beamsplitter	10/12/2010	6/3/2011	\$15,000	\$15,000
Boreman, G	Plasmonics, Inc	Profile Feature Extractor (PFx) Sensor Component for Persistent ISR Applications	1/26/2011	7/25/2011	\$5,000	\$5,000
Boreman, G	Sandia National Laboratories	Releasable Signature Metamaterials	5/16/2011	9/30/2011	\$100,000	\$100,000
Christodoulidis, D	United States-Israel Binational Science Foundation	Linear and Nonlinear Waves in Photonic Lattices	10/1/2007	9/30/2011	\$11,250	\$49,500
Christodoulidis, D	University of Arizona	Mathematical Modeling and Experimental Validation of Ultrafast Nonlinear Light-Matter Coupling Associated with Filamentation in Transparent Media	9/30/2010	11/29/2011	\$102,302	\$102,302
Delfyett, P	Raydiance, Inc.	Amplitude and Phase Tailoring Phase 2	2/1/2011	6/29/2012	\$150,000	\$150,000

Delfyett, P	MIT Lincoln Laboratory	Compact, High Power, Low Noise Mode-locked Semiconductor Lasers for Photonic Analog to Digital Converter Applications	10/13/2010	10/13/2011	\$200,000	\$200,000
Delfyett, P	Harris Corporation	Laser Metrology and Coherent Signal Development	9/1/2010	4/30/2011	\$175,000	\$175,000
Delfyett, P	University of Washington	Science and Technology Center at the University of Washington	8/1/2005	7/31/2012	\$30,000	\$420,000
Deppe, D, Freisem, S	National Science Foundation	Research into the P-N Junction Thermophotonic Effect	9/15/2010	8/31/2012	\$278,305	\$278,305
Deppe, D	Lockheed Martin	Nanophotonics for the Halifax Collaboration	8/2/2010	12/15/2010	\$50,000	\$50,000
Deppe, D	DOD/Defense Advanced Research Projects Agency (DARPA)	Uncooled 1.55 um Quantum Dot Laser Diode	9/1/2010	5/31/2012	\$291,950	\$291,950
Dogariu, A	KaMin LLC	Light Scattering Properties of Load Pigment Layers	7/15/2010	7/14/2011	\$61,736	\$61,736
Dogariu, A	Malvern Instruments Ltd	Microheology Technology Development and Tests	4/1/2011	3/30/2012	\$71,391	\$71,391
Dogariu, A	Air Force Office of Scientific Research	Sensing Random Electromagnetic Fields and Applications	5/1/2010	4/30/2015	\$149,253	\$311,715
Dogariu, A	Schafer Corporation	Study of high-order cross correlations	10/1/2010	12/31/2010	\$25,000	\$25,000
Fathpour, S	National Science Foundation	Cladding-Pumped Silicon Raman Amplifiers Integrated with In(Ga)As Quantum Dot Laser Pumps	8/15/2009	7/31/2012	\$137,224	\$400,000
Freisem, S	BD Displays	New Technology for High Efficiency Low Voltage Microdisplays	9/1/2008	8/31/2011	\$70,000	\$230,000
Glebov, L	Raydiance, Inc.	Fabrication of chirped Bragg gratings for high power nanosecond-to-femtosecond range pulse compression at 1553 nm	10/21/2010	12/16/2011	\$150,000	\$150,000
Glebov, L	OptiGrate	Mode Selection in Fiber Lasers	4/5/2011	4/4/2012	\$40,000	\$40,000
Glebov, L	Emory University	RF: High Power Diode Pumped Alkali Vapor Lasers and Analog Systems	8/15/2007	8/14/2011	\$139,531	\$558,124

Glebov, L	US Air Force Research Laboratory	Spectral Combining of five 150-W fiber lasers by volume Bragg gratings in PTR glass	1/30/2009	2/1/2010	\$40,000	\$100,000
Glebov, L	Raydiance, Inc.	Technology and metrology development for fabrication of chirped Bragg gratings with improved characteristics at 1553nm	8/31/2010	4/21/2011	\$83,500	\$83,500
Glebov, L, Schulzgen, A, Zeldovich, B	Air Force Office of Scientific Research	Volume Bragg Gratings - Research, Testing and High Power Applications	9/27/2010	9/26/2012	\$275,000	\$725,000
Harvey, J	Fraunhofer Institute for Applied Optics and Precision Engineering	Implementation of Light Scattering Models	8/25/2010	7/31/2011	\$6,500	\$6,500
Harvey, J	Fraunhofer Institute for Applied Optics and Precision Engineering	Implementation of Light Scattering Models, II	4/1/2011	12/31/2011	\$6,500	\$6,500
Harvey, J	Lockheed Martin Adv Technologies	Solar Ultra-Violet Imager (SUV)	3/24/2008	1/31/2012	\$63,695	\$286,370
Kuebler, S	Academy of Applied Science	AAS-REAP Program 2011	2/10/2011	5/31/2012	\$780	\$2,600
Kuebler, S	National Science Foundation	CAREER: Three-Dimensional Multi-Scale Metallodielectric Materials (This project is linked to 24066049)	2/15/2008	1/31/2013	\$34,490	\$574,840
Li, G	Northrop Grumman Corporation	Millimeter-wave and THz Aperture-Plane Imaging using Digital Holography Techniques	5/1/2010	6/30/2012	\$5,000	\$20,000
Li, G	Lockheed Martin	Nano-Photonic Silicon Fiber for Infrared Generations	2/23/2010	3/4/2011	\$15,000	\$40,000
Li, G	NEC Laboratories America, Inc.	RF - Li Group Research	3/1/2010	4/15/2013	\$40,000	\$80,000
Li, G	AT&T	RF: Advanced Modulation Technologies for High-Speed and High-Spectral Efficiency Optical Transmission	4/9/2010	4/30/2012	\$40,000	\$40,000
Li, G	AT&T	RF: Support of Propagation of Super-modes in Multicore	4/11/2011	4/10/2012	\$15,000	\$15,000
Lumeau, J	OptiGrate	A narrow-band laser source for pumping the Rb D2 transition in the vicinity of 780nm - Service for absorption measurements	8/1/2010	12/22/2010	\$15,000	\$15,000
Lumeau, J	OptiGrate	High Power Measurement Services	8/1/2010	12/31/2010	\$5,000	\$5,000

