

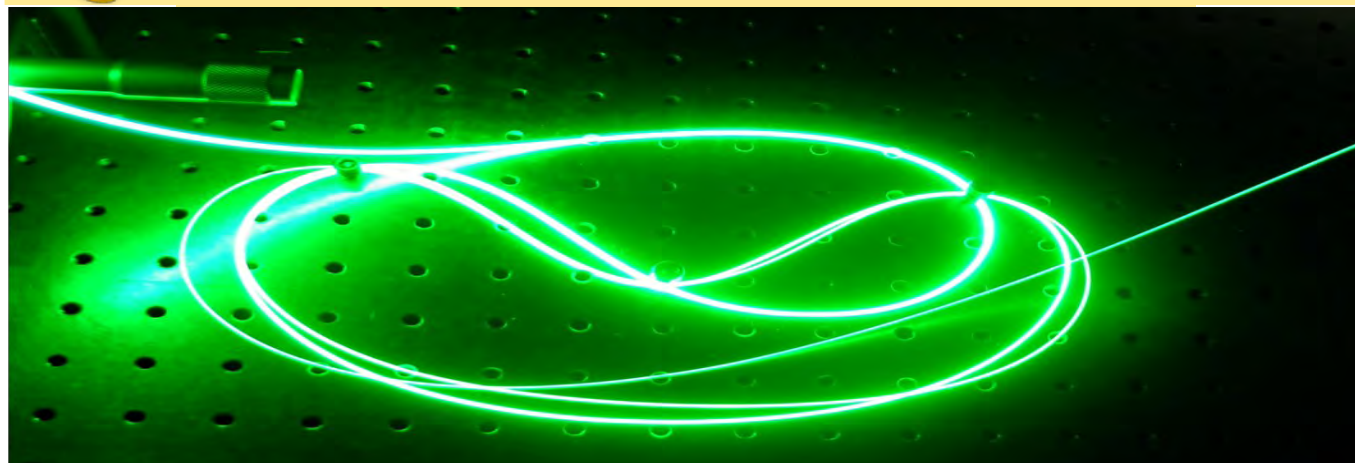
# Annual Report



University of Central Florida

**CREOL – The College of Optics and Photonics**

**2010**

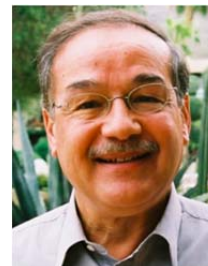


# Contents

<b>Message from the Dean</b> .....	<b>1</b>
<b>1. Faculty and Staff</b> .....	<b>2</b>
1.1 Faculty .....	2
Awards and Honors .....	8
Fellows of Professional Societies.....	9
Presidents, Directors and Officers of Professional Societies.....	10
Journal Editors & Associate Editors .....	11
Authors & Editors of Books .....	12
Awards & Honors (2010) .....	13
1.2 Research Staff .....	14
1.3 Organization and Administrative Staff .....	15
<b>2. Academic Programs</b> .....	<b>18</b>
2.1 Graduate Recruitment and Enrollment .....	18
2.2 Degrees Awarded .....	20
2.3 PhD Dissertations .....	21
2.4 Courses Taught .....	23
2.5 Course and Program Development .....	23
2.6 Instructional Laboratories .....	25
2.7 Colloquia, Seminars and Workshops.....	26
2.8 International Collaboration .....	30
<b>3. Research</b> .....	<b>32</b>
3.1 Areas of Research .....	32
3.2 Laboratories and Facilities .....	35
3.3 Publications .....	38
Books .....	38
Book Chapters .....	38
Journal Publications .....	39
Conference Papers .....	45
Presentations and Lectures .....	49
Patents and Disclosures .....	60
3.4 Research Funding .....	64
New Projects .....	64
Continuing Projects .....	68
3.5 Affiliated Research Centers .....	71
<b>4. Partnership</b> .....	<b>73</b>
4.1 Industrial Affiliates Program .....	73
4.2 Industrial Affiliates Members .....	74
4.3 Industrial Affiliates Day .....	75
4.4 Industrial Projects .....	77
<b>5. CREOL Association of Optics Students (CAOS)</b> .....	<b>79</b>
5.1 Officers .....	79
5.2 Educational Outreach .....	80
5.3 Conferences .....	83
5.4 Seminars .....	84

# Message from the Dean

One of the world's foremost institutions for teaching and research in optics and photonics, CREOL started in 1985 as a major research and education center, the *Center for Research and Education in Optics and Lasers* (CREOL). In 2004, it became CREOL, The College of Optics and Photonics, the first such college in the US. It houses two major research centers: the *Florida Photonics Center of Excellence* (FPCE), and the *Townes Laser Institute* named after Charles Townes, the co-inventor of the laser. The CREOL faculty are recipients of numerous awards and honors and are world-renowned for their contributions to fundamental and applied optics and photonics. CREOL, The College of Optics and Photonics, is an exciting place to have an outstanding educational experience leading to the MS and the PhD degrees, and we have several international programs.



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 nano-photonics, atto-second optics, metamaterials, 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. Now, there are more than 100 optics & photonics-related companies in the region. And 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. UCF has spun off over 21 successful photonics-based companies involving a wide variety of technologies and the faculty have a total of more than 130 patents in optics and photonics since 2002.

## Highlights of 2010

In 2010, 129 graduate students were enrolled, and 23 PhD degrees and 18 MS degrees were awarded. In collaboration with the School of Electrical Engineering and Computer Science at UCF, we have launched a program for a new BS degree in Electrical Engineering with a photonics specialization, which began in Fall 2010, with three new courses offered.

The research performed by our faculty, students, and scientists was disseminated nationally and internationally in two books and 3 book chapters, 145 journal papers published in the reviewed literature, 87 conference papers, and 219 talks. The College hosted 56 seminars delivered by many distinguished speakers. Research and educational programs were funded by contracts and grants totaling approximately \$10.1M, including \$7.6M of federal funding. The faculty members continue to receive awards and recognitions. In this year, Prof. S.T. Wu received the OSA Fraunhofer/Burley Prize and Prof. Peter Delfyett received the APS Edward A. Bouchet Award. Professors Leon Glebov and Bahaa Saleh became SPIE Fellows.

In 2010, we received approximately \$2.3M from industry and \$2.4M of the federal funding was obtained through industry, 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 2010, the faculty generated 28 issued patents, 34 provisional applications, and 22 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 2010 also include the addition of several new faculty members to the College. Dr. Zenghu Chang, a leading researcher in atto-second optics, has a joint appointment with the Physics Department at the rank of Professor. Dr. Rodrigo Amezcua, an expert in optical fibers, was recruited to join our faculty at the rank of Research Assistant Professor in 2011, and Dr. Romaine Gaume, an expert in optical ceramics, currently at Stanford University, will also join the faculty at the rank of Assistant Professor with a joint appointment at the NanoScience Technology Center.

**This annual report** provides a detailed description of the education, research, and partnership activities of the faculty, staff, and students during the 2010 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 ABOURADDY**

Asst. Prof. Of Optics  
PhD, Boston University  
Multi-material Optical Fiber  
Devices, Quantum Optics

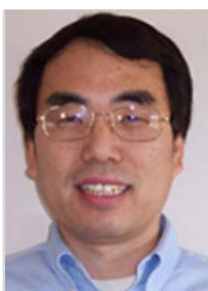
[raddy@creol.ucf.edu](mailto:raddy@creol.ucf.edu)



**GLENN D. BOREMAN**

Trustee Chair Prof. of Optics,  
EECS and Physics  
PhD, University of Arizona  
Infrared Systems

[boreman@creol.ucf.edu](mailto:boreman@creol.ucf.edu)



**ZENGHU CHANG**

Distinguished Prof. of Optics and  
Physics  
PhD, Xi'an Institute of Optics and  
Precision Mechanics

Attosecond Science and  
Technology

[zechang@mail.ucf.edu](mailto:zechang@mail.ucf.edu)



**DEMETRIOS  
CHRISTODOULIDES**

Provost Distinguished Prof. of  
Optics

PhD, Johns Hopkins University

Nonlinear Waves

[demetri@creol.ucf.edu](mailto:demetri@creol.ucf.edu)



**PETER J. DELFYETT**

Trustee Chair Prof. of Optics,  
EECS and Physics

PhD, City University of New York

Ultrafast Photonics

[delfyett@creol.ucf.edu](mailto:delfyett@creol.ucf.edu)



**DENNIS DEPPE**

FPCE Eminent Scholar Chair of  
Nanophotonics,  
Prof. of Optics

PhD, University of Illinois

Nanophotonics, Semiconductor  
Lasers

[ddeppe@creol.ucf.edu](mailto:ddeppe@creol.ucf.edu)



**ARISTIDE DOGARIU**

Prof. of Optics and EECS

PhD, Hokkaido University

Photonic Diagnostics of Random  
Media

[adogariu@creol.ucf.edu](mailto:adogariu@creol.ucf.edu)



**SASAN FATHPOUR**

Asst. Prof. of Optics

PhD, University of Michigan

Integrated Photonics and Energy  
Solutions

[fathpour@creol.ucf.edu](mailto:fathpour@creol.ucf.edu)



**LEONID B. GLEBOV**

Research Prof. of Optics

PhD, State Optical Institute,  
Leningrad

Photoinduced Processing

[lbglebov@creol.ucf.edu](mailto:lbglebov@creol.ucf.edu)



**DAVID J. HAGAN**

Assoc. Dean for Academic  
Programs  
Prof. of Optics

PhD, Heriot-Watt University

Nonlinear Optics

[hagan@creol.ucf.edu](mailto:hagan@creol.ucf.edu)

**JAMES E. HARVEY**

Assoc. Prof. of Optics  
 PhD, University of Arizona  
 Optical Design and Image Analysis  
[harvey@creol.ucf.edu](mailto:harvey@creol.ucf.edu)

**ARAVINDA KAR**

Prof. of Optics, MMAE, EECS and Physics  
 PhD, University of Illinois  
 Laser Advanced Materials Processing  
[akar@creol.ucf.edu](mailto:akar@creol.ucf.edu)

**PIETER G. KIK**

Assoc. Prof. of Optics  
 PhD, Institute for Atomic & Molecular Physics, Amsterdam  
 Nanophotonics and Near-field Optics  
[kik@creol.ucf.edu](mailto:kik@creol.ucf.edu)

**STEPHEN KUEBLER**

Assoc. Prof. of Chemistry and Optics  
 PhD, University of Oxford  
 Nanophotonic Materials  
[kuebler@mail.ucf.edu](mailto:kuebler@mail.ucf.edu)

**GUIFANG LI**

Prof. of Optics, Physics and EECS  
 PhD, University of Wisconsin-Madison  
 Optical Fiber Communications  
[li@creol.ucf.edu](mailto:li@creol.ucf.edu)

**PATRICK L. LIKAMWA**

Assoc. Prof. of Optics and EECS  
 PhD, University of Sheffield  
 Multiple Quantum Wells  
[patrick@creol.ucf.edu](mailto:patrick@creol.ucf.edu)

**M. G. "JIM" MOHARAM**

Prof. of Optics and EECS  
 PhD, University of British Columbia  
 Photonic Structures and Devices  
[moharam@creol.ucf.edu](mailto:moharam@creol.ucf.edu)

**MARTIN C. RICHARDSON**

Trustee Chair, Northrop Grumman Prof. of Optics and Photonics  
 Director Townes Laser Institute  
 PhD, London University  
 Lasers & Laser Plasma  
[mcr@creol.ucf.edu](mailto:mcr@creol.ucf.edu)

**NABEEL A. RIZA**

Prof. of Optics and EECS  
 PhD, California Institute of Technology  
 Photonic Information Processing Systems  
[riza@creol.ucf.edu](mailto:riza@creol.ucf.edu)

**BAHAA E. A. SALEH**

Dean & Director, Prof. of Optics  
 PhD, Johns Hopkins University  
 Nonlinear and Quantum Optics, and Image Science  
[besaleh@creol.ucf.edu](mailto:besaleh@creol.ucf.edu)

**WINSTON V. SCHOENFELD**

Assoc. Prof. of Optics

PhD, University of California,  
Santa Barbara

Nanophotonics Devices

[winston@creol.ucf.edu](mailto:winston@creol.ucf.edu)

**AXEL SCHÜLZGEN**

Prof. of Optics

PhD, Humboldt University

Fiber Optics

[axel@creol.ucf.edu](mailto:axel@creol.ucf.edu)

**M.J. SOILEAU**

Vice President. for Research and  
Commercialization  
Prof. of Optics, EECS, and Physics

PhD, University of Southern  
California

Nonlinear Optics, Laser Induced  
Damage

[mj@mail.ucf.edu](mailto:mj@mail.ucf.edu)

**ERIC W. VAN STRYLAND**

Prof. of Optics

PhD, University of Arizona

Nonlinear Optics

[ewvs@creol.ucf.edu](mailto:ewvs@creol.ucf.edu)

**SHIN-TSON WU**

Pegasus Professor, Provost  
Distinguished Prof. of Optics

PhD, University of Southern  
California

Liquid Crystal Displays

[swu@creol.ucf.edu](mailto:swu@creol.ucf.edu)

**BORIS Y. ZELDOVICH**

Prof. of Optics and Physics

D.Sc., Lebedev Physics Institute,  
Moscow

Physical Optics & Propagation,  
Nonlinear Optics

[boris@creol.ucf.edu](mailto:boris@creol.ucf.edu)

## Faculty Emeritus

**MICHAEL BASS**

Emeritus Prof. of Optics,  
Physics & EECS

PhD, University of Michigan

Lasers, Spectroscopy & Modeling

[bass@creol.ucf.edu](mailto:bass@creol.ucf.edu)

**WILLIAM SILFVAST**

Emeritus Prof. of Optics

PhD, University of Utah

Lasers

[silfvast@creol.ucf.edu](mailto:silfvast@creol.ucf.edu)

**GEORGE STEGEMAN**

Emeritus Prof. of Optics, Physics  
and EECS

PhD, University of Toronto

Nonlinear Optics

[george@creol.ucf.edu](mailto:george@creol.ucf.edu)

## Joint Appointments



### KEVIN D. BELFIELD

Department Chair & Prof. of  
Chemistry and Optics  
PhD, Syracuse University  
Multiphoton Absorbing Materials  
[belfield@mail.ucf.edu](mailto:belfield@mail.ucf.edu)



### LOUIS CHOW

Prof. and Univ. Chair of MMAE  
PhD, University of California,  
Berkeley  
Heat Transfer Issues in Electro-  
Optics  
[lchow@mail.ucf.edu](mailto:lchow@mail.ucf.edu)



### ANDRE GESQUIERE

Asst. Prof. Nanoscience  
Technology Center,  
Chemistry and Optics  
PhD, University of Leuven  
Optoelectronic Materials,  
Nanobiology  
[andre@mail.ucf.edu](mailto:andre@mail.ucf.edu)



### FLORENCIO E. HERNANDEZ

Assoc. Prof. of Chemistry &  
Optics  
D.Sc., Universidad Central de  
Venezuela & Université Franche-  
comté  
Optical Materials  
[florenzi@mail.ucf.edu](mailto:florenzi@mail.ucf.edu)