Lumeau, J	OptiGrate	Monolithic rare earth doped PTR glass laser	6/1/2011	3/31/2012	\$22,500	\$90,000
Moharam, M, LiKamWa, P.	Ocean Optics	Wideband High Efficiency Gratings for Spectrometer Applications	7/1/2010	2/12/2011	\$1,000	\$36,000
Richardson, M	US Army Research Office	Engineered laser filaments in air for defense stand-off sensing and interaction applications	9/5/2009	3/4/2012	\$275,000	\$650,543
Richardson, M	Clemson University	Materials World Network in Advanced Glasses for Novel Optical Fibers	9/1/2008	8/31/2011	\$35,000	\$35,000
Richardson, M	Mannkind Biopharmaceuticals	Microscopic and spectral examination of FDKP self assembly processes	1/1/2008	8/31/2009	(\$0)	\$155,500
Richardson, M	University of North Carolina Charlotte	Novel GMRF devices for integration with Tm: fiber lasers	12/1/2010	9/30/2013	\$20,400	\$52,080
Richardson, M	KLA-Tencor Corporation	Theoretical Analysis of the Radiation Dynamics from Mass-Limited Laser-Plasma Sources	5/25/2011	5/24/2012	\$100,000	\$100,000
Richardson, M	US Army Research Office	Ultrafast Laser Interaction Processes for Libs and other Sensing Technologies	6/15/2006	9/14/2012	\$458,430	\$4,627,884
Richardson, M, Baudalet, M	Air Force Office of Scientific Research	Fundamentals of Filament Interaction	10/15/2010	10/14/2015	\$275,000	\$714,178
Richardson, M, Baudalet, M	DOD	PHASE-CONTROLLED MULTI-kHz MULTI-TERAWATT FEMTOSECOND LASER (PCMTFL)	9/20/2010	3/19/2012	\$155,596	\$155,596
Richardson, M, Hagan, D	US Department of Education-FIPSE	MILMI - International Masters in Laser Materials and Interactions	9/1/2008	8/31/2012	\$111,987	\$447,582
Richardson, M, Shah, L	High Energy Laser-Joint Tech. Office	MULTI-KW 2 M EMISSION BY SPECTRALLY COMBINING MANY Tm FIBER LASERS Year 2	6/28/2011	6/28/2012	\$473,726	\$473,726
Richardson, M, Shah, L	Trumpf Photonics, Inc.	Seed Injected and Ceramic Thin Disk Laser Development	1/1/2011	6/30/2012	\$35,934	\$35,934
Richardson, M, Sudesh, V	DOD	TUNABLE EYE-SAFE FIBER LASER SYSTEM (TEFLS) FOR LASER RANGING Facility	6/15/2010	12/14/2011	\$172,455	\$172,455
Rolland, J	HEDZOPT	HEDZOPT Eyeglass Display	7/15/2008	9/30/2010	(\$90)	\$173,123

Schoenfeld, W	US Army Research Office	Deep-UV Emitters and Detectors Based on Lattice-Matched Cubic Oxide Semiconductors	7/1/2010	12/31/2011	\$100,000	\$120,000
Schoenfeld, W	Orlando Health	Feasibility Study: Method for Bioimplant Compatibility in MRI Imaging	8/1/2010	2/28/2011	\$25,000	\$25,000
Schoenfeld, W	Sandia National Laboratories	High Efficiency Photovoltaic Systems	6/24/2010	9/30/2011	\$18,715	\$18,691
Schoenfeld, W	US Army Research Laboratory	Hybrid MgZnO/AlGaIn Ultra-violet Lasers	3/3/2011	3/2/2014	\$148,000	\$148,000
Schoenfeld, W	PICO Technologies	Smart AMLCD Backlighting for Military Craft	9/18/2008	9/18/2010	\$13,976	\$27,951
Schoenfeld, W, Hagan, D	National Science Foundation	REU Site: Research Experiences for Undergraduates in Optics and Lasers	3/1/2009	5/31/2012	\$109,360	\$318,638
Van Stryland, E	Kent State University	Self-Assembled Soft Optical NIMs	5/1/2006	4/30/2011	\$43,750	\$375,000
Van Stryland, E, Hagan, D	Georgia Tech Research Corporation	MURI: Nonlinear Optical Characterization	9/30/2010	11/30/2011	\$283,891	\$283,891
Van Stryland, E, Hagan, D	Georgia Tech Research Corporation	Zeno Project for Georgia Tech	9/30/2009	11/30/2012	\$64,385	\$265,000
Van Stryland, E, Hagan, D, Kik P	US Army Research Office	Engineered Multifunctional Nanophotonic Materials for Ultrafast Optical Switching	8/15/2006	8/14/2012	\$561,461	\$5,250,000
Wu, ST	AU Optonics Corporation	Advanced Liquid Crystal Displays	7/1/2010	6/30/2013	\$150,000	\$450,000
Wu, ST	ITRI Display Technology Center	Blue-Phase Liquid Crystals	4/1/2010	3/31/2012	\$101,250	\$295,000
Wu, ST	Air Force Office of Scientific Research	Fast response and low voltage dual frequency liquid crystals	3/1/2009	11/30/2011	\$150,000	\$450,000
Wu, ST	Raytheon	Fast-Response Liquid Crystals	8/25/2010	11/30/2011	\$130,000	\$150,000
Wu, ST	Raytheon	LWIR LC Light Shutter	6/30/2010	8/31/2010	\$10,000	\$10,000
Wu, ST	Kent Optonics, Inc.	Switchable IR beam splitter	6/24/2010	12/23/2010	\$35,000	\$35,000
Zeldovich, B	OptiGrate	Calculation of the Intensity Distribution transformed by a phase mask	11/1/2010	11/30/2010	\$6,000	\$6,000

TOTAL

\$7,659,154 \$22,800,469

Continuing Projects

Recipient	Source	Title of Award	Begin	End
Abouraddy, A	Oak Ridge Associated Universities	Electromagnetic-assisted optical chromatography in hollow-core multi-material photonic band gap filters	5/14/09	5/13/10
Abouraddy, A	National Science Foundation	Mid-infrared, wide-bandwidth, stable coherent optical sources generated by multi-material, nonlinear chalcogenide-glass	4/15/2010	3/31/2012
Bass, M	Naval Air Warfare Center WPN Div	Laser Calorimetry	8/14/2010	2/29/2012
Bass, M	E6	10.6 Micron Calorimetric Measurement of Diamond Absorption	2/1/2011	1/31/2012
Boreman, G	Florida Institute of Technology	Support of PECASE Program	5/1/2010	9/14/2011
Christodoulides, D	University of Arkansas	Engineering the linear and nonlinear optical properties of periodic wave guide arrays	5/1/2007	12/31/2011
Delfyett, P	Army Research Office	Linear Interferometric Modulator for RF Links	6/28/2010	6/27/2012
Dogariu, A	Mayo Clinic	Intraoperative, Real-Time Monitoring of Coagulation with Laser Spectroscopy	8/15/2007	3/31/2013
Glebov, L Zeldovich, B	OptiGrate	Coherent Beam Combining of Fiber Lasers by Volume Bragg Gratings	2/15/2010	2/14/2012
Glebov, L	OptiGrate	Compact single frequency volume Bragg lasers operating at 1.5 um	11/1/2009	9/15/2011
Kar, A	Medtronic, Inc	MRI Compatibility of Alloys and Devices	10/15/2009	9/1/2011
Kik, P	National Science Foundation	CAREER: Silicon Compatible Hybrid Nanophotonic Systems	2/1/2007	1/31/2013
Li, G	NSG America, Inc	10 Gb/s APD Packaging	6/1/2009	5/31/2012
Richardson, M	National Science Foundation	REU Site: International Program on Optics, Lasers, Photonics and Optical Materials	4/15/2007	3/31/2012
Richardson, M	National Science Foundation	Long Range Laser Measurements and Signature Intelligence	9/1/2008	8/31/2012
Richardson, M	DOD	Tunable Eye-Safe Fiber Laser System (TEFLS) for Laser Ranging Facility	6/15/2010	12/14/2011
Richardson, M	Army Research Office	ARO High School Apprenticeships in Laser Development and Spectroscopy at the Townes Laser Institute	9/5/2009	3/4/2012
Richardson, M Bass, M	Clemson University	High Power Fiber Lasers	10/1/2005	12/31/2011
Richardson, M	Trumpf Photonics, Inc	Seed Injected and Ceramic Thin Disc Laser Development	1/1/2011	6/30/2012
Wu, ST	Rockwell Scientific	Dual Frequency Liquid Crystal Mixture	9/1/2003	10/1/2011

3.5 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 2003 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 15 faculty and 42 graduate students 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, Bio-Imaging, NanoElectronics & NanoPhysics, and Integrated Device Development.

Biomolecular Science Center

The Burnett School of Biomedical Sciences became an integral part of the UCF College of Medicine in 2007, 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. We vigorously pursue our mission, to build nationally recognized research programs and undergraduate and graduate programs in biomedical sciences. The School is well on its way of accomplishing its goal towards hiring faculty members to build vigorous research programs focused on cancer, cardiovascular diseases, neurological diseases and infectious diseases. The School has formed active partnerships with other units such as the College of Optics and Photonics, the School of Electrical Engineering and Computer Science and the NanoScience Technology Center to build interdisciplinary research and education programs in the innovative applications of photonics and nanoscience to biomedical problems. The School recently updated its undergraduate curriculum to better prepare students for health professions and graduate studies in biomedical sciences. The School also provides pre-health advisement for UCF students to prepare them for entry into health professional schools. Our BS degree program in Biotechnology started Fall 2007 and graduated the first students in Spring 2009.



Florida Solar Energy Center

The Florida Solar Energy Center (FSEC) was created in 1975 to serve as the State's energy research institute. The main responsibilities of the center are to conduct research, test and certify solar systems and develop education programs. Our mission is to research and develop energy technologies that enhance Florida's and the nation's economy and environment and to educate the public, students and practitioners on the results of the research. As Florida's energy research institute — with a 35-year history of unique expertise, experience and infrastructure — we are leading research and development efforts to bring our vision of Energy Independence to fruition.



Florida Space Institute

FSI is located at the space center, in Brevard County in East Central Florida, so as to provide a focus on space for the research and education programs of its institutional members. Classrooms, faculty offices and laboratories are located at the Kennedy Space Center Visitors Center, in the Astronaut Memorial Foundation's Center for Space Education facility. While the academic program is at the core of FSI, providing Masters and Ph.D. level programs of study, the



Institute also has a strong engineering support staff, and performs research on contracts and grants, providing real-life opportunities for student research and thesis projects. The organizational structure also encourages research on the individual campuses of the member schools, allowing the development of space hardware, and then "flowing" that hardware through the FSI facilities at the space center for processing and then on to space flight. Since its founding in 1990 as a consortium of state universities, community colleges, and private schools, the consortium has expanded, and now counts as its members UCF, Florida Institute of Technology, Brevard Community College, Embry-Riddle Aeronautical University, Florida Agricultural & Mechanical University, University of Miami, Florida Atlantic University, University of South Florida, University of Florida, and Broward Community College. Additionally, through NASA's Florida Space Grant Consortium program resident with FSI, some 16 additional universities and colleges throughout Florida enjoy an indirect relationship with the Institute.

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, the Progress building, Partnership II, and the Simulation and Training Technology Center.