### DAVID KAUP

Provost Distinguished Research  
Prof. of Math and Optics  
[kaup@ucf.edu](mailto:kaup@ucf.edu)



### MICHAEL LEUENBERGER

Asst. Prof. of Physics and Optics  
PhD, University of Basel  
Quantum Information  
[mleuenbe@mail.ucf.edu](mailto:mleuenbe@mail.ucf.edu)



### ROBERT E. PEALE

Prof. of Physics and Optics  
PhD, Cornell University  
Defects in Semiconductors  
[rep@physics.ucf.edu](mailto:rep@physics.ucf.edu)



### ALFONS SCHULTE

Prof. of Physics and Optics  
Dr. rer. Nat, Technical University  
of Munich  
Near-IR Raman Spectroscopy  
[afs@physics.ucf.edu](mailto:afs@physics.ucf.edu)



### LARRY C. ANDREWS

Emeritus Prof. of EECS and Optics  
PhD, Michigan State University  
Propagation in Random Media  
[landrews@mail.ucf.edu](mailto:landrews@mail.ucf.edu)



### RONALD L. PHILLIPS

Emeritus Prof. of EECS and Optics  
PhD, Arizona State University  
Laser Beam Propagation Through  
Random Media  
[phillips@mail.ucf.edu](mailto:phillips@mail.ucf.edu)



**MUBARAK A. SHAH**

Agere Chair Prof. of Computer Science and Optics

PhD, Wayne State University

Computer Vision

[shah@cs.ucf.edu](mailto:shah@cs.ucf.edu)

**MICHAEL SIGMAN**

Assoc. Prof. of Chemistry and Optics

PhD, Florida State University

Explosives, Chemistry & Forensics

[msigman@mail.ucf.edu](mailto:msigman@mail.ucf.edu)

**THOMAS X. WU**

Assoc. Prof. of EECS and Optics

PhD, University of Pennsylvania

Numerical Techniques in Electromagnetics

[tomwu@mail.ucf.edu](mailto:tomwu@mail.ucf.edu)

**CYNTHIA YOUNG**

Prof. of Math and Optics

PhD, University of Washington

Laser Propagation in Random Media

[cyyoung@mail.ucf.edu](mailto:cyyoung@mail.ucf.edu)

## Courtesy Appointments

**KURT BUSCH**

Prof. of Physics, Univ. Karlsruhe

PhD, University of Karlsruhe

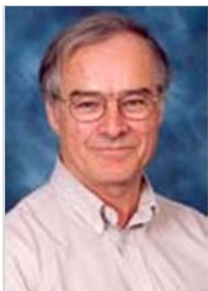
[kurt@tfp.uni-karlsruhe.de](mailto:kurt@tfp.uni-karlsruhe.de)

**BRUCE H. CHAI**

President, Crystal Photonics

PhD, Yale University

[chai@crystalphotonics.com](mailto:chai@crystalphotonics.com)

**HANS P. JENSSEN**

AC Materials

PhD, MIT

[h.jenssen@ac-materials.com](mailto: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](mailto:rolland@optics.rochester.edu)





**ERIC G. JOHNSON**  
Prof. of Physics & Optical Science  
University of North Carolina  
Charlotte  
PhD, University of Alabama  
[egjohnso@uncc.edu](mailto:egjohnso@uncc.edu)



**KATHLEEN A. RICHARDSON**  
Prof. Materials Science and  
Engineering, Clemson University  
PhD, Alfred University  
[richar3@clemson.edu](mailto:richar3@clemson.edu)



**CRAIG W. SIDERS**  
ARES Program Element Leader,  
Lawrence Livermore Lab  
PhD, The University of Texas at  
Austin  
Photon Science and Applications  
[prof.craig.siders@gmail.com](mailto:prof.craig.siders@gmail.com)



**EMIL WOLF**  
Wilson Professor of Optical  
Physics  
PhD, Bristol University, England  
Optical Coherence  
[ewlupus@pas.rochester.edu](mailto:ewlupus@pas.rochester.edu)



The CREOL Building

## 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

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



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 (2007)  
 NSF CAREER Award (2008)  
 NSF CAREER Award (1996)

Peter Delfyett  
 Dennis Deppe  
 Pieter Kik  
 Stephen Kuebler  
 Guifang Li



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

Dennis Deppe  
 Guifang Li



John Simon Guggenheim  
 Memorial Foundation

Ralph E. Powe Junior Faculty Award (2009)

Ayman Abouraddy

Guggenheim Fellow (1984)

Bahaa Saleh

## International Awards

Foreign Member, Russian Academy of Science (1994)  
 Hubert Schardin Gold Medal Medal (1996)  
 ICO International Prize In Optics (2001)  
 Ernst Abbe Medal, Carl Zeiss, Germany (2001)  
 Erasmus Mundus Scholar Award, European Union (2007)

Michael Bass  
 Zenghu Chang  
 Nabeel Riza  
 Nabeel Riza  
 Nabeel Riza

Berthold Leibinger Innovation Prize, Germany (2008)  
 T. S. Walton Visitor Award, Ireland (2010)  
 Hubert Schardin Gold Medal Medal (1976)  
 Kuwait Prize (2006)  
 Habilitation Grant, German Research Foundation (1993)  
 Carl-Ramsauer-Award of the AEG AG (1992)  
 USSR Academy of Sciences (1987)  
 USSR State Prize (1983)

Nabeel Riza  
 Nabeel Riza  
 Martin Richardson  
 Bahaa Saleh  
 Axel Schülzgen  
 Axel Schülzgen  
 Boris Zeldovich  
 Boris Zeldovich

## Fellows of Professional Societies



Michael Bass  
 Glenn Boreman  
 Demetrios Christodoulides  
 Peter Delfyett  
 Dennis Deppe  
 Aristide Dogariu  
 Leonid Glebov

David Hagan  
 Guifang Li  
 M.G. Moharam  
 James Pearson  
 Martin Richardson  
 Nabeel Riza  
 Bahaa Saleh

William Silfvast  
 M.J. Soileau  
 George Stegeman  
 Eric Van Stryland  
 Shin-Tson Wu  
 Boris Zeldovich



Michael Bass  
 Peter Delfyett  
 Dennis Deppe  
 James Pearson  
 Nabeel Riza

Bahaa Saleh  
 William Silfvast  
 M.J. Soileau  
 Eric Van Stryland  
 Shin-Tson Wu



SPIE

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

Glenn Boreman  
 Leon Glebov  
 James Harvey  
 Guifang Li  
 James Pearson  
 Nabeel Riza

Bahaa Saleh  
 Winston V. Schoenfeld  
 M.J. Soileau  
 Eric Van Stryland  
 Shin-Tson Wu



Zenghu Chang  
 Aristide Dogariu  
 Demetrios Christodoulides



Shin-Tson Wu



Laser Institute  
 of America

Aravinda Kar



ACS  
 Chemistry for Life®

Leonid Glebov



## Presidents, Directors and Officers of Professional Societies

---



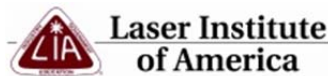
Eric Van Stryland	President (2006)
Michael Bass	Board of Directors Member (1989-1992)
Peter Delfyett	Board of Directors Member (2004-2006)
Bahaa Saleh	Board of Directors Member (1998-2005)
Eric Van Stryland	Board of Directors Member (1998-2001)



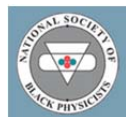
M.J. Soileau	President (1997)
Glenn Boreman	Board of Directors Member (1997-1999)
James Harvey	Board of Directors Member (2001-2003)



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)
----------------	-----------------------

## Journal Editors & Associate Editors

### Journal Editors

Journal of the Optical Society of America B (1984-1987)	Michael Bass
Applied Optics (2000-2005)	Glenn Boreman
Applied Optics/Optical Technology (1998-2003)	Glenn Boreman
IEEE Journal of Selected Topics in Quantum Electronics (2001-2006)	Peter Delfyett
IEEE/LEOS Newsletter (1995-2000)	Peter Delfyett
Optical Materials Express (2010-Present )	David Hagan
Journal of the Optical Society of America A (1991-1997)	Bahaa Saleh
Advances in Optics & Photonics (2008-present)	Bahaa Saleh
IEEE/OSA Journal of Display Technology (2004-2008)	Shin-Tson Wu

### Associate/Topical Editors

Optics Express (2001-2001)	Michael Bass
Optical Engineering (Radiometry & Detectors) (1998-1999)	Glenn Boreman
Applied Optics (Radiometry & Detectors) (1992-1997)	Glenn Boreman
Optics Express (2009-present)	Glenn Boreman
International Journal of Optics (2008-present)	Glenn Boreman
IEEE Photonics Technology Letters (1995-2003)	Peter Delfyett
IEEE J. of Quantum Electronics (1996-2001)	Demetrios Christodoulides
Journal of the Optical Society of America B (2001-2003)	Demetrios Christodoulides
Journal of the Optical Society of America B (2007- 2013)	David Hagan
Journal of Materials Research (2000 - 2007)	David Hagan
Optics Express (2007-present)	Guifang Li
Photonics Technology Letters (2007-present)	Guifang Li
Journal of the Optical Society of America A (1998-2004)	Jim Moharam
Journal of Quantum Electronics (1980-1986)	Martin Richardson
International Journal of OptoMechatronics (2009-present)	Nabeel Riza
Journal of the Optical Society of America A (1984-1990)	Bahaa Saleh
Journal of the Optical Society of America (1980-1983)	Bahaa Saleh
Journal of Materials Research (2007-present)	Winston Schoenfeld
Applied Optics (2008-2011)	Axel Schülzgen
Optics Letters: Nonlinear Optics (1995-1998)	Eric Van Stryland
IEEE/OSA Journal of Display Technology (2008-present)	Shin-Tson Wu
Liquid Crystals (2009-present)	Shin-Tson Wu

## Author & 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, *Handbook of Optics*, 3<sup>rd</sup> 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 (2011).

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 2<sup>nd</sup> 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, 2<sup>nd</sup> 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).

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).

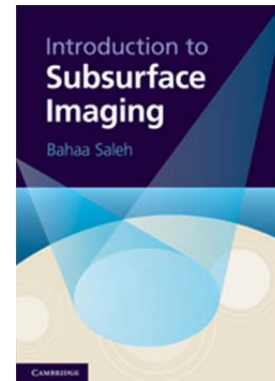
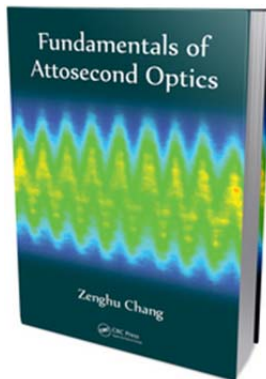
David Armitage, Ian Underwood and **Shin-Tson Wu**, *Introduction to Microdisplays*, Wiley (2006).

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).

Thomas Wu and **Shin-Tson Wu**, *Modelling of Liquid Crystal Devices*, Wiley (2011).

**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 (2010)

### National/International

2010 Joseph Fraunhofer/Robert M. Burley Prize – Shin-Tson Wu

2010 SPIE Fellow – Bahaa Saleh

2010 SPIE Fellow – Leonid Glebov

### University

2010 UCF Pegasus Professor – Shin-Tson Wu

2010 UCF Teaching Incentive Award – Winston V. Schoenfeld

2009-2010 UCF Excellence in Graduate Teaching Award – Winston V. Schoenfeld

2009-2010 UCF Excellence in Research Award – David Hagan

## 1.2 Research Staff

NAME	TITLE	ADVISOR
Hong Shu	Senior Research Scientist	Bass
Larry Shah	Senior Research Scientist	Richardson
Matthieu Baudelet	Senior Research Scientist	Richardson
Olga V. Przhonska	Senior Research Scientist	Hagan/Van Stryland
Sabine Freisem	Senior Research Scientist	Deppe
Ying Chen	Senior Research Scientist	Bass
George Venus	Associate Research Scientist	Glebov
Alexey Podvyaznyy	Research Scientist	Glebov
Anand Santhanam	Research Scientist	Rolland
Andrey Krywonos	Research Scientist	Harvey
Bill Franklin	Research Scientist	Boreman
Daniel Mullally	Research Scientist	Boreman
Daniela Petrova-Tchoneva	Research Scientist	Glebov
Fatih Yaman	Research Scientist	Li
Guy Zummo	Research Scientist	Boreman
Haiqing Xianyu	Research Scientist	Wu
Igor Ciapurin	Research Scientist	Glebov
Ivan Divliansky	Research Scientist	Glebov
Julien Lumeau	Research Scientist	Glebov
Larissa Glebova	Research Scientist	Glebov
Lazaro Padilha	Research Scientist	Hagan/Van Stryland
Mehmetcan Akbulut	Research Scientist	Delfyett
Scott Webster	Research Scientist	Hagan/Van Stryland
Sergey Sukhov	Research Scientist	Dogariu
Vadim Smirnov	Research Scientist	Glebov
Vasile Rotar	Research Scientist	Glebov
Karima Chamma	Research Associate	Glebov
Dhaval Shah	Post Doctoral Research Associate	Klemenzenz
Dmitry Fishman	Post Doctoral Research Associate	Hagan/Van Stryland
Eduardo Mateo	Post Doctoral Research Associate	Li
Gokhan Ozgur	Post Doctoral Research Associate	Deppe
Jeffrey Bean	Post Doctoral Research Associate	Boreman
Jung-Hyun Cho	Post Doctoral Research Associate	Bass
Nishant Bhatambreakar	Post Doctoral Research Associate	Delfyett
Olena Tirpak	Post Doctoral Research Associate	Fathpour
Sebastian Gauza	Post Doctoral Research Associate	Wu
Xiaobo Xie	Post Doctoral Research Associate	Li
Arther Freeman	Laboratory Technician	Richardson
Lorrene Denney	Laboratory Technician	Dogariu
Somsak (Tony) Teerawattanasook	Senior Electrical Engineer	Richardson