Innovative Science & Technology Facility (ISTEF)

The ISTEF site is located at the Kennedy Space Center, Florida. It is a Navy SSC PAC facility operated by CSC. ISTEF was originally built in 1989 to support the Strategic Defense Initiative Organization's Innovative Sciences and Technology Office (SDIO/ISTEF). Today ISTEF 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, 1 km laser test range, a precision tracker (gimbal) with a coude mirror feed (for laser transmission), and several transportable trackers capable of supporting active (laser) or passive testing. Additionally, ISTEF maintains an assortment of telescopes, optics, and sensors to support data collection requirements. ISTEF is a tenant of the 45th Space Wing at Cape Canaveral Florida and has operating agreements that allow tasking Eastern Range assets as needed. It also has standardized range operations for laser testing against boosting rockets, satellites, and other targets. ISTEF has a close partnership with the CREL, The UCF College of Optics and Photonics, 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.



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)

4. Partnership

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.

4.1 Industrial Affiliates Program

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 The College of Optics and Photonics. 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. Other benefits include:

- Establishing a close association with this leading institute in optics, lasers, and photonics
- Exposure to the latest research and developments in cutting edge technologies
- Membership certificate or plaque for display in your facility
- Availability of sophisticated measurement, test, and calibration facilities
- Early notice of students approaching graduation (the next generation of experts in the field). See our Student Resumes.
- Ability to post your job openings on our website (exclusive benefit for IA members)
- Close interactions with our faculty, each of whom are leaders in their fields
- Opportunity to make presentations about your company and products to the faculty and students of the College
- Opportunity to participate in our Industrial Advisory Board, a committee of our senior stakeholders that provides advice on the long-term direction of CREOL, The College of Optics & Photonics
- Copies of the College's periodic newsletter, Highlights, and monthly e-Highlights
- Notification of seminars at the College
- Opportunity for free presentation space at our annual Industrial Affiliates Day meeting
- Several Web-based benefits, including linkage to your company's web site from the College website
- For companies who donate equipment, getting their hardware/software in the hands of some of the leading researchers – faculty and students– in the field provides visibility to future customer prospects and information on its impact in leading-edge research
- Demonstration by the company of their support of CREOL, The College of Optics & Photonics, its research programs, and its effective corporate cooperation and partnership activities

In addition, we use many mechanisms to give visibility to our Industrial Affiliates that can be valuable to them in marketing their products. Wherever possible, the level of the membership is indicated. Examples of current practices include:

- Listing in CREOL, The College of Optics & Photonics Highlights quarterly newsletter
- Special recognition at the annual Industrial Affiliates Day
- Listing in other CREOL, The College of Optics & Photonics publications, where appropriate, including on CREOL, The College of Optics & Photonics website (with a link to the company's website)
- Company name plaque prominently displayed in the entrance lobby of the CREOL building of CREOL, The College of Optics & Photonics

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 in the Center for Research & Education in Optics & Lasers (CREOL) and the Florida Photonics Center of Excellence (FPCE), UCF facilities include the following major research centers:

- Nano-Sciences & 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, The College of Optics & Photonics connects. Through the IA program, your company 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 — ranked #1 in the US in 2004 — and a large family of laser and optics companies in the Central Florida region.

4.2 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
Northrop Grumman Laser

Newport Corporation
Optical Research Associates

Paul G. Suchoski, Jr
Zemax Development Corp.

Senior Members

Coherent, Inc.
CST of America
Cubic Defense Applications
Edmund Optics
ER Precision Optical
Lambda Research
Corporation

LAS-CAD GmbH
LightPath Technologies
Lockheed Martin
Ocean Optics
Ophir-Spiricon
Optimax Systems

Thorlabs
TRUMPF, Inc.
Vectronix Inc.
Veeco Instruments-
Metrology
Zygo Corporation

Tektronix

Affiliate Members

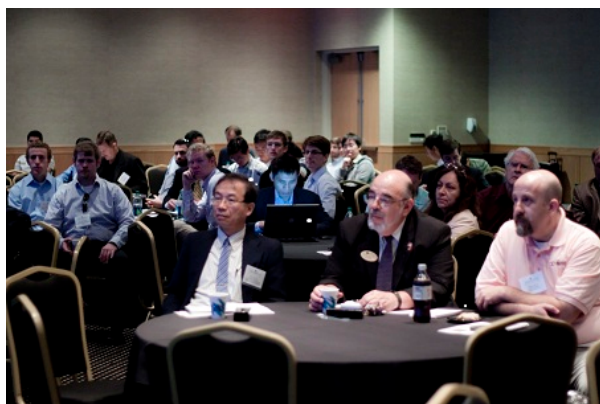
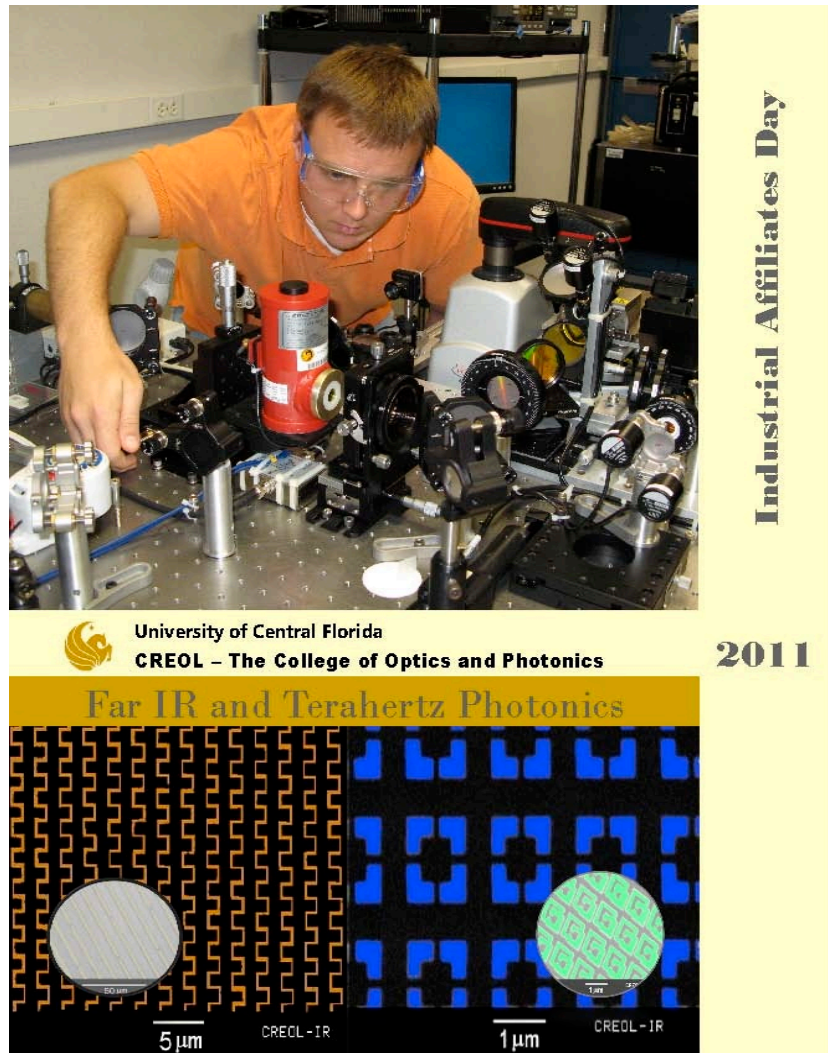
Aerotech Inc.
Analog Modules
Applicote Associates, LLC
eVision, LLC
Gooch & Housego, LLC
Harris Corporation
HORIBA Jobin Yvon
Imagine Optics
JENOPTIK Optical Systems Inc.
Kaufman & Robinson, LLC
L-3 Communications
Laser Institute of America
Lee Laser
NKT Photonics
Northrop Grumman Aerospace Systems
Optigrate Corp.

Optoelectronicss Industry Development Assoc.
Photonics Online
Photonics Spectra
Princeton Instruments
Qioptic
QPC Lasers/Laser Operations LLC
Ray Williamson Consulting
R-Soft Design Group
Sciperio, Inc.
SPIE- The Int'l Society for Optics & Photonics
StellarNet, Inc.
The Optical Society
Tower Optical Corporation
TwinStar Optics, Coatings & Crystals
Vytran LLC
Yokogawa Corporation of America

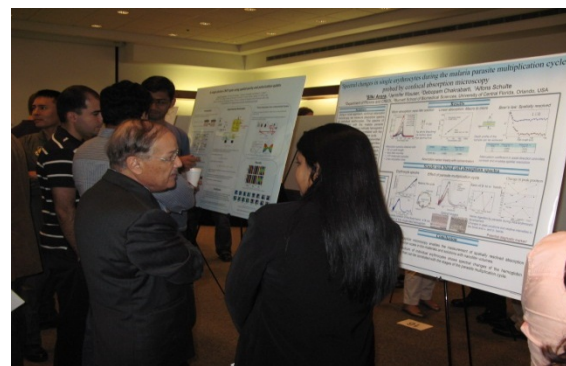
4.3 Industrial Affiliates Day

The Industrial Affiliates Day was held on April 29, 2011 and included a symposium on “*Far IR and Terahertz Photonics*.” Invited talks were presented by distinguished speakers.

The event drew over 200 registrants, 26 exhibitors, and 23 student poster participants.



Affiliates Day at the Alumni Center



Student Poster presentations at the CREOL building

Industrial Affiliates Day Program

Morning Session –UCF Alumni Center

Time	Topic	Speaker	Affiliation
8:00	Continental Breakfast and Walk-in Registrations		
8:30	Welcoming Remarks	Tony Waldrop MJ Soileau	UCF Provost & Vice President UCF Vice-President for Research
8:50	<i>CREOL, The College of Optics and Photonics –Overview</i>	Bahaa Saleh	Dean & Director, CREOL, The College of Optics and Photonics
9:20	<i>"Quantum Cascade Lasers:widely Tailorable light source from the Mid-infrared to TeraHertz"*</i>	Federico Capasso*	Harvard School of Engineering and Applied Optics*
9:55	Break & Exhibit		
10:10	<i>"Novel nano architectural concepts for THz/IR based bio-sensing"</i>	Dwight Woolard	Army Research Laboratory
10:35	<i>"Far IR and Terahertz Technology-at the Turning Point of Change!"</i>	Micheal Dudzik	Lockheed Martin Corp.
11:00	Break & Exhibit		
11:15	<i>"Infrared Imaging in the Military: Status and Challenges"</i>	Ronald Driggers	Optical Sciences Division Naval Research Laboratory
11:40	Open Questions		
12:00	Lunch		
1:00	<i>"Next generation optical fibers for IR Applications"</i>	Axel Schülzgen	CREOL, The College of Optics & Photonics
1:25	<i>"Infrared Antennas and Frequency Selective Surfaces"</i>	Glenn Boreman	CREOL, The College of Optics & Photonics
1:50	<i>Student of the Year talk-"A low noise Chirped pulse laser with an intra-cavity Fabry-Pérot etalon and high precision etalon characterization"</i>	Dimitrios Mandridis	Graduate Student CREOL, The College of Optics & Photonics

*Cancelled

Afternoon Session

Posters, Award presentations &Reception -CREOL Bldg.