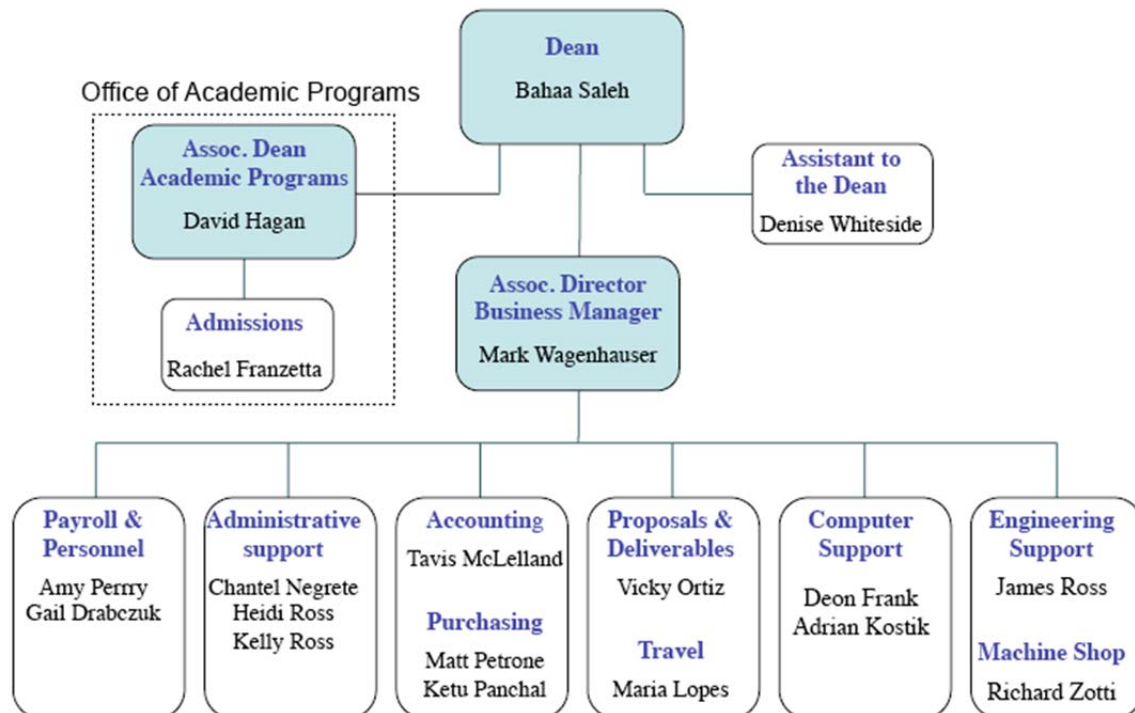
## Visiting Scientists

NAME	TITLE	HOST
Brian Lail	Visiting Lecturer	Boreman
Wei Lee	Visiting Professor	Wu

Yeong-Ren Lin	Visiting Research Associate	Chow
Jianfei Liu	Visiting Research Professor	Li
Giorgio Turri	Visiting Research Scientist	Bass
Giovanni Di Giuseppe	Visiting Research Scientist	Saleh
Guanmao Zhang	Visiting Research Scientist	Li
Guijun Hu	Visiting Research Scientist	Li
Guiqiu Li	Visiting Research Scientist	Bass
Gyu Ug Kim	Visiting Research Scientist	Bass
Hamidreza Shirvani Mahdavi	Visiting Research Scientist	Wu
Ilja Mingareev	Visiting Research Scientist	Richardson
Irina Popkova	Visiting Research Scientist	Glebov
Lanlan Gao	Visiting Research Scientist	Bass
Luis Rodriguez	Visiting Research Scientist	Belfield
Miguel Basurto	Visiting Research Scientist	LiKamWa
Miguel Torres Cisneros	Visiting Research Scientist	LiKamWa
Qi Guo	Visiting Research Scientist	Christodoulides
Shaofeng Guo	Visiting Research Scientist	Bass
Sven Schröder	Visiting Research Scientist	Harvey
Xiangru Wang	Visiting Research Scientist	Bass

## 1.3 Organization and Administrative Staff

### Organization Chart





## Administrative Staff



**TATIANA ARRIARAN**

Travel Coordinator  
[tatiana@creol.ucf.edu](mailto:tatiana@creol.ucf.edu)



**GAIL DRABCUK**

Coordinator, Administrative Services  
[gaild@creol.ucf.edu](mailto:gaild@creol.ucf.edu)



**DEON FRANK**

Computer Support  
[dfrank@creol.ucf.edu](mailto:dfrank@creol.ucf.edu)



**RACHEL FRANZETTA**

Senior Admissions Specialist  
[rfranzet@creol.ucf.edu](mailto:rfranzet@creol.ucf.edu)



**ADRIAN KOSTIC**

Computer Support  
[akostic@creol.ucf.edu](mailto:akostic@creol.ucf.edu)



**MARIA LOPES**

Travel Coordinator  
[mlopes@creol.ucf.edu](mailto:mlopes@creol.ucf.edu)



**TAVIS McLELLAND**

Fiscal Assistant  
[tavis@creol.ucf.edu](mailto:tavis@creol.ucf.edu)



**CHANTEL NEGRETE**

Receptionist  
[cnegrete@creol.ucf.edu](mailto:cnegrete@creol.ucf.edu)



**VICKY ORTIZ**

Research Programs Coordinator  
[vsortiz@creol.ucf.edu](mailto:vsortiz@creol.ucf.edu)



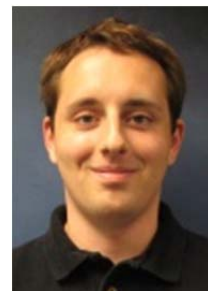
**KETU PANCHAL**

Receiving Assistant  
[kpanchal@creol.ucf.edu](mailto:kpanchal@creol.ucf.edu)



**AMY M. PERRY**

Coordinator, Administrative Services  
[amy@creol.ucf.edu](mailto:amy@creol.ucf.edu)



**MATTHEW PETRONE**

Purchasing Office Manager  
[mpetrone@creol.ucf.edu](mailto:mpetrone@creol.ucf.edu)



**HEIDI ROSS**  
Office Assistant  
[hross@creol.ucf.edu](mailto:hross@creol.ucf.edu)



**JAMES D. ROSS**  
Assistant in Development Engineering  
[jross@creol.ucf.edu](mailto:jross@creol.ucf.edu)



**KELLY ROSS**  
Office Assistant  
[kaross@creol.ucf.edu](mailto:kaross@creol.ucf.edu)



**MICHAEL TORRANCE**  
Computer Support  
[torrance@creol.ucf.edu](mailto:torrance@creol.ucf.edu)



**MARK C. WAGENHAUSER**  
Associate Director/Business Manager  
[markw@creol.ucf.edu](mailto:markw@creol.ucf.edu)



**DENISE WHITESIDE**  
Assistant to the Dean  
[dwhitesi@creol.ucf.edu](mailto:dwhitesi@creol.ucf.edu)



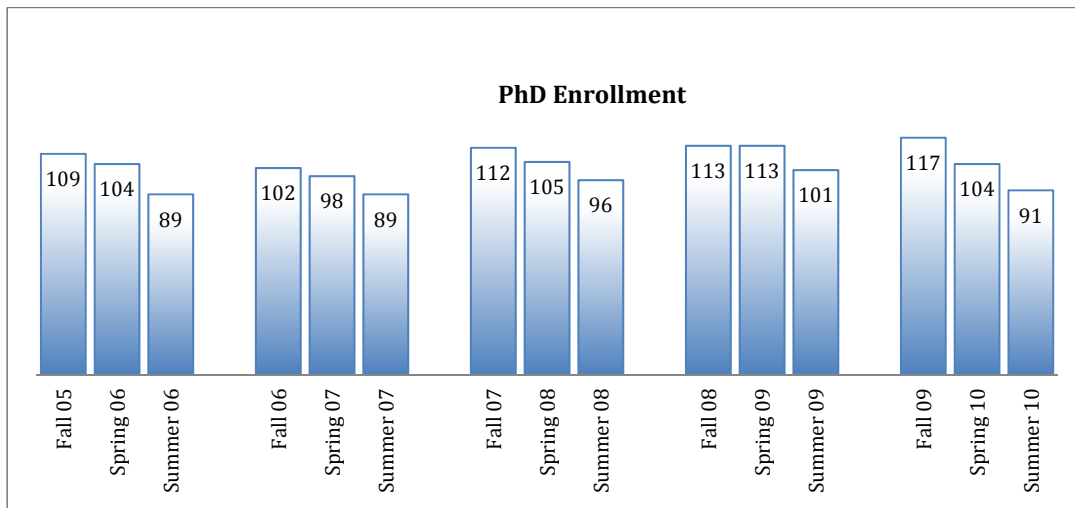
**RICHARD E. ZOTTI**  
Engineer  
[rzotti@creol.ucf.edu](mailto:rzotti@creol.ucf.edu)

## 2. Academic Programs

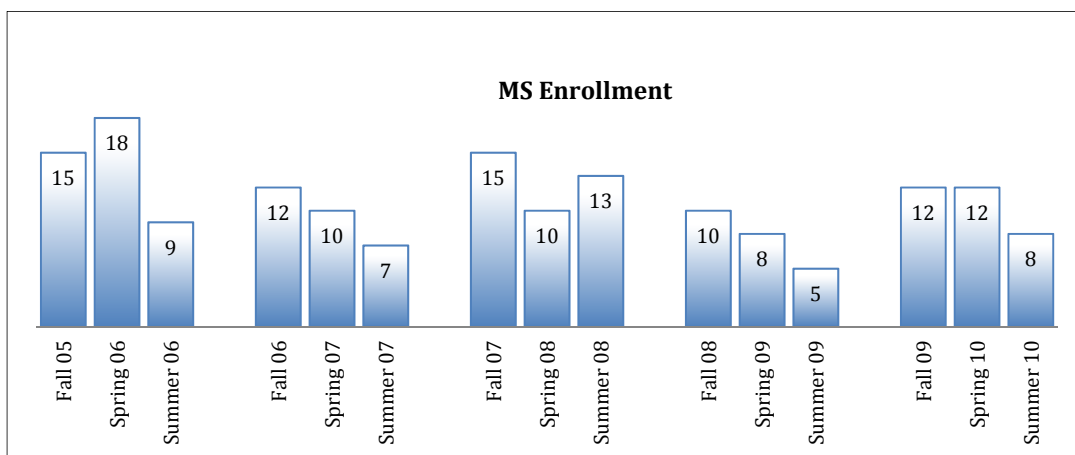
The College has a strong focus on education at the MS and PhD levels through both coursework and research. Our graduates are highly educated and well prepared for the modern-day work force and consequently our graduates are highly sought after in both the private sector and in top research universities.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

### 2.1 Graduate Recruitment and Enrollment

Enrollment in both MS and PhD programs has remained approximately constant at about 130 (Approx. 110 – 120 in the PhD and 10 – 15 in the MS.) A total of 34 new students (25 Ph.D. and 9 MS) enrolled in the 2009-10 academic year. The GRE scores of our admitted students were noticeably higher than in previous years. Overall, we received 301 pre-applications and 174 full applications to the graduate programs, which is similar to previous years.



History of PhD Enrollment since 2005



History of MS Enrollment since 2005



We received a total of 268 pre-applications to our graduate programs in Fall 2009, which resulted in 155 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.

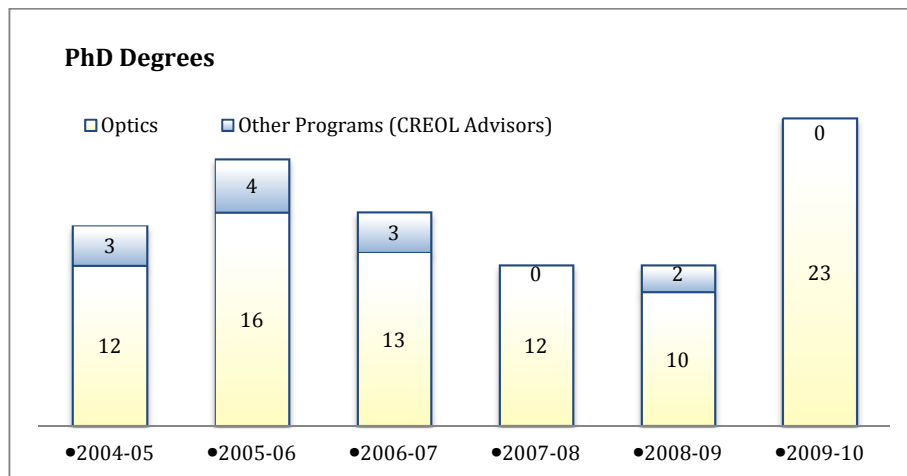
New Matriculants Fall 2009 – Summer 2010									
		Male	Female	FT	PT	CREOL Fellow	CREOL Award	UCF Provost	UCF Presidential
PhD	US	7	1	6	2	5	0	1	0
	Intl	10	7	17	0	14	0	3	0
MS	US	6	1	5	2	0	0	0	0
	Intl	2	0	2	0	0	0	0	0
Total		25	9	30	4	19	0	4	0

Fall 2009 Mean GRE Scores							
		Quantitative	%	Verbal	%	Analyt. Writing	%
PhD	US	762	85%	557	75%	4	39%
	Intl	769	89%	430	39%	3	20%
MS	US	763	88%	457	49%	5	69%
	Intl	-	-	-	-	-	-
Mean		765		481		4	

Spring 2010 Mean GRE Scores							
		Quantitative	%	Verbal	%	Analyt. Writing	%
PhD	US	735	80%	430	42%	3.75	34%
	Intl	790	92%	320	12%	2.5	3%
MS	US	668	64%	465	46%	3	9%
	Intl	775	88%	360	24%	3.5	27.5%
Mean		742		394		3	

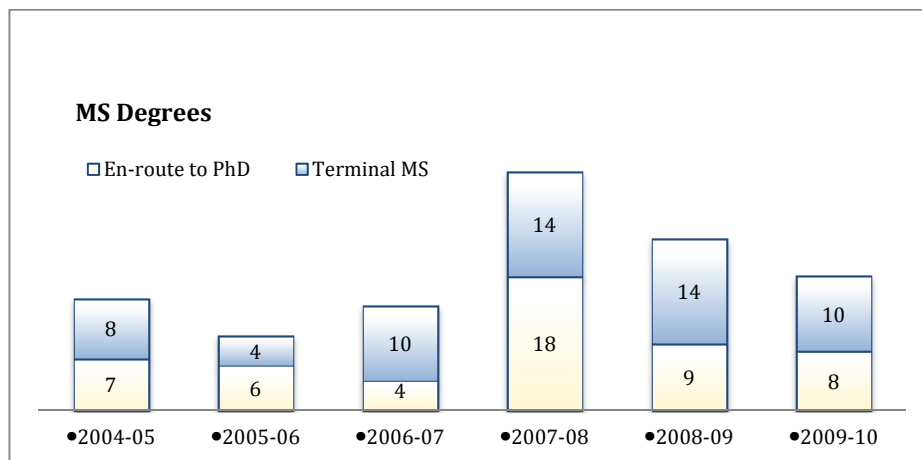
## 2.2 Degrees Awarded

As shown in the chart below,<sup>†</sup> there was a marked increase 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 lower than normal graduation rate last year may be partly responsible. Overall, we are seeing a 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 2009-2010 (18) is smaller than in previous years, which we attribute to statistical fluctuations rather than any long-term trend.



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").

<sup>†</sup> Data on enrollment and awarded degrees are taken from UCF's official reports, which consider Summer 09, Fall 09 and Spring 10 as the Academic year 2009-10.

## 2.3 PhD Dissertations

Academic Year Fall 2009 – Summer 2010

Student Name	Advisor	Dissertation Title
Jiyeon Choi	Martin Richardson	Femtosecond Laser Written Volumetric Diffractive Optical Elements And Their Applications
Ramy El-Ganainy	Demetrios Christodoulides	Optical Nonlinear Interactions In Dielectric Nano-Suspensions
Toufic Jabbour	Steven Keubler	Design, Analysis, And Optimization Of Diffractive Optical Elements Under High Numerical Aperture Focusing
Xiaoxu Li	Guifang Li	Wavelength-Division-Multiplexed Transmission Using Semiconductor Optical Amplifiers And Electronic Impairments Compensation
Timothy McComb	Martin Richardson	Power Scaling of Large Mode Area Thulium Fiber Lasers in Various Spectral and Temporal Regimes
Mumtaz Sheikh	Nabeel Riza	Silicon Carbide and Agile Optics based Sensors for Power Plant Gas Turbines, Laser Beam Analysis and Biomedicine
Pradeep Srinivasan	Patrick LiKamWa	Design and Fabrication of Space Variant Micro Optical Structures
Troy Anderson	Martin Richardson	Femtosecond Laser Processing of Chalcogenide Glasses for Optofluidics
Amitabh Ghoshal	Pieter Kik	Plasmon enhanced near-field interactions in surface coupled nanoparticle arrays for integrated nanophotonic devices
David Haefner	Aristide Dogariu	Near-Field Optical Interactions and Applications
William Hageman	Michael Bass	The Development of Scalable Pump Techniques for GG-IAG Fiber Lasers and Passive Athermalization Techniques for Solid State Lasers
Jeremy Mares	Winston Schoenfeld	Epitaxial Growth, Characterization and Application of Novel Wide Bandgap Oxide Semiconductors
Syed Azer Reza	Nabeel Riza	Micro-Electro-Mechanical Systems (MEMS) and Agile Lensing-Based Modules for Communications, Sensing and Signal Processing

K Shavitraturuk	Dennis Deppe	Long Cavity Quantum Dot Laser Diode and Monolithic Passively Mode-Locked Operation
Qiong Song	Shin-Tson Wu	Fast Response Time Dual Frequency Liquid Crystal Materials
Nathan Bickel	Patrick LiKamWa	Electro-Optical and All-Optical Switching IN Multimode Interference Waveguides Incorporating SemiConductor NANOStructures
Abdullah Demir	Dennis Deppe	Lithographic Lasers and Theoretical Modeling of a Quantum Dot Laser Diode
Florian Fournier	Jannick Rolland	Freeform Reflector Design with Extended Sources
Ji-Myung Kim	Peter Delfyett	Quantum Dot Based Mode-Locked Semiconductor Laser and Applications
Peter Krenz	Glenn Boreman	Response-Calibration Techniques for Antenna-Coupled Infrared Sensors
Oleksandr Savchyn	Pieter Kik	Silicon-Sensitized Erbium Excitation in Silica for Integrated Photonics
Tobias Schmid	Jannick Rolland	Misalignment Induced Nodal Aberration Fields and Their Use in the Alignment of Astronomical Telescopes
Georgios Siviloglou	Demetrios Christodoulides	Accelerating Optical Airy Beams



2010 Student-of-The-Year David Haefner (left) receiving the award from Dr. Bahaa Saleh.



## 2.4 Courses Taught

Core Courses		Fall 2009	Spring 2010	Summer 2010
OSE 5203	GEOMETRICAL OPTICS AND IMAGING SYSTEMS	Harvey	Boreman	
OSE 5312	LIGHT MATTER INTERACTION	Kik	Fathpour	
OSE 6111	OPTICAL WAVE PROPAGATION	Moharam	Christodoulides	
OSE 6115	INTERFERENCE, DIFFRACTION AND COHERENCE	Riza	Abouraddy	
OSE 6432	GUIDED WAVES & OPTOELECTRONICS		Moharam	LiKamWa
OSE 6525	LASER ENGINEERING	Richardson	Schulzgen	
Other OSE Graduate Courses		Fall 2009	Spring 2010	Summer 2010
OSE 5041	INTRODUCTION TO WAVE OPTICS	Wu		
OSE 5414	FUNDAMENTALS OF OPTOELECTRONICS	LiKamWa		
OSE 6120	THEORETICAL FOUNDATION OF OPTICS	Zeldovich		
OSE 6211	FOURIER OPTICS		Dogariu	
OSE 6234L	APPLIED OPTICS LABORATORY		Harvey	
OSE 6265	OPTICAL SYSTEMS DESIGN	Harvey		
OSE 6314	OPTICS OF LOW DIMENSIONAL SEMICONDUCTORS		Schoenfeld	
OSE 6319	OPTICAL WAVES AND MATERIALS			Zeldovich
OSE 6334	NONLINEAR OPTICS		Van Stryland	
OSE 6335	NONLINEAR GUIDED WAVE OPTICS	Christodoulides		
OSE 6421	INTEGRATED OPTICS	Moharam	Moharam	
OSE 6445	HIGH SPEED PHOTONICS	Delfyett		
OSE 6457	PHOTONIC SIGNAL PROCESSING	Riza		
OSE 6526C	LASER ENGINEERING LABORATORY	Richardson		Richardson
OSE 6615L	OPTOELECTRONIC DEVICE FABRICATION LABORATORY	Schoenfeld		
OSE 6650	OPTICAL PROPERTIES OF NANOSTRUCTURED MATERIALS		Kik	
OSE 6820	FLAT PANEL DISPLAYS			Wu

OSE 6938P	ST: OPTICAL FIBER DEVICES: PHYSICS AND APPLICATIONS	Abouraddy		
Other Courses		Fall 2009	Spring 2010	Summer 2010
EEL4440	OPTICAL ENGINEERING		Riza	
IDS 5127	FOUNDATIONS OF BIOIMAGING SCIENCE		Dogariu	
EMA 6611C	OPTOELECTRICAL MATERIALS PROCESSING			Kar
IDS 6938	ST: HISTORY OF PHYSICAL SCIENCE, CULTURAL CONNECTIONS & OTHER ISSUES		Bass	

## 2.5 Course and Program Development

### Graduate Education

Significant changes to the PhD core were implemented in 2009-10. This included adding a sixth course, *OSE 6525 Laser Engineering*, to the core as well as some changes in *OSE 5312 Fundamentals of Optical Science*. This course was renamed *Light-Matter Interaction* and the primary changes were to the syllabus involved removing lasers, nonlinear optical and magneto optics, while adding quantum-mechanical models of light matter interaction. Two other courses were slightly restructured and renamed: *OSE 5203 Fundamentals of Applied Optics* was renamed *Geometrical Optics and Imaging Science*, while *OSE 6432 Fundamentals of Photonics* was renamed *Guided Waves and Optoelectronics*. These changes were accompanied by a change in the format of the Ph.D. qualifying exam so that problems are more integrated across disciplines. The new exam will be implemented in 2010-11.

### Undergraduate Education

Significant expansion of our undergraduate offerings was planned in 2009-10 and was approved for implementation in Fall and Spring of the 2010-11 academic year. Specifically, a specialization in photonics, primarily aimed at Electrical Engineering majors, was created. This consists of three courses, each of 3 credit hours:

OSE 4052 - Introduction to Photonics, to be offered each Fall semester  
 OSE 4470 - Optoelectronics and Fiber Communications, Spring  
 OSE 4830 - Imaging Systems, Spring

Discussions on taking a further step to offer a full undergraduate degree also continued.

## 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**

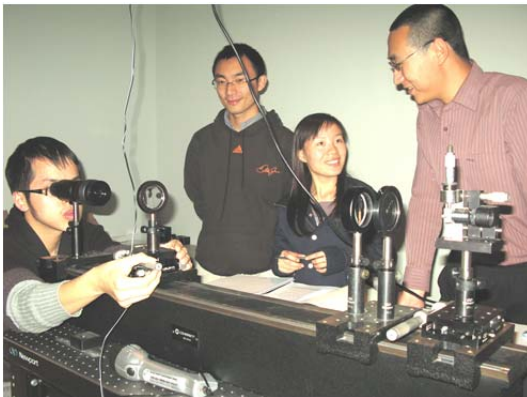
Prerequisite Course: Graduate standing and OSE 6432 or consent of the instructor. Experimental study of photonic devices and systems including liquid crystal displays, fiber-optic sensors, laser diodes, electro optic modulation, acousto-optic modulation, lightwave detection, optical communications, and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



## 2.7 Colloquia, Seminars and Workshops

DATE	SPEAKER	TITLE
1/28/2010	Alfred Leipertz Director SAOT University of Erlangen- Nuremberg, Germany	A useful tool for scientific collaboration in research and education.
1/29/2010	Hirotsugu Kikuchi Institute for Materials Chemistry and Engineering, Kyushu University, Japan	Material properties and electro-optics of polymer-stabilized blue phases. SID Student Chapter Seminar Series.
2/4/2010	Jared L. Anderson University of Toledo	Exploiting the versatility of ionic liquids in separation science.
2/5/2010	Mohan Srinivasarao Georgia Institute of Technology	Patterns on beetles and butterflies: origins of their color and patterns.
2/10/2010	Bryan Fonslow Scripps Research Institute	Expanding shotgun proteomics for a better understanding of insulin signaling.
2/23/2010	Bruno Viana LCMP – ENSCP, Paris	Crystals and ceramics for high power lasers and scintillation at the LCMCP- Paris.
2/25/2010	Ronald Driggers Naval Research Laboratory	An overview of NRL Optical Sciences Division.
2/26/2010	Jean-luc Doumont Stanford University	Making the most of your presentation.
3/1/2010	Hongrui Jiang University of Wisconsin- Madison	Liquid microlenses and their biomedical applications. IEEE Student Chapter Seminar Series.
3/1/2010	Bruce J. Tromberg University of California- Davis	Spectroscopy and imaging in medicine.
3/5/2010	John Miner- Keith Engh UCF Research & Commercialization	Patents & PhDs. SPIE Professional Development Series.
3/12/10	Tingye Li AT&T Labs-Research Boulder, Colorado	Strategic innovation in optical fiber communications.
3/17/2010	Cun-Zheng Ning Arizona State University	Nanolasers with wires and plasmonic shells: how small can they be? IEEE Student Chapter Seminar Series
4/7/2010	Stuart D. Jackson University of Sydney, Australia	Fiber lasers that emit CW light at wavelengths approaching 3 $\mu\text{m}$ .



4/9/2010	David Miller Stanford University	Fundamental limits for optical devices. Industrial Affiliates Day Guest Speaker
4/9/2010	Nader Engheta Univ. of Pennsylvania	Optical nanocircuits. Industrial Affiliates Day Guest Speaker
4/9/2010	Sam Hess University of Maine	Single-molecule imaging. Industrial Affiliates Day Guest Speaker
4/9/2010	Zenghu Chang Kansas State University	Atto-second optics. Industrial Affiliates Day Guest Speaker
4/12/2010	Belyakov Alekseevich L.D.Landau Institute for Theoretical Physics, Moscow	Localized modes in CLC and low threshold DFB lasing. IEEE & SID Student Chapter Seminar Series
4/13/2010	Sajeev John University of Toronto, Canada	Photonic band gap materials: light trapping crystals. IEEE Student Chapter Seminar Series
4/16/2010	Michael Sigman UCF Chemistry Dept. and National Center for Forensic Science	Optics in security and forensics research.
4/16/2010	Gabriel Popescu University of Illinois at Urbana-Champaign	Spatial light interference microscopy and tomography.
4/23/10	John C. Cartledge Queen's University at Kingston and Corning, Inc.	Optical and electronic signal processing for fiber-optic communications. IEEE Student Chapter Seminar Series
4/27/2010	Tetsuya Mizumoto Tokyo Institute of Technology	Optical isolator: application to photonic integrated circuits. IEEE Student Chapter Seminar Series
5/26/2010	A.A. Jalali Electro-Optics Technology, Inc	Enhancement of magneto-optical effects in gyrotropic photonic bandgap.
6/14/2010	Alan Willner University of Southern California	Towards robust and reconfigurable optical communication systems. IEEE Student Chapter Seminar Series
6/23/2010	Richard F. Haglund, Jr. Vanderbilt University	Wanted: A band-tunable mid-infrared laser for processing of polymer and organic materials.
6/28/2010	Stanislav Balushev Sofia University	Energetically–conjoined annihilation upconversion in multi–component organic systems.
7/22/2010	Eric Delevaque Manlight S.A.S.	Fiber lasers from concept and emerging technologies to industrial applications.
7/22/2010	Victor Valles-Gomez Heriot-Watt University	Transparent polycrystalline YAG ceramics for new technology solid-state lasers.

7/23/2010	Philippe Clemenceau Imagine Optic Inc	Adaptive optics, from astronomy, to high energy lasers and biomedical imaging.
7/26/2010	Romain Gaume Stanford University	Optical ceramics.
7/29/2010	Rodrigo Amezcua Powerlase Photonics, UK	Photonic crystal fibers for advanced photonics devices.
8/19/2010	Adam Stevenson Penn State	Transparent Nd:YAG ceramics.
8/20/2010	Norbert Fruehauf University of Stuttgart, Germany	Active matrix technologies for AMLCDs and AMOLEDs. SID Student Chapter Seminar Series.
9/9/2010	Rémy Boulesteix SPCTS Laboratory in Limoges, France	Correlations between optical and microstructural properties of transparent Nd:YAG ceramics: suitable process parameters to elaborate new materials for power lasers.
9/23/2010	Igor Voitenko LightVortex, LLC	New types of cladding-pumped fibers for next generation of monolithic power-scalable fiber laser technology.
9/24/2010	Archangelo V. Arecchi Labsphere	Labsphere-radiometry & photometry.
9/29/2010	Mattieu Baudalet CREOL	Basic principals of laser- induced breakdown spectroscopy.
9/29/2010	Yasuhiro Haseba Chisso Co.	Optically isotropic liquid crystals for electro-optical devices. SID Student Chapter Seminar Series.
10/1/2010	Terry Dorschner Network Centric Systems	Adaptive photonic phase-locked elements (APPLE).
10/19/10	Margaret Murnane JILA/NIST and U. of Colorado	Attosecond light and science at the timescale of the electron-coherent x-ray from tabletop ultrafast lasers.
10/20/2010	Razva Ciocan Newport	Improved spectral characterization of solar cells using a mapping system based on a tunable optical source.
10/28/2010	Romaine Gaume Stanford Univ.	Optical ceramics.
11/5/2010	Mubarak Shah Computer Science	Airborne video surveillance and monitoring.
11/5/2010	Ingomar Kelbassa RWTH Aachen Univ.	Additive manufacturing, repair and salvage of turbo machinery components by laser metal deposition.
11/10/2010	Janglin (John) Chen Industrial Technology Research Institute	E-paper technology and future development. SID Student Chapter Seminar Series.

## Faculty Highlights Seminars

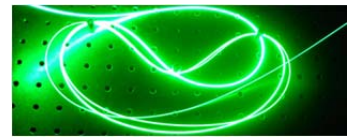
2/5/2010	Martin Richardson	High power fiber lasers.
2/19/2010	Nabeel Riza	Scanning is light work.
3/26/2010	Sasan Fathpour	Nonlinear absorption coefficients in silicon: time to revisit the data.
4/23/2010	James Harvey	A Global View of Diffraction and Surface-Scatter Phenomena.
4/30/2010	Dennis Deppe	Quantum dot lasers, lithographic lasers, quantum light sources, and photonic fabric.
5/7/2010	Patrick LiKamWa	Multi-mode interference devices.
5/21/2010	Guifang Li	Coherent detection and fiber-optic communication.
7/16/2010	Boris Zeldovich	Spin-orbit interaction of a photon, and special role of impedance.