2:05	Walk to CREOL Building		
2:20	Poster Sessions Lab Tours Exhibits Open (contiguous)	CREOL Graduate Students	CREOL rooms 102 & 103; tours start from lobby CREOL lobby
4:00-5:30	Poster award presentation reception	Bahaa Saleh	Dean & Director, CREOL, The College of Optics & Photonics

Tabletop Exhibits – CREOL Lobby & Alumni Center

4.4 Industrial Projects

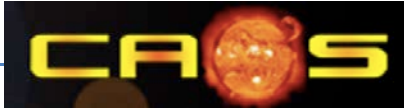
Recipient	Source	Title of Award	Begin	End	Awarded 2010	Cumulative Funding
Abouraddy, A	LightPath	Chalcogenide Glass Recycling and Extrusion	7/30/2010	2/28/2011	\$30,000	\$30,000
Boreman, G	ERC, Incorporated	Antenna-Coupled Laser Detection Sensors	5/1/2011	7/10/2011	\$110,000	\$110,000
Boreman, G	Lockheed Martin	Infrared Metamaterial Antennas: A Path to Miniaturization of EO Systems	11/1/2009	5/31/2011	\$50,000	\$250,000
Boreman, G	Plasmonics, Inc	CREOL Support for STTR AF103-BT35: Tunable Fresnel-Zone Lens for Agile Wavefront Control	4/22/2011	1/21/2012	\$50,000	\$50,000
Boreman, G	Plasmonics, Inc	Profile Feature Extractor (PFx) Sensor Component for Persistent ISR Applications	1/26/2011	7/25/2011	\$5,000	\$5,000
Boreman, G	Polaris Sensor Technologies, Inc	Polarizing IR Beamsplitter	10/12/2010	6/3/2011	\$15,000	\$15,000
Delfyett, P	Harris Corporation	Laser Metrology and Coherent Signal Development	9/1/2010	4/30/2011	\$175,000	\$175,000
Delfyett, P	MIT Lincoln Laboratory	Compact, High Power, Low Noise Mode-locked Semiconductor Lasers for Photonic Analog to Digital Converter Applications	10/13/2010	10/13/2011	\$200,000	\$200,000
Delfyett, P	Raydiance, Inc.	Amplitude and Phase Tailoring Phase 2	2/1/2011	6/29/2012	\$150,000	\$150,000
Deppe, D	Lockheed Martin	Nanophotonics for the Halifax Collaboration	8/2/2010	12/15/2010	\$50,000	\$50,000
Dogariu, A	KaMin LLC	Light Scattering Properties of Load Pigment Layers	7/15/2010	7/14/2011	\$61,736	\$61,736
Dogariu, A	Malvern Instruments Ltd	Microheology Technology Development and Tests	4/1/2011	3/30/2012	\$71,391	\$71,391
Dogariu, A	Schafer Corporation	Study of high-order cross correlations	10/1/2010	12/31/2010	\$25,000	\$25,000
Freisem, S	BD Displays	New Technology for High Efficiency Low Voltage Microdisplays	9/1/2008	8/31/2011	\$70,000	\$230,000
Glebov, L	OptiGrate	Mode Selection in Fiber Lasers	4/5/2011	4/4/2012	\$40,000	\$40,000
Glebov, L	Raydiance, Inc.	Fabrication of chirped Bragg gratings for high power nanosecond-to-femtosecond range pulse compression at 1553 nm	10/21/2010	12/16/2011	\$150,000	\$150,000
Glebov, L	Raydiance, Inc.	Technology and metrology development for fabrication of chirped Bragg gratings with improved characteristics at 1553nm	8/31/2010	4/21/2011	\$83,500	\$83,500
Harvey, J	Lockheed Martin Adv Technologies	Solar Ultra-Violet Imager (SUV)	3/24/2008	1/31/2012	\$63,695	\$286,370
Kuebler, S	Academy of Applied Science	AAS-REAP Program 2011	2/10/2011	5/31/2012	\$780	\$2,600
Li, G	AT&T	RF: Advanced Modulation Technologies for High-Speed and High-Spectral Efficiency Optical Transmission	4/9/2010	4/30/2012	\$40,000	\$40,000

Li, G	AT&T	RF: Support of Propagation of Super-modes in Multicore	4/11/2011	4/10/2012	\$15,000	\$15,000
Li, G	Lockheed Martin	Nano-Photonic Silicon Fiber for Infrared Generations	2/23/2010	3/4/2011	\$15,000	\$40,000
Li, G	NEC Laboratories America, Inc.	RF - Li Group Research	3/1/2010	4/15/2013	\$40,000	\$80,000
Li, G	Northrop Grumman Corporation	Millimeter-wave and THz Aperture-Plane Imaging using Digital Holography Techniques	5/1/2010	6/30/2012	\$5,000	\$20,000
Lumeau, J	OptiGrate	A narrow-band laser source for pumping the Rb D2 transition in the vicinity of 780nm - Service for absorption measurements	8/1/2010	12/22/2010	\$15,000	\$15,000
Lumeau, J	OptiGrate	High Power Measurement Services	8/1/2010	12/31/2010	\$5,000	\$5,000
Lumeau, J	OptiGrate	Monolithic rare earth doped PTR glass laser	6/1/2011	3/31/2012	\$22,500	\$90,000
Moharam, M, LiKamWa, P.	Ocean Optics	Wideband High Efficiency Gratings for Spectrometer Applications	7/1/2010	2/12/2011	\$1,000	\$36,000
Richardson, M	KLA-Tencor Corporation	Theoretical Analysis of the Radiation Dynamics from Mass-Limited Laser-Plasma Sources	5/25/2011	5/24/2012	\$100,000	\$100,000
Richardson, M	Mannkind Biopharmaceuticals	Microscopic and spectral examination of FDKP self assembly processes	1/1/2008	8/31/2009	(\$0)	\$155,500
Richardson, M, Shah, L	High Energy Laser-Joint Tech. Office	Multi-KW 2 m emission by spectrally combining many Tm fiber lasers Year 2	6/28/2011	6/28/2012	\$473,726	\$473,726
Richardson, M, Shah, L	Trumpf Photonics, Inc.	Seed Injected and Ceramic Thin Disk Laser Development	1/1/2011	6/30/2012	\$35,934	\$35,934
Rolland, J	HEDZOPT	HEDZOPT Eyeglass Display	7/15/2008	9/30/2010	(\$90)	\$173,123
Schoenfeld, W	Orlando Health	Feasibility Study: Method for Bioimplant Compatibility in MRI Imaging	8/1/2010	2/28/2011	\$25,000	\$25,000
Schoenfeld, W	PICO Technologies	Smart AMLCD Backlighting for Military Craft	9/18/2008	9/18/2010	\$13,976	\$27,951
Van Stryland, E, Hagan, D	Georgia Tech Research Corporation	MURI: Nonlinear Optical Characterization	9/30/2010	11/30/2011	\$283,891	\$283,891
Van Stryland, E, Hagan, D	Georgia Tech Research Corporation	Zeno Project for Georgia Tech	9/30/2009	11/30/2012	\$64,385	\$265,000
Wu, ST	ITRI Display Technology Center	Blue-Phase Liquid Crystals	4/1/2010	3/31/2012	\$101,250	\$295,000
Wu, ST	Kent Optronics, Inc.	Switchable IR beam splitter	6/24/2010	12/23/2010	\$35,000	\$35,000
Wu, ST	Raytheon	Fast-Response Liquid Crystals	8/25/2010	11/30/2011	\$130,000	\$150,000
Wu, ST	Raytheon	LWIR LC Light Shutter	6/30/2010	8/31/2010	\$10,000	\$10,000
Zeldovich, B	OptiGrate	Calculation of the Intensity Distribution transformed by a phase mask	11/1/2010	11/30/2010	\$6,000	\$6,000