## Workshops

### Workshop on Next-Generation Optical Fiber Technology

October 17–19, 2010

Hilton Cocoa Beach Oceanfront, Cocoa Beach, FL.



#### Conference Chair

Professor Ayman Abouraddy, Townes Laser Institute, CREOL, College of Optics & Photonics

#### Conference co-Chairs:

Professor Almantus Galvanauskus, University of Michigan; Professors Martin Richardson and Axel Schülzgen, Townes Laser Institute, CREOL, College of Optics & Photonics

This workshop attractee researchers in this field from across the nation, together with a few select experts from the major optical fiber facilities outside the US. It had two objectives (i) to identify application areas of new optical fibers and quantify their potential technological impact, and (ii), to assess the challenges and opportunities in new materials development and fabrication techniques that will enable these next-generation fibers. Topics include new materials for optical fibers, multi-material structured fibers, photonic crystal and photonic bandgap fibers, bio-compatible optical fibers, single crystal and transparent ceramic fibers, micro/nano-structured fibers, and fiber fabrication technologies, in particular.



Attendees of the Workshop on Next-Generation Optical Fibers held in Cocoa Beach.

## 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 Lipnharski, 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 t he 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)**

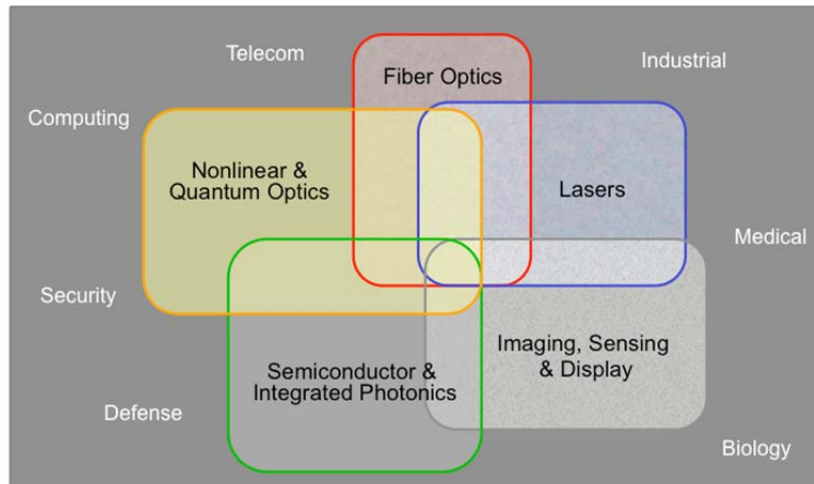
The FPCE was established with a \$10 million grant from the State of Florida to create a new center of excellence within The College of Optics and Photonics at the University of Central Florida. The program began in 2003 with three primary goals: Advance excellence in research and graduate education 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 industry 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 have forecasts of rapid market growth. The grant has been used for developing an 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 (TLI)**

The TLI was established in 2007 as a new initiative within the FPCE funded by a \$4.7M grant from the State of Florida and a matching fund from UCF for 5 faculty positions as well as \$3M for start-ups and infrastructure. The primary goal of the TLI is to make UCF the premier institution in advanced laser science and technology for medical applications and advanced manufacturing tools. The TLI was dedicated in May 2007 by Charles Townes, inventor of the laser and 1964 Nobel Laureate for Physics. The TLI is creating a major capability in advanced optical fibers with significant investments in optical fiber pulling facilities, pre-form fabrication, glass science and processing. It is now embarking on the establishment of a national capability in ceramic laser materials. It will also be investing in medical laser technology, laser-bioengineering, advanced laser-based manufacturing and new defense-related laser technologies. The TLI 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 to be a principal component of the optics discipline, but advanced topics such as nano-photonics, atto-second optics, meta-materials, plasmonics, and biophotonics, are 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. The Webpage <http://www.creol.ucf.edu/Research/ResearchArea.aspx> lists the faculty active in each of these areas.



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

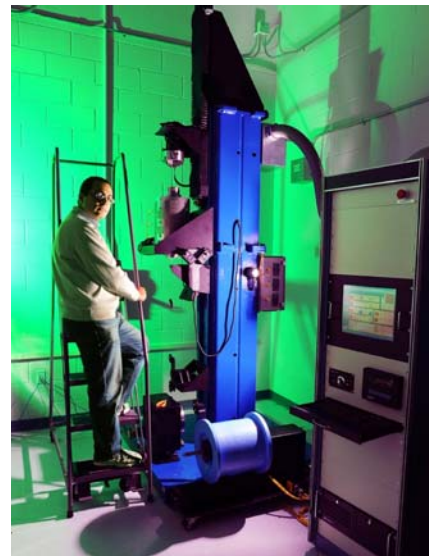
## Fiber Optics

### 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 Tower

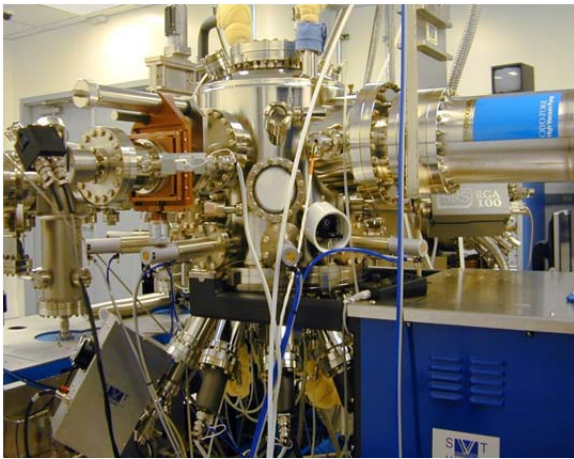
## Semiconductor & Integrated Photonics

### 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

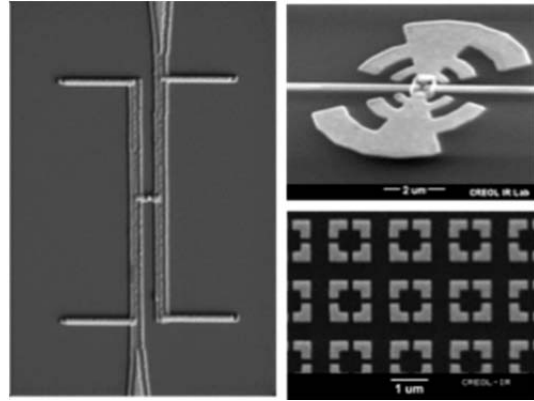


### Science & Technology

- 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



Infrared antennas fabricated in the  
Infrared Systems 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 ft<sup>2</sup> 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

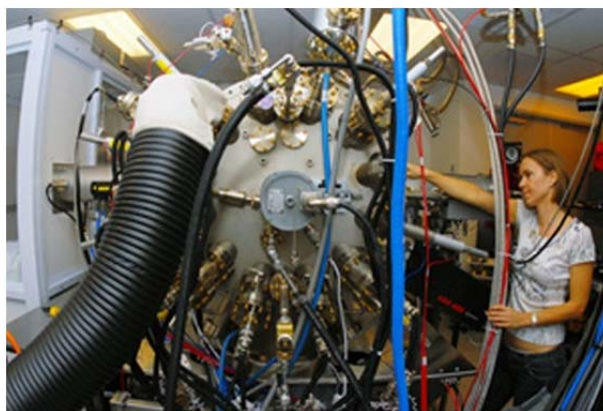
**Scanning Electron Microscope (SEM) Facility.** Vega SBH system built by Tescan is a tungsten-filament scanning electron microscope. The system is designed with a fully electronic column and is capable of imaging from 1-30 keV with nanometer scale resolution. Additionally, the system is equipped with 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](#).





MBE Facility

## 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](#).

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

**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](#).

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

**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 nanolithography. [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](#) and [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](#).

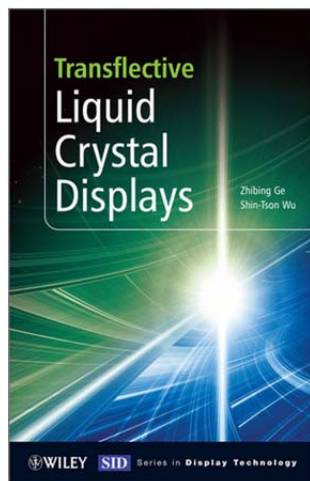
**Liquid Crystal Display Lab.** Investigating 1) advanced liquid crystal display materials, display devices, and device modeling, 2) electronic laser beam steering and adaptive optics using fast-response spatial light modulators, 3) adaptive liquid crystal and liquid lenses for foreveated imaging and zoom lens, and 4) bio-inspired tunable optical filters using cholesteric liquid crystals. [Shin-Tson Wu](#).

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

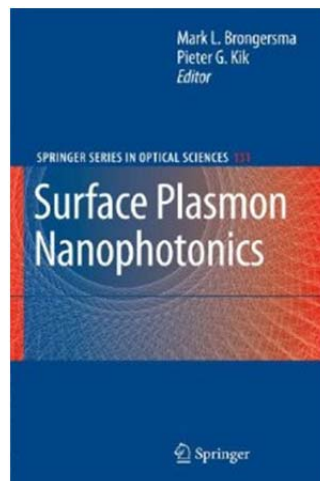
## 3.3 Publications

### Books

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



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



### Book Chapters

Olga V. Przhonska, Scott Webster, Lazaro A. Padilha, Honghua Hu, Alexey D. Kachkovski, **David J. Hagan**, and **Eric W. Van Stryland**, *Two-Photon Absorption in Near-IR Conjugated Molecules: Design Strategy and Structure-Property Relations*, in *Advanced Fluorescence Reporters in Chemistry and Biology, I. Fundamentals and Molecular Design*, Springer Series on Fluorescence, 2010,. Series Editor: Otto S. Wolfbeis, volume Editor A. Demchenko, Volume 8, 2010. (2010).

**Winston V. Schoenfeld**, *Chapter 18: High Brightness Visible LEDs*, *Handbook of Optics*, 3rd Edition, Volume II, M. Bass, Ed. New York: McGraw-Hill, 2010 (2010).

Ying Zhou, Yuhua Huang, and **Shin-Tson Wu**, *Emission Enhancement of Cholesteric Liquid Crystal Lasers*, Transworld (2010).

X. Feng, S. Gilbertson, H. Mashiko, S. Khan, H. Wang, M. Chini, Y. Wu, and **Z. Chang**, *Single Isolated Attosecond Pulses Generation with Double Optical Gating*, *Progress in Ultrafast Intense Laser Science* (2010).

## Journal Publications

- O. Shapira, **A.F. Abouraddy**, Q. Hu, D. Shemuly, J.D. Joannopoulos, and Y. Fink, *Enabling Coherent Superpositions of Iso-Frequency Optical States in Multimode Fibers*, Optics Express 18, pp. 12622-12629 (2010).
- D. Deng, N.D. Orf, S. Danto, **A.F. Abouraddy**, J.D. Joannopoulos, and Y. Fink, *Enhanced Optoelectronic Performance of Extended In-Fiber Crystalline-Selenium Filament Arrays*, Applied Physics Letters 96, 023102 (2010).
- S. Babu, J.H. Cho, J.M. Dowding, E. Heckert, C. Komanski, S. Das, J. Colon, C.H. Baker, **M. Bass**, W.T. Self, and S. Seal, *Multicolored Redox Active Upconverter Cerium Oxide Nanoparticle for Bio-Imaging and Therapeutics*, Chemical Communications 46(37), pp. 6915-6917 (2010).
- D. Nguyen, X. Wang, H. Ahn, L. Rodriguez, M. Bondar, **K.D. Belfield**, *Novel Hydrophilic Bis(1,2,3-triazolyl)fluorenyl Probe for In vitro Zinc Ion Sensing*, ACS Applied Materials & Interfaces 2(11) pp. 2978-2981 (2010).
- K.D. Belfield**, C. Andrade, C. Yanez, *New Two-Photon-Absorbing Probe with Efficient Superfluorescent Properties*, Journal of Physical Chemistry 114(44), pp. 14087-14095 (2010).
- A. Parthasarathy, H. Ahn, **K.D. Belfield**, *Two-Photon Excited Fluorescence of a Conjugated Polyelectrolyte and Its Application in Cell Imaging*, ACS Applied Materials & Interfaces 2(10), pp. 2744-2748 (2010).
- X. Wang, D. Nguyen, C. Yanez, L. Rodriguez, H. Ahn, M. Bondar, **K.D. Belfield**, *High-Fidelity Hydrophilic Probe for Two-Photon Fluorescence Lysosomal Imaging*, Journal of the American Chemical Society 132(35), pp. 12237-12239 (2010).
- K.D. Belfield**, M. Bondar, A. Frazer, *Fluorene-Based Metal-Ion Sensing Probe with High Sensitivity to Zn<sup>2+</sup> and Efficient Two-Photon Absorption*, Journal of Physical Chemistry 114(28), pp. 9313-9321 (2010).
- C. Andrade, C. Yanez, L. Rodriguez, **K.D. Belfield**, *A Series of Fluorene-Based Two-Photon Absorbing Molecules: Synthesis, Linear and Nonlinear Characterization, and Bioimaging*, Journal of Organic Chemistry 75(12) pp. 3975-3982 (2010).
- D. Nguyen, A. Frazer, L. Rodriguez, **K.D. Belfield**, *Selective Fluorescence Sensing of Zinc and Mercury Ions with Hydrophilic 1,2,3-Triazolyl Fluorene Probes*, Chemistry of Materials 22(11), pp. 3472-3481 (2010).
- Morales, G. Luchita, C. Yanez, M. Bondar, O. Przhonska, **K.D. Belfield**, *Linear and nonlinear photophysics and bioimaging of an integrin-targeting water-soluble fluorenyl probe*, Organic & Biomolecular Chemistry 8(11), pp. 2600-2608 (2010).
- G. Kumi, C. Yanez, **K.D. Belfield**, *High-speed multiphoton absorption polymerization: fabrication of microfluidic channels with arbitrary cross-sections and high aspect ratios*, Lab on a Chip 10(8), pp. 1057-1060 (2010).
- J. Bean, B. Slovick, and **G. Boreman**, *Influence of Substrate Configuration on the Angular Response Pattern of Infrared Antennas*, Optics Express 18(21), pp. 21705-21713 (2010).
- D. Shelton, D. Peters, M. Sinclair, I. Brener, L. Warne, L. Basilio, K. Coffey, and **G. Boreman**, *Effect of Thin Silicon Dioxide Layers on Resonant Frequency in Infrared Metamaterials*, Optics Express 18(2), pp. 1085-1090 (2010).
- D.J. Shelton, K.R. Coffey, and **G. Boreman**, *Experimental Demonstration of Tunable Phase in a Thermochromic Infrared-Reflectarray Metamaterial*, Optics Express 18, pp. 1330-1335 (2010).
- J. Ginn, D. Shelton, P. Krenz, B. Lail, and **G. Boreman**, *Polarized Infrared Emission Using Frequency Selective Surfaces*, Optics Express 18(5), pp. 4557-4563 (2010).
- J. T. DuBosq, R. Knox, and **G. Boreman**, *Detection of Subsurface Rocks in Sand of Similar Composition Using a Millimeter Wave Imaging System*, Journal of Infrared, Millimeter, and Terahertz Waves, 31(1) pp. 54-59 (2010).
- B. Slovick, J. Bean, P. Krenz, and **G. Boreman**, *Directional Control of Infrared Antenna-Coupled Tunnel Diodes*, Optics Express 18(20), pp. 20960-20967 (2010).
- R. Olmon, P. Krenz, B. Lail, L. Saraf, **G. Boreman**, and M. Raschke, *Nano-Optical Vector Network Analyzer*, Physical Review Letters 105, 167403:1-4 (2010).
- P. Krenz, R. Olmon, B. Lail, M. Raschke, and **G. Boreman**, *Near-Field Measurement of Infrared Coplanar Strip Transmission Line Attenuation and Propagation Constants*, Optics Express 18, pp. 21678-21686 (2010).
- J.W. Cleary, R.E. Peale, D.J. Shelton, **G. Boreman**, C.W. Smith, M. Ishigami, R. Soref, A. Drehman, and W.R. Buchwald, *IR Permittivities for Silicides and Doped Silicon*, JOSA B 27, pp. 730-734 (2010).
- C. Packham, M. Escuti, J. Ginn, C. Oh, I. Quijano, and **G. Boreman**, *Polarization Gratings: A Novel Polarimetric Component for Astronomical Instruments*, Publications of the Astronomical Society of the Pacific 122, pp. 1471-1482 (2010).

- B. Slovick, P. Krenz, G. Zummo, and **G. Boreman**, *Evaporation of Uniform Antireflection Coatings on Hemispherical Lenses to Enhance Infrared Antenna Gain*, *Infrared Physics & Technology* 53(2), pp. 89-93 (2010).
- Z. Chang** and P. Corkum, *Attosecond Photon Sources: The First Decade and Beyond*, *Journal of the Optical Society of America B* 27, B9-B17 (Invited) (2010).
- H. Wang, M. Chini, S. Chen, C.H. Zhang, F. He, Y. Cheng, Y. Wu, U. Thumm, and **Z. Chang**, *Attosecond Time-Resolved Autoionization of Argon*, *Physical Review Letters* 105, 143002 (2010).
- M. Chini, S. Gilbertson, S.D. Khan, and **Z. Chang**, *Characterizing Ultrabroadband Attosecond Lasers*, *Optical Express* 18, 13006 (2010).
- B. Ulrich, A. Vredenburg, A. Malakzadeh, M. Meckel, K. Cole, M. Smolarski, **Z. Chang**, T. Jahnke, and R. Dörner, *Double Ionization Mechanisms of the Argon Dimer in Intense Laser Fields*, *Physics Review A* 82, 013412 (2010).
- S. Gilbertson, Y. Wu, S.D. Khan, M. Chini, K. Zhao, X. Feng, and **Z. Chang**, *Isolated Attosecond Pulse Generation Using Multicycle Pulses Directly from a Laser Amplifier*, *Physics Review A* 81, 043810 (2010).
- S. Gilbertson, M. Chini, X. Feng, S. Khan, Y. Wu, and **Z. Chang**, *Monitoring and Controlling the Electron Dynamics in Helium with Isolated Attosecond Pulses*, *Physics Review Letters* 105, 263003 (2010).
- H. Wang, M. Chini, Y. Wu, E. Moon, H. Mashiko and **Z. Chang**, *Carrier-Envelope Phase Stabilization of 5 fs, 0.5 mJ, Pulses From Adaptive Phase Modulators*, *Applied Physics B* 98, pp. 291-294 (2010).
- Q. Zhang, K. Zhao, and **Z. Chang**, *Determining Time Resolution of Microchannel Plate Detectors for Electron Time-of-Flight Spectrometer*, *Review of Scientific Instruments* 81, 073112 (2010).
- N.K. Efremidis and **D.N. Christodoulides**, *Abruptly Autofocusing Waves*, *Opt. Lett.* 35, pp. 4045-4047 (2010).
- A. Chong, W.H. Renninger, **D.N. Christodoulides**, and F.W. Wise, *Airy-Bessel Wave Packets as Versatile Linear Light Bullets*, *Nature Photonics* 4(2), pp. 103-106 (2010).
- S. Jia, J. Lee, J.W. Fleischer, G.A. Siviloglou, and **D.N. Christodoulides**, *Diffusion-Trapped Airy Beams in Photorefractive Media*, *Physical Review Letters* 104(25), 253904 (2010).
- A. Perez-Leija, H. Moya-Cessa, A. Szameit, **D.N. Christodoulides**, *Glauber-Fock Photonic Lattices*, *Optics Letters* 35(14), pp. 2409-2411 (2010).
- O. Manela, M. Segev, **D.N. Christodoulides**, and D. Kip, *Hofstadter Butterflies in Nonlinear Harper Lattices, and Their Optical Realizations*, *New Journal of Physics* 12, 053017 (2010).
- D.N. Christodoulides**, I. Choon Khoo, G.J. Salamo, **G.I. Stegeman**, and **E.W. Van Stryland**, *"Nonlinear Refraction and Absorption: Mechanisms and Magnitudes"*, *Advances in Optics and Photonics* 2(1), pp. 60-200 (2010).
- T. J. Eichelkraut, G. A. Siviloglou, I. M. Besieris, and **D. N. Christodoulides**, *Oblique Airy wave packets in bidispersive optical media*, *Opt. Lett.* 35, pp. 3655-3657 (2010).
- C.E. Ruter, K.G. Makris, R. El-Ganainy, **D.N. Christodoulides**, M. Segev, and D. Kip, *Observation of Parity-Time Symmetry in Optics*, *Nature Physics* 6(3), pp. 192-195 (2010).
- M.C. Zheng, **D.N. Christodoulides**, R. Fleischmann, and T. Kottos, *PT Optical Lattices and Universality in Beam Dynamics*, *Physical Review* 82(1), 010103 (2010).
- K.G. Makris, R. El-Ganainy, **D.N. Christodoulides**, and Z.H. Musslimani, *PT-Symmetric Optical Lattices*, *Physical Review* 81(6), 063807 (2010).
- Y. Lahini, Y. Bromberg, **D.N. Christodoulides**, and Y. Silberberg, *Quantum Correlations in Two-Particle Anderson Localization*, *Physical Review Letters* 105(16), 163905 (2010).
- H. Ramezani, T. Kottos, R. El-Ganainy, and **D.N. Christodoulides**, *Unidirectional Nonlinear PT-Symmetric Optical Structures*, *Physical Review* 82(4), 043803 (2010).
- A. Salandrino and **D.N. Christodoulides**, *Airy Plasmon: A Nondiffracting Surface Wave*, *Optical Letters* 35(12), pp. 2082-2084 (2010).
- M. Akbulut, S. Bhooplapur, I. Ozdur, J. Davila-Rodriguez, **P.J. Delfyett**, *Dynamic Line-By-Line Pulse Shaping with GHz Update Rate*, *Optics Express* 18(17), pp. 18284-18291 (2010).
- D. Mandridis, I. Ozdur, F. Quinlan, M. Akbulut, J.J. Plant, P.W. Juodawlkis, **P.J. Delfyett**, *Low-Noise, Low Repetition Rate, Semiconductor-Based Mode-Locked Laser Source Suitable for High Bandwidth Photonic Analog-Digital Conversion*, *Applied Optics* 49(15), pp. 2850-2857 (2010).
- I. Ozdur, M. Akbulut, N. Hoghooghi, D. Mandridis, M.U. Piracha, **P.J. Delfyett**, *Optoelectronic Loop Design with 1000 Finesse Fabry-Perot Etalon*, *Optics Letters* 35(6), pp. 799-801 (2010).
- N. Hoghooghi, I. Ozdur, M. Akbulut, J. Davila-Rodriguez, and **P.J. Delfyett**, *Resonant Cavity Linear Interferometric Intensity Modulator*, *Optics Letters* 35(8), pp. 1218-1220 (2010).
- D. Mandridis, I. Ozdur, M. Bagnell, **P.J. Delfyett**, *Free Spectral Range Measurement of a Fiberized Fabry-Perot Etalon with Sub-Hz Accuracy*, *Optics Express* 18(11), pp. 11264-11269 (2010).



- I. Ozdur, M. Akbulut, N. Hoghooghi, D. Mandridis, S. Ozharar, F. Quinlan, **P.J. Delfyett**, *A Semiconductor-Based 10-GHz Optical Comb Source With Sub 3-fs Shot-Noise-Limited Timing Jitter and similar to 500-Hz Comb Linewidth*, IEEE Photonics Technology Letters, 22(6), pp. 431-433, March 15 (2010).
- J. Davila-Rodriguez, I. Ozdur, C. Williams, and **P.J. Delfyett**, *A Semiconductor-based Frequency Stabilized Mode-locked Laser using a Phase Modulator and an Intra-cavity Etalon*, Optics Letters, 35(24), pp. 4130-4132 (2010).
- M. Bagnell, J. Davila-Rodriguez, A. Ardey, **P.J. Delfyett**, *Dispersion Measurements of a 1.3  $\mu$ m Quantum Dot Semiconductor Optical Amplifier Over 120 nm of Spectral Bandwidth*, Applied Physics Letters 96(21), 211907 (2010).
- I. Ozdur, D. Mandridis, M.U. Piracha, M. Akbulut, N. Hoghooghi, **P.J. Delfyett**, *Optical Frequency Stability Measurement Using an Etalon Based Optoelectronic Oscillator*, Photonics Technology Letters 99(1), doi: 10.1109/LPT.2010.2100375 (2010).
- S. Gee, **P.J. Delfyett**, *Noise Transfer Functions of Mode-Locked Semiconductor Laser*, Optics Express 18(2), pp. 624-631 (2010).
- N. Hoghooghi, I. Ozdur, S. Bhooplapur, **P.J. Delfyett**, *Direct Demodulation and Channel Filtering of Phase-Modulated Signals Using an Injection-Locked VCSEL*, IEEE Photonics Technology Letters, 22(20), pp. 1509-1511, October (2010).
- I. Ozdur, D. Mandridis, N. Hoghooghi, **P.J. Delfyett**, *Low Noise Optically Tunable Opto-electronic Oscillator with Fabry-Perot Etalon*, Journal of Lightwave Technology 28(21), pp. 3100-3106 (2010).
- M.U. Piracha, D. Nguyen, D. Mandridis, T. Yilmaz, I. Ozdur, S. Ozharar, **P.J. Delfyett**, *Range Resolved Lidar for Long Distance Ranging with Sub-Millimeter Resolution*, Optics Express 18(7), pp. 7184-7189 (2010).
- D. Mandridis, I. Ozdur, M. Akbulut, **P.J. Delfyett**, *A Photonic Method for Measuring the AM Noise of Periodic Electrical Signals*, IEEE Photonics Technology Letters 22(11), pp. 790-792 (2010).
- K. Hsu, P. Meemon, K-S. Lee, **P.J. Delfyett**, **J.P. Rolland**, *Broadband Fourier Domain Mode-Locked Lasers*, Photonic Sensors, Springer Open Access, DOI: 10.1007/s13320-010-0006-z (2010).
- A. Demir, G. Zhao, and **D.G. Deppe**, *Lithographic Lasers with Low Thermal Resistance*, Electronics Letters 46(16), pp. 1147-1148 (2010).
- S. Zlatanovic, J.S. Park, S. Moro, J.M. Chavez Boggio, **I.B. Divliansky**, N. Alic, S. Mookherjea and S. Radic, *Mid-infrared Wavelength Conversion in Silicon Waveguides Using Ultracompact Telecom-band-derived Pump Source*, Nature Photonics 4, pp. 561-564 (2010).
- M.L. Cooper, G. Gupta, J.S. Park, M.A. Schneider, **I.B. Divliansky** and S. Mookherjea, *Quantitative infrared imaging of silicon-on-insulator microring resonators*, Optics Letters 35, pp.784-786 (2010).
- K.M. Douglass, J. Ellis, C. Toma, A. Mahalanobis, and **A. Dogariu**, *Expanding the Field of Biew by Polarization Multiplexing*, Applied Optics 49, H40-H46 (2010).
- S. Sukhov, D. Haefner, and **A. Dogariu**, *Stochastic Reconstruction of Anisotropic Polarizabilities*, Journal of the Optical Society of America A-Optics Image Science and Vision 27(4), pp. 827-831 (2010).
- T.W. Kohlgraf-Owens, **A. Dogariu**, *Transmission Matrices of Random Media: Means for Spectral Polarimetric Measurements*, Optics Letters 35(13) pp. 2236-2238 (2010).
- O. Lopatiuk-Tirpak, J. Ma, and **S. Fathpour**, *Optical Transmission Properties of C-shaped Subwavelength Waveguides on Silicon*, Applied Physics Letters 96, 241109 (2010).
- S. Fathpour**, and **N.A. Riza**, *Silicon-Photonics-Based Wideband Radar Beamforming: Basic Design*, SPIE Journal of Optical Engineering 49, 018201 (2010).
- Z.J. Hu, J.H. Zou, C. Deibel, **A.J. Gesquiere** and L. Zhai, *Single-Molecule Spectroscopy and AFM Morphology Studies of a Diblock Copolymer Consisting of Poly(3-hexylthiophene) and Fullerene*, Macromolecular Chemistry and Physics 211, pp. 2416-2424 (2010).
- Z.J. Hu, D. Tenery, M.S. Bonner and **A.J. Gesquiere**, *Correlation between spectroscopic and morphological properties of composite P3HT/PCBM nanoparticles studied by single particle spectroscopy*, Journal of Luminescence 130, pp.771-780 (2010).
- V.M. Fokin, G.P. Souza, E.D. Zanotto, J. Lumeau, L. Glebova, and **L.B. Glebov**, *Sodium Fluoride Solubility and Crystallization in Photo-Thermo-Refractive Glass*, Journal of the American Ceramic Society 93(3), pp. 716-721 (2010).
- F. Terenziani, O.V. Przhonska, S. Webster, L.A. Padilha, Y.L. Slominsky, I.G. Davydenko, A.O. Gerasov, Y.P. Kovtun, M.P. Shandura, A.D. Kachkovski, **D.J. Hagan**, **E.W. Van Stryland**, A. Painelli, *Essential-State Model for Polymethine Dyes: Symmetry Breaking and Optical Spectra*, Journal of Physical Chemistry Letters 1(12), pp. 1800-1804 (2010).
- G. Nootz, L.A. Padilha, P.D. Olszak, S. Webster, **D.J. Hagan**, **E.W. Van Stryland**, L. Levina, V. Sukhovatkin, L. Brzozowski, E.H. Sargent, *Role of Symmetry Breaking on the Optical Transitions in Lead-Salt Quantum Dots*, Nano Letters 10(9), pp. 3577-3582 (2010).
- P.D. Olszak, C.M. Cirloganu, S. Webster, L.A. Padilha, S. Guha, L.P. Gonzalez, S. Krishnamurthy, **D.J. Hagan**, and **E.W. Van Stryland**, *Spectral and*