Industrial Affiliates members providing financial support for research projects

5. CREOL Association of Optics Students



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 facilitate communication and integration of the student chapters of four optics and photonics professional societies: OSA, IEEE-Photonics Society, SPIE and SID.

5.1 Officers

Elected officers of CAOS and the professional societies' student sections in 2009-2010 are listed below:



President – Joshua Bradford
Vice President – Zhang Yu
Treasurer – Kumel Kagalwala



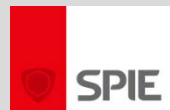
President – Likai Zhu
Vice President – Yifan Liu
Treasurer – Cen Xia
Secretary – Matt Falanga



President – Matt Weed
Vice President – Casey Boutwell
Treasurer – Matt Weidman
Secretary – Tony Klee



Chairman – Linghui Rao
Vice-Chairman – Su Xu
Treasurer – Jie Sun
Secretary – Hui-Chuan Cheng



President – Apurva Jain
Vice President – Pankaj Kadwani
Treasurer – Christina Willis
Secretary – Erdem Erden

5.2 Educational Outreach

Expanding Your Horizons: February 26, 2011

Organized by SPIE

Middle School Science Night: March 16, 2011

Each year, local middle schools host science nights during which they invite community members to exhibit their science to students and parents. CREOL has participated in 5 of these in the past two years and our OSA chapter has taken the lead on the two in the past year at Avalon and Corner Lake Middle Schools. OSA student members took demonstrations, photographed here, to the schools to show the wonders of how things emit light.

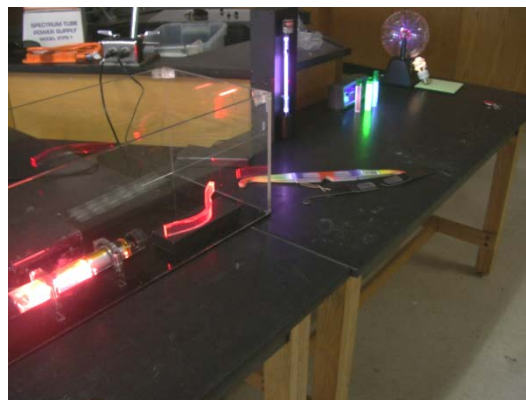
CREOL Educators' Day: March 19, 2011

With a strong, 2 year track record of interfacing with the local K-12 school system through classroom visits and open houses at our facility, our chapter shifted toward working more exclusively with the teachers themselves this year. We focused our time and effort on generating a workshop model to teach teachers how to be more comfortable working with topics in optics. The culmination of this effort was the first CREOL Educators' Day where representatives from 10 elementary and middle schools came to CREOL for a half-day workshop.

Educators' Day event was very well received and we were invited to conduct a set of mini-workshops at a day-long STEM workshop organized by Disney. While we felt that these short sessions missed the mark, simply too short a time to get any worthwhile experience, there is a second invitation for August to work with elementary school teachers for a day that we are working toward.



Local teachers visiting CREOL to learn about how to better teach optics at Educators' Day.



Demonstrations of light emitters prepared for Science Night at Corner Lake Middle School.

Optics Day: April 1, 2011

Organized by CAOS

CREOL Summer Camp: June 13 - 17, 2011

This year's campers were focused on Science Olympiad training and worked at problem solving as well as gaining some fun exposure to optics technology. Also, as is customary, a liquid nitrogen exploration was provided in which marshmallows and flowers are frozen and 'analyzed.'

Florida-AAPT Workshop: October 22 - 23, 2011

The Florida Section of the American Association of Physics Teachers held their annual meeting at UCF this year and CREOL played host. The teachers from all over Florida brought work for discussion and CREOL students lead tours of our facilities on Friday evening. As part of Saturday's program, our OSA student chapter developed a

demonstration of how to build a laser communications experiment that can be used in a high-school and introductory college physics settings.

Super Scientist Day Partin Elementary School: December 15, 2011

This local elementary school is home to the children of CREOL faculty and so during their Super Scientist Day, CREOL students are sure to make an appearance. OSA student members volunteered their time teaching introductory physics topics like heat transfer, the water cycle, and even basic circuits in a fun way that also provides a face to a profession that is veiled in mystery to most kids.



CREOL Student demonstrates the effect liquid nitrogen has on different materials at the CREOL summer camp.



CREOL student gives a demonstration for a visiting home-schooled 10th grader.

Student Open Houses:

When schedules permit, members of our OSA chapter have put aside time to host small groups (<10) of students and their parents or teachers at CREOL. For example, twice we've had home-schooled students in a study group come visit the building to learn about the impact of the material they were learning.

5.3 Professional Development

The Human Side of Research Series: February 24, 2011

How Washington works and why scientists should care with Greg Schuckman

With more than 20 years of experience in leadership, advocacy and policy development for postsecondary institutions, associations, and various nonprofit boards and commissions, Greg Schuckman works on behalf of UCF in Washington with a focus on how to improve educational achievement, increase economic opportunity, and enhance access to higher education in our the United States. A brief presentation on the current political landscape was followed by an open discussion on how to make an impact as a scientist.