- Temperature Dependence of Two-Photon and Free-Carrier Absorption in InSb*, Physical Review 82, 235207 (2010).
- C. Toro, L. De Boni, N. Lin, F. Santoro, A. Rizzo and **F.E. Hernandez**, *Two-Photon Absorption Circular-Linear Dichroism on Axial Enantiomers*, Chirality 22, pp.202-210, (2010).
- C. Toro, L. De Boni, N. Lin, F. Santoro, A. Rizzo and **F.E. Hernandez**, *Two-Photon Absorption Circular Dichroism: A New Twist in Nonlinear Spectroscopy*, Chemistry-A European Journal 16, pp. 3504-3509 (2010).
- L. De Boni, C. Toro, S.C. Zilio, C.R. Mendonca and **F.E. Hernandez**, *Azo-group dihedral angle torsion dependence on temperature: A theoretical-experimental study*, Chemical Physics Letters 487, pp. 226-231 (2010).
- L. De Boni, C. Toro and **F.E. Hernandez**, *Excited State Absorption Study in Hematoporphyrin IX*, Journal of Fluorescence 20, pp. 197-202 (2010).
- A. Jocelyn, **A. Kar**, A. Fanourakis, T. Flower, M. Ackerman, A. Keevil, and J. Way, *Indirect Versus Direct Heating of Sheet Materials: Superplastic Forming and Diffusion Bonding Using Lasers*, Journal of Materials Engineering and Performance 19(4), pp. 527-532 (2010).
- A. Ghoshal and **P.G. Kik**, *Frequency dependent power efficiency of a nanostructured surface plasmon coupler*, Phys. Stat. Sol. Rapid Research Letters 4, 280 (2010).
- O. Shapira, R.M. Todi, K.R. Coffey, **P.G. Kik**, *High-Temperature Optical Properties of Sensitized Er<sup>3+</sup> in Si-rich SiO<sub>2</sub> - Implications for Gain Performance*, Optical Materials 32(9), pp. 1274-1278 (2010).
- L. Borowska, S. Fritzsche, **P.G. Kik**, and A.E. Masunov, *Near-Field Enhancement of Infrared Intensities for F-F Transitions in Er<sup>3+</sup> ions Close to the Surface of Silicon Nanoparticles*, J. Mol. Model (2010).
- O. Savchyn, K.R. Coffey, and **P.G. Kik**, *Determination of Optimum Si Excess Concentration in Er-Doped Si-rich SiO<sub>2</sub> for Optical Amplification at 1.54  $\mu$ m*, Applied Physics Letters 97, 201107 (2010).
- C.Y. Tang, S.M. Huang and **W. Lee**, *Dielectric relaxation dynamics in a dual-frequency nematic liquid crystal doped with CI Acid Red 2*, Dyes and Pigments 88, pp. 1-6 (2010).
- W. Lee**, C.T. Wang and C.H. Lin, *Recovery of the electrically resistive properties of a degraded liquid crystal*, Displays 31, pp. 160-163 (2010).
- F. Yaman, N. Bai, B.Y. Zhu, T. Wang, **G. Li**, *Long Distance Transmission in Few-Mode Fibers*, Optics Express 18(12), pp. 13250-13257 (2010).
- X.O. Xie, F. Yaman, X. Zhou, and **G. Li**, *Polarization Demultiplexing by Independent Component Analysis*, IEEE Photonics Technology Letters 22(11), pp. 805-807 (2010).
- F. Yaman, N. Bai, Y.K. Huang, M.F. Huang, B. Zhu, T. Wang and **G. Li**, *10 x 112Gb/s PDM-QPSK Transmission Over 5032 km in Few-Mode Fibers*, Optical Express 18(20), pp. 21342-21349 (2010).
- X. Gao, M.A. Bassiouni, and **G. Li**, *Effective Preemptive Scheduling Scheme for Optical Burst-Switched Networks with Cascaded Wavelength Conversion Consideration*, Optical Engineering 49(3), 035004 (2010).
- E.F. Mateo, F. Yaman, **G. Li**, *Efficient Compensation of Inter-Channel Nonlinear Effects Via Digital Backward Propagation in WDM Optical Transmission*, Optics Express 18(14), pp. 15144-15154 (2010).
- L. Zhu, F. Yaman, **G. Li**, *Experimental Demonstration of XPM Compensation for WDM Fibre Transmission*, Electronics Letters 46(16), pp. 1140-U68 (2010).
- X. Li and **G. Li**, *Joint Fiber and SOA Impairment Compensation Using Digital Backward Propagation*, IEEE Photonics Journal 2(5), pp. 753-758 (2010).
- F. Yaman and **G. Li**, *Nonlinear Impairment Compensation for Polarization-Division Multiplexed WDM Transmission Using Digital Backward Propagation (Invited)*, IEEE Photonics Journal 2(5), pp. 816-832 (2010).
- A. Castillo-Guzman, J. E. Antonio-Lopez, R. Selvas-Aguilar, D. A. May-Arrioja, J. Estudillo-Ayala, and **P.L. LiKamWa**, *Widely Tunable Erbium-Doped Fiber Laser Based on Multimode Interference Effect*, Optics Express 18(2), pp. 591-597 (2010).
- J.E. Antonio-Lopez, A. Castillo-Guzman, D.A. May-Arrioja, R. Selvas-Aguilar, and **P.L. LiKamWa**, *Tunable Multimode Interference Bandpass Fiber Filter*, Optics Letters 35(3), pp. 324-326 (2010).
- K. Richardson, L. Petit, N. Carlie, B. Zdyrko, I. Luzinov, J. Hu, A. Agarwal, L. Kimerling, T. Anderson, **M.C. Richardson**, *Progress on the Fabrication of On-Chip, Integrated Chalcogenide Glass (CHG)-Based Sensors*, Journal of Nonlinear Optical Physics & Material 19(1), pp. 75-99 (2010).
- Y. Liu, M. Baudelet and **M.C. Richardson**, *Elemental Analysis by Microwave-Assisted Laser-Induced Breakdown Apectroscopy: Evaluation on Ceramics*, J. Anal. At. Spectrom., 2010, 25, pp. 1316-1323 (2010).
- M. Weidman, M. Baudelet, S. Palanco, **M. Sigman**, P.J. Dagdigian, **M.C. Richardson**, *Nd:YAG-CO<sub>2</sub> Fouble-Pulse Laser Induced Breakdown Spectroscopy of Organic Films*, Optics Express 18, pp. 259-266 (2010).
- M. Bellec, A. Royon, K. Bourhis, J. Choi, B. Bousquet, M. Treguer, T. Cardinal, J.J. Videau, **M.C. Richardson**, L. Canioni, *3D Patterning at the*

- Nanoscale of Fluorescent Emitters in Glass*, Journal of Physical Chemistry 114(37), pp. 15584-15588 (2010).
- M. Baudelet, C. Willis, L. Shah, and **M.C. Richardson**, *Laser-Induced Breakdown Spectroscopy of Copper with a 2  $\mu$ m Thulium Fiber Laser*, Optics Express 18, pp. 7905-7910 (2010).
- V. Sudesh, T.S. McComb, R.A. Sims, L. Shah, **M.C. Richardson**, J. Stryjewski, *Latest Developments in High Power, Tunable, CW, Narrow Line Thulium Fiber Laser for Deployment to the ISTEF*, Proceedings of SPIE 7325, 73250B-1 (2010).
- N.A. Riza**, M. Sheikh, *All-Silicon Carbide Hybrid Wireless-Wired Optics Temperature Sensor Network Basic Design Engineering for Power Plant Gas Turbines*, International Journal of Optomechatronics 4(1), pp. 83-91 (2010).
- N.A. Riza** and P.J. Marraccini, *Broadband  $2 \times 2$  Free-Space Optical Switch Using Electronically Controlled Liquid Lenses*, Optics Communications 283, pp. 1711-1741 (2010).
- N.A. Riza**, S.A. Reza, and P.J. Marraccini, *Electronically Controlled Agile Lens-Based Broadband Variable Photonic Delay Line For Photonics and RF Signal Processing*, Applied Optics 49(35), pp. 6718-6725 (2010).
- N.A. Riza**, M.A. Sheikh, *Silicon Carbide-Based Extreme Environment Hybrid Design Temperature Sensor Using Optical Pyrometry and Laser Interferometry*, Optical Engineering 49(1), 018201 (2010).
- S.A. Reza, **N.A. Riza**, *Agile Lensing-Based Non-Contact Liquid Level Optical Sensor for Extreme Environments*, Optics Communications 283(18), pp. 3391-3397 (2010).
- N.A. Riza**, S.A. Reza, *Smart Agile Lens Remote Optical Sensor for Three-Dimensional Object Shape Measurements*, Applied Optics 49(7), pp. 1139-1150 (2010).
- T. Schmid, **J.P. Rolland**, A. Rakich and K.P. Thompson, *Separation of the effects of astigmatic figure error from misalignments using Nodal Aberration Theory (NAT)*, Optics Express 18, pp. 17433-17447 (2010).
- T. Schmid, K.P. Thompson and **J.P. Rolland**, *Misalignment-induced nodal aberration fields in two-mirror astronomical telescopes*, Applied Optics 49, pp. 131-144 (2010).
- S. Murali, P. Meemon, K.S. Lee, W.P. Kuhn, K.P. Thompson and **J.P. Rolland**, *Assessment of a liquid lens enabled in vivo optical coherence microscope*, Applied Optics 49, pp. 145-156 (2010).
- K.S. Lee, P. Meemon, W. Dallas, K. Hsu and **J.P. Rolland**, *Dual detection full range frequency domain optical coherence tomography*, Optics Letters 35, pp. 1058-1030 (2010).
- T. Schmid, K.P. Thompson and **J.P. Rolland**, *A unique astigmatic nodal property in misaligned Ritchey-Chretien telescopes with misalignment coma removed*, Optics Express 18, pp. 5282-5288 (2010).
- F.R. Fournier, W. J. Cassarly and **J.P. Rolland**, *Fast freeform reflector generation using source-target maps*, Optics Express 18, pp. 5295-5304 (2010).
- J.P. Rolland**, P. Meemon, S. Murali, K.P. Thompson and K.S. Lee, *Gabor-based fusion technique for Optical Coherence Microscopy*, Optics Express 18, pp. 3632-3634 (2010).
- M.F. Saleh, G. Di Giuseppe, **B.E.A. Saleh**, and M.C. Teich, *Modal and Polarization Qubits in Ti:LiNbO<sub>3</sub> Photonic Circuits for a Universal Quantum Logic Gate*, Optics Express, Vol. 18, pp. 20475-20490 (2010).
- M.F. Saleh, G. Di Giuseppe, **B.E.A. Saleh**, M.C. Teich, *Photonic Circuits for Generating Modal, Spectral, and Polarization Entanglement*, IEEE Photonics Journal 2(5), pp. 736-752 (2010).
- J.W. Mares, R.C. Boutwell, A. Scheurer, **W.V. Schoenfeld**, *Cubic ZnMg<sub>1-x</sub>O Thin Films Grown by Plasma-Assisted Molecular-Beam Epitaxy for Optoelectronic Applications*, Journal of Materials Research 25(6), pp. 1072-1079 (2010).
- G. Gonzalez, **M.N. Leuenberger**, H. Seigneur, **W.V. Schoenfeld**, *Theory of a Scalable Electron-Spin Based Quantum Network Inside a Photonic Crystal*, Journal of Computational and Theoretical Nanoscience 7(9), pp. 1651-1672 (2010).
- X. Zhu, **A. Schülzgen**, H. Li, H. Wei, J. V. Moloney, and N. Peyghambarian, *Coherent Beam Transformation Using Multimode Waveguides*, Opt. Express 18, 7506 (2010).
- D. Milanese, H. Gebavi, J. Lousteau, M. Ferraris, **A. Schülzgen**, L. Li, N. Peyghambarian, S. Taccheo, and F. Auzel, *Tm<sup>3+</sup> and Yb<sup>3+</sup> Co-Doped Tellurite Glasses for Short Cavity Optical Fiber Lasers: Fabrication and Optical Characterization*, J. Non-Cryst. Sol. 356, 2378 (2010).
- H. Shu**, *More on the Iteration of the Beam Propagation Method for Analyzing Bragg Gratings*, Journal of the Optical Society of America A, 27(6), pp. 1424-1431 (2010).
- S. Toroghi**, A.K. Jafari and A.H. Golpayegani, *A Model of Lasing Action in a Quasi-Four-Level thin Active Media*, IEEE Journal of Quantum Electronics 46, pp. 871-876 (2010).
- A.L. May-Herrera, L.A. Aguilera-Cortés, P.J. Garcia-Ramirez, H. Plascencia-Mora and **M. Torres-Cisneros**, *Modeling of the intrinsic stress effect on the resonant frequency of NEMS resonators integrated by beams with variable cross-section*, Microsystem Technologies 16, pp. 2067-2074 (2010).
- E.W. Van Stryland**, **D.J. Hagan**, O.V. Przhonska,