SPIE Donut Series: April 15, 2011

Presentation Skills with Courtney Lewis

Organized by SPIE

Human Side of Research Series: September 9, 2011

The Building of Organizations with Dr. MJ Soileau

M.J. Soileau has built a research group as a professor, a world class graduate research facility as a director and a high ranking university wide research portfolio as a Vice President. Who better to discuss the planning, building, and leadership of scientific establishment? A brief presentation about the origins and influencing events of this living legend was followed by an open discussion on usefull experiences with managing people in academia.

5.4 Political Advocacy

Congressional Visits Day: April 7, 2011 & May 5, 2011

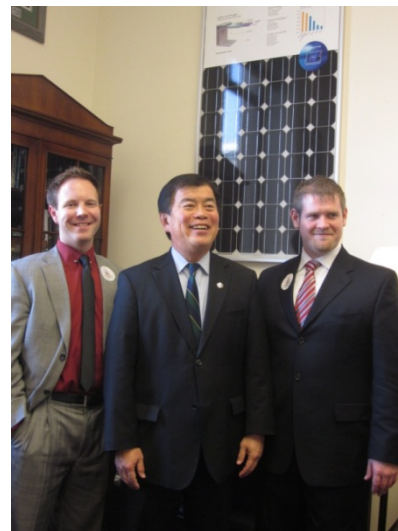
Five CREOL students represented the College as well as the Central Florida optics industry this year in DC during two OSA sponsored Congressional Visits. CREOL's contingency took to the Hill with stories of federal research investments that are making real impact in the Central Florida communities. In a region soon to be greatly hurt by the minimization of NASA, the Florida Photonics Cluster has made enormous strides in turning the research powerhouse of UCF into economically stimulating industry. This was a message that was heard loud and clear by those members of Congress the CREOL contingency met with, and the college has since hosted a reaction visit by Jared Stout from Congresswoman Adams's office.

District Office Visit with Congresswoman Sandy Adams: August 16, 2011

While at home in her district office in Oviedo during the Congressional Recess, Congresswoman Adams accepted a request by CREOL students to meet and discuss the importance that Federal research support has in Central Florida, and at UCF in particular. The students' message was received and the Congresswoman accepted an invitation to visit and tour CREOL.



CREOL Students posing in front of the US Capitol in between meetings with congressional staff at CVD 2011



CREOL Students with former Oregon Congressman and Chair of the Subcommittee on Technology and Innovation, David Wu.



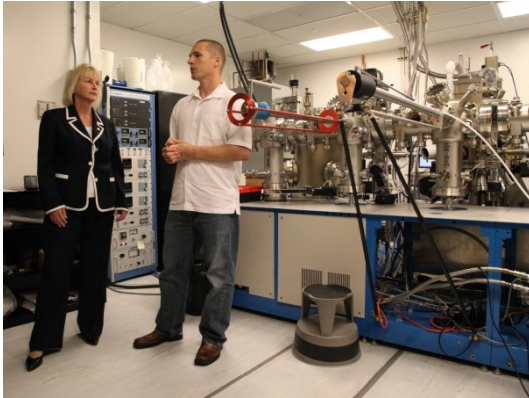
CREOL Students present gifts from CREOL at the conclusion of a meeting with Congresswoman Sandy Adams.



Greg Schuckman posing with CREOL students in front of the US Capitol Building

Congresswoman Sandy Adams visits CREOL: September 26, 2011

While on campus, Congresswoman Adams paid CREOL a visit to see the progress first hand since she had visited during the dedication of the Florida Photonics Center of Excellence (FPCE) in 2003 as a Representative in the Florida legislature. She was able to see two of CREOL's most impressive fabrication tools, Molecular Beam Epitaxy (MBE) and Fiber Draw Towers, as a message of CREOL as an engine for commercial possibilities was relayed.



Dr. Winston Schoenfeld discusses film growth and solar initiatives with Congresswoman Adams.



CREOL students and Dr. David Hagan pose with the Congresswoman at the end of her visit to CREOL.



Dr. Axel Schülzgen explains optical fiber fabrication to Congresswoman Adams.



Dr. Ayman Abouraddy discusses novel optical fiber devices with Congresswoman Adams.

5.5 Seminars

2/18/2011	Glenn Boreman	CREOL	Donuts Series Student Chapter Seminar Series	SPIE
2/24/2011	Greg Shuckman Assistant VP for University Relations		How Washington works and why scientists should care? OSA Student Chapter Seminar Series	
4/01/2011	CAOS	CREOL	Optics Day CREOL Association of Optics Students (CAOS)	
4/27/2011	Sarath Gunapala NASA - Jet Propulsion Laboratory, California Institute of Technology		III-V Quantum Structures for Infrared Detection. IEEE Student Chapter Seminar Series	
5/20/2011	SPIE	CREOL	Life After Grad School Student Chapter Symposium	SPIE
6/13/2011	CREOL		Summer Science Camps	
8/03/2011	REU	CREOL	REU Student Poster Presentation	
8/29/2011	Prof. Yan-qing Lu College of Engineering and Applied Sciences, Nanjing University, China		Optical Sensing with Microstructured Fibers. Student Chapter Seminar Series	SID
9/9/2011	MJ Soileau of Research & Commercialization, UCF	VP	Building of Research Organization. Student Chapter Seminar Series	OSA
10/14/2011	Yi-Hsin Lin National Chiao Tung University, Taiwan		Electrically switchable surface of a liquid crystal and polymer composite film and its applications. Student Chapter Seminar Series	SID
12/05/2011	L. Pavesi, University of Trento, Povo (Trento) Italy		NanoSilicon NanoPhotonics IEEE Student Chapter Seminar Series	
2/18/2011	Glenn Boreman	CREOL	Donuts Series Student Chapter Seminar Series	SPIE
2/24/2011	Greg Shuckman Assistant VP for University Relations		How Washington works and why scientists should care? OSA Student Chapter Seminar Series	
11/10/2010	Janglin (John) Chen		E-paper technology and future development. SID Student Chapter Seminar Series	