- S.R. Marder, S. Webster and L.A. Padilha, *Nonlinear Absorption Spectroscopy of Organic Dyes*, *Nonlinear Optics*, *Quantum Optics* 40, pp. 95-113 (2010).
- S. Yao, H. Ahn, X. Wang, J. Fu, **E.W. Van Stryland**, **D.J. Hagan**, **K.D. Belfield**, *Donor-Acceptor-Donor Fluorene Derivatives for Two-Photon Fluorescence Lysosomal Imaging*, *Journal of Organic Chemistry* 75(12), pp. 3965-3974 (2010).
- E. Wolf**, *The influence of Young's interference experiment on the development of statistical optics*, *Progress in Optics* 50, pp. 251-273 (2010).
- J. Weirich, J. Laegsgaard, L. Wei, T.T. Alkeskjold, T.X. Wu, **S.T. Wu**, and A. Bjarklev, *Liquid Crystal Parameters Analysis for Tunable Photonic Bandgap Fiber Devices*, *Opt. Express* 18, pp. 4074-4087 (2010).
- H. Shirvani-Mahdavi, E. Mohajerani, and **S.T. Wu**, *Circularly Polarized High-Efficiency Cholesteric Liquid Crystal Lasers with a Tunable Nematic Phase Retarder*, *Optics Express* 18, pp. 5021-5027 (2010).
- H. Shirvani-Mahdavi, S. Fardad, E. Mohajerani, and **S.T. Wu**, *High Efficiency Cholesteric Liquid Crystal Lasers with an External Stable Resonator*, *Opt. Express* 18, pp. 13593-13599 (2010).
- L. Rao, Z. Ge, S. Gauza, K.M. Chen, and **S.T. Wu**, *Emerging Liquid Crystal Displays Based on the Kerr Effect*, *Mol. Cryst. Liq. Cryst.* 527, pp. 30-42 (2010).
- L. Rao, Z. Ge, and **S.T. Wu**, *Viewing Angle Controllable Displays with a Blue-Phase Liquid Crystal Cell*, *Optics Express* 18, pp. 3143-3148 (2010).
- L. Rao, Z. Ge, and **S.T. Wu**, *Zigzag Electrodes for Suppressing the Color Shift of Kerr Effect-Based Liquid Crystal Displays*, *Journal of Display Technology* 6, pp. 115-120 (2010).
- H. Shirvani-Mahdavi, E. Mohajerani, and **S.T. Wu**, *Circularly Polarized High-Efficiency Cholesteric Liquid Crystal Lasers with A Tunable Nematic Phase Retarder*, *Optics Express* 18, pp. 5021-5027 (2010).
- H. Ren, S. Xu, and **S.T. Wu**, *Deformable Liquid Droplets for Optical Beam Control*, *Optics Express* 18, pp. 11904-11910 (2010).
- H. Ren, S. Xu, and **S.T. Wu**, *Effects of Gravity on the Shape of Liquid Droplets*, *Optics Communications* 283, pp. 3255-3258 (2010).
- J. Yan, H.C. Cheng, S. Gauza, Y. Li, M. Jiao, L. Rao, and **S.T. Wu**, *Extended Kerr Effect of Polymer-Stabilized Blue-Phase Liquid Crystals*, *Applied Physics Letters* 96, 071105 (2010).
- H.C. Cheng, I. Ben-David, and **S.T. Wu**, *Five-Primary-Color LCDs*, *Journal Display Technology* 6, pp. 3-7 (2010).
- S. Yoon, M. Kim, M.S. Kim, B.G. Kang, M.K. Kim, A.K. Srivastava, S.H. Lee, Z. Ge, L. Rao, S. Gauza, and **S.T. Wu**, *Optimization of Electrode Structure to Improve the Electro-Optic Characteristics of Liquid Crystal Display Based on Kerr Effect*, *Liquid Crystal* 37, pp. 201-208 (2010).
- M. Jiao, Y. Li, and **S.T. Wu**, *Low Voltage and High Transmittance Blue-Phase Liquid Crystal Displays with Corrugated Electrodes*, *Applied Physics Letters* 96, 011102 (2010).
- M. Jiao and **S.T. Wu**, *Sunlight Readable Fast-Response Transflective LCDs by Horizontal Electric Fields*, *Journal of Display Technology* 6, pp. 163-165 (2010).
- Y. Li, M. Jiao, and **S.T. Wu**, *Transflective Display Using a Polymer-Stabilized Blue-Phase Liquid Crystal*, *Optical Express* 18, pp. 16486-16491 (2010).
- L. Rao, H.C. Cheng, and **S.T. Wu**, *Low Voltage Blue-Phase LCDs with Double-Penetrating Fringe Fields*, *Journal Display Technology* 6, pp. 287-289 (2010).
- Y. Huang and **S. T. Wu**, *Multi-Wavelength Laser from Dye-Doped Cholesteric Polymer Films*, *Optics Express* 18, pp. 27697-27702 (2010).
- H. Ren and **S.T. Wu**, *Optical Switch Using a Deformable Liquid Droplet*, *Optics Letters* 35, pp. 3826-3828 (2010).
- L. Rao, J. Yan, and **S.T. Wu**, *Prospects of Emerging Polymer-Stabilized Blue-Phase Liquid Crystal Displays*, *The Journal of the Society for Information Display* 18, pp. 954-959 (2010).
- Q. Song, S. Gauza, H. Xianyu, **S.T. Wu**, Y.M. Liao, C.Y. Chang, and C.S. Hsu, *High Birefringence Lateral Difluoro Phenyl Tolane Liquid Crystals*, *Liquid Crystals* 37, pp. 139-147 (2010).

---

**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

**D.N. Christodoulides**, *Airy Beams and Optical Bullets*, Electromagnetics Meeting-AFOSR 2010, January 5-7, San Antonio, Texas (2010).

A. Salandrino and **D.N. Christodoulides**, *Airy Plasmon: A Non-Diffracting Surface Wave*, QMD2, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

H. Ren, A. Salandrino, G. Siviloglou, and **D.N. Christodoulides**, *Anomalous Optical Force Fields Around High-Contrast Subwavelength Nanowaveguides*, QMA4, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

**D.N. Christodoulides**, *Conical Optical Waves*, Nonlinear Optics AFOSR Conference, September 21-23, Albuquerque, New Mexico (2010).

D. Duchesne, K.A. Rutkowska, M. Volatier, F. Légaré, S. Delprat, M. Chaker, D. Modotto, A. Locatelli, C. De Angelis, M. Sorel, **D.N. Christodoulides**, G. Salamo, R. Arès, V. Aimez and R. Morandotti, *Continuous Wave Second Harmonic Generation in Ultra-Compact AlGaAs Photonic Wire Waveguides*, postdeadline paper, Nonlinear Photonics, June 21-24, Karlsruhe, Germany (2010).

**D.N. Christodoulides**, *Discrete Linear and Nonlinear Optics*, Nonlinear Waves-Theory and Applications, June 26-29, Beijing, China (2010).

A. Chong, W.H. Renninger, F.W. Wise, **D.N. Christodoulides**, *Experimental Demonstration of Airy-Bessel 3D Linear Light Bullets*, CMU1, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

D. Duchesne, K. Rutkowska, M. Volatier, F. Legare, S. Delprat, M. Chaker, D. Modotto, A. Locatelli, C. De Angelis, **D.N. Christodoulides**, M. Sorel, G. J. Salamo, R. Ares, V. Aimez, R. Morandotti, *Integrated, Continuous Wave Second Harmonic Source Using AlGaAs Photonic Wire Waveguides*, FThA3, Frontiers in Optics 2010, October 24-28, Rochester, New York (2010).

H. Ramezani, T. Kottos, R. El-Ganainy, **D.N. Christodoulides**, *Nonlinear PT-Symmetric Optical Diode*, FWG4, Frontiers in Optics 2010, October 24-28, Rochester, New York (2010).

T. Eichelkraut, G. Siviloglou, **D. N. Christodoulides**, and I. Besieris, *Oblique Airy Wavepackets in Bidispersive Optical Media*, QWA3, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

**D.N. Christodoulides**, *Optical Airy Beams and Bullets*, The 2nd International Workshop on Nonlinear Optics and Novel Phenomena, TEDA Applied Physics School, June 30-July 1, 2010, Nankai, China (Invited) (2010).

**D.N. Christodoulides**, *Optical Airy Beams and Bullets*, Summer Topicals 2010, IEEE Photonics Society, July 19-21, Playa del Carmen, Riviera Maya, Mexico (Invited) (2010).

**D.N. Christodoulides**, *Optical Airy Beams and Bullets*, COFIL 2010, 3rd International Symposium on Filamentation, May 31-June 5, Crete, Greece (Invited) (2010).

**D.N. Christodoulides**, *Optical Nonlinearities of Dielectric Nano-Suspensions and Optical Airy beams*, Lecture Series, Photonics Workshop 2010, Cancun-Mexico, July 11-18 (2010).

G. Siviloglou, N. Efremidis, P. Polynkin, J. V. Moloney, and **D.N. Christodoulides**, *Optical Linear Bullets with Hydrogen-Like Symmetries*, QMA3, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

R. El-Ganainy, **D.N. Christodoulides**, C. Ruter, and D. Kip, *Resonant Delocalization of Light in Engineered Bloch Waveguide Arrays*, QMC4, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

Q. Chao, D. Hudson, N. Kutz, **D.N. Christodoulides**, R. Morandotti, S. Cundiff, *Spectral Phase Clamping in Waveguide Arrays*, QWE6, CLEO/QELS 2010, May 16-June 21, San Jose, California (2010).

N.K. Efremidis, P. Zhang, Z. Chen, **D.N. Christodoulides**, C. Ruter, D. Kip, *Wave Propagation in Waveguide Arrays With Alternating Positive And Negative Couplings*, NThB7, Nonlinear Photonics, Karlsruhe, Germany, June 21-24 (2010).

I. Ozdur, J. Davila-Rodriguez, M. Mandridis, and **P.J. Delfyett**, *Coupled Optoelectronic Oscillator with 1000 Finesse Intracavity Etalon*, Proceedings of the SPIE, 2011 (2010).

D. Mandridis, I. Ozdur, M. Akbulut, and **P. J. Delfyett**, *A Photonic Method for Overcoming the Mode Partition Noise Contribution in the AM Noise Spectra of Periodic Electrical Signals*, Conference on Lasers and Electro-Optics (CLEO) and Quantum Electronics and Laser Science Conference (QELS), pp. 1-2. (2010).



- I. Ozdur, M. Akbulut, N. Hoghooghi, D. Mandridis, M.U. Piracha, and **P.J. Delfyett**, *An Etalon Based Optoelectronic Oscillator*, Conference on Lasers and Electro-Optics (CLEO) (2010).
- N. Hoghooghi, I. Ozdur, M. Akbulut, **P.J. Delfyett**, *Direct Phase Detection Technique Using an Injection-Locked VCSEL*, Conference on Lasers and Electro-Optics (CLEO) and Quantum Electronics and Laser Science Conference (QELS), San Jose, CA, May (2010).
- J. Davila-Rodriguez, C. Williams, M. Akbulut, and **P.J. Delfyett**, *Multi-Heterodyne Characterization of Multi-Gigahertz Spaced Optical Frequency Comb Sources*, Conference on Lasers and Electro-Optics, OSA Technical Digest (CD), Optical Society of America (2010).
- S. Bhooplapur, M. Akbulut, F. Quinlan, and **P.J. Delfyett**, *Pattern Recognition of Electronic Bit-Sequences Using a Semiconductor Mode-Locked Laser and Spatial Light Modulators*, Enabling Photonics Technologies for Defense, Security, and Aerospace Applications VI, SPIE, pp. 770003-770009 (2010).
- M. Bagnell, J. Davila-Rodriguez, A. Ardey, and **P.J. Delfyett**, *Femtosecond Dispersion Measurements of 1.3  $\mu\text{m}$  Quantum Dot Semiconductor Optical Amplifier*, Conference on Lasers and Electro-Optics, OSA Technical Digest (CD), Optical Society of America, 2010 (2010).
- M. Bagnell, J. Davila-Rodriguez, A. Ardey and **P.J. Delfyett**, *Group Delay Measurement of 1.3  $\mu\text{m}$  Quantum Dot Semiconductor Optical Amplifier Over 120 nm of Spectral Bandwidth*, Proc. SPIE 7700, 77000G, 10.1117/12.852732 (2010).
- D. Mandridis, M. Bagnell, I. Ozdur, and **P.J. Delfyett**, *High Precision Characterization of a High Finesse Fiberized Etalon*, IEEE PS Annual Meeting (2010).
- D. Mandridis, M. Bagnell, I. Ozdur, and **P.J. Delfyett**, *Measurement of the FSR of a High Finesse Etalon with 2.5 kHz Accuracy Using a Narrow-Linewidth Frequency Swept Laser*, Conference on Lasers and Electro-Optics (CLEO) and Quantum Electronics and Laser Science Conference (QELS) pp. 1-2. (2010).
- D. Mandridis, M. Bagnell, I. Ozdur, and **P.J. Delfyett**, *Supermode Noise Spur Suppression and Frequency Comb Generation in a 100 MHz Semiconductor-Based Theta Cavity Laser Using an Intra-Cavity Fabry-Perot Etalon*, Conference on Lasers and Electro-Optics (CLEO) and Quantum Electronics and Laser Science Conference (QELS), pp. 1-2. (2010).
- D. Nguyen, U. Piracha, **P.J. Delfyett**, *Time Domain Parabolic Pulse Creation of Ultrafast Chirped Pulses*, SPIE Defense, Security and Sensing 2010, pp. 7700-7718 (2010).
- D. Mandridis, I. Ozdur, C. Williams, and **P.J. Delfyett**, *100 MHz Chirped Pulse and Frequency Comb Laser Source Using an Intra-Cavity Etalon and Long-Term Stabilization*, IEEE PS Annual Meeting (2010).
- G. Zhao, A. Demir, S. Freisem, and **D.G. Deppe**, *Lithographic and Oxide-Free Vertical Cavity Surface Emitting Lasers*, Photonics North 2010, Niagara Falls, Canada, June 1-3 (2010).
- A. Demir, G. Zhao, G. Ozgur, S. Freisem, and **D.G. Deppe**, *Oxide Free Vertical Cavity Surface Emitting Lasers*, Conference on Lasers and Electro-Optics (2010).
- D.G. Deppe**, A. Demir, S. Freisem, G. Ogur, G. Zhou, and K. Shavritranuruk, *Threshold, Electronic Confinement, and Internal Loss Characteristics of Quantum Dot Lasers: Prospects for Continued Performance Improvement*, SPIE Photonics West 2010, San Francisco, January 23-28 (Invited) (2010).
- D. Haefner, S. Sukhov, J. Bae, **A. Dogariu**, D. Ma, and D. Carter, *Optical Properties of Diffuse Coatings under Partially Coherent Illumination*, TAPPI, Munich, October (2010).
- D. Haefner, S. Sukhov, J. Bae, **A. Dogariu**, D. Ma, D. Carter, *Properties of Diffuse Coatings under Partially Coherent Illumination*, TAPPI, Munich, October (2010).
- T. Kohlgraf-Owens, **A. Dogariu**, D. Ma, and D. Carter, *Understanding the Particle Size/Shape Ambiguity and its Impact on Optical Responses of Particulate Composites*, TAPPI, Munich, October (2010).
- O. Lopatiuk-Tirpak, and **S. Fathpour**, *Effects of the Substrate on the Optical Properties of Plasmonic Subwavelength Apertures*, Conference on Lasers and Electro-Optics, IEEE CLEO, CFM6, San Jose, CA, May (2010).
- S. Khan and **S. Fathpour**, *Electronically Tunable Silicon Photonic Delay Lines*, 23rd IEEE Photonics Society Annual Meeting, Paper TuP4, Denver, CO, October (2010).
- B. Jalali, D. Solli, P. Koonath, D. Borlaug, and **S. Fathpour**, *Noise, Broadband Gain, Inverse Stimulated Scattering, and Extreme Value Fluctuations; Recent Developments in Silicon Raman Amplifiers*, Frontiers in Optics (FIO) FTuC1, Rochester, NY, October (2010).

- D.R. Drachenberg, O.G. Andrusyak, I. Cohanoschi, I. Divliansky, O. Mokhun, A. Podvyaznyy, V.I. Smirnov, G.B. Venus, and **L.B. Glebov**, *Thermal Tuning of Volume Bragg Gratings for High Power Spectral Beam Combining*, SPIE Photonics West 2010, Proc. SPIE 7580, 75801U (2010).
- S. Mokhov, **L.B. Glebov**, J. Lumeau, V. Smirnov, and **B. Zeldovich**, *Optical Resonant Cavities in Volume Bragg Gratings*, X29.00006 in APS March Meeting, Portland, OR, March 15–19 (2010).
- L.A. Padilha, G. Nootz, S. Webster, **D.J. Hagan**, **E. W. Van Stryland**, Larissa Levina, Vlad Sukhovatkin, and Edward H. Sargent, *Two-Photon Absorption and Multi-Exciton Generation in Lead Salt Quantum Dots*, Proc. SPIE 7600, 760008 (2010).
- D. Martinez-Galarce, **J. E. Harvey**, M. Bruner, J. Lemen, E. Gullikson, R. Soufli, E. Prast and S. Khatri, *A Novel Forward-Model Technique for Estimating EUV Imaging Performance: Design and Analysis of the SUVI Telescope*, SPIE's International Symposium on Astronomical Instrumentation, San Diego, CA, June; published as Proc. SPIE 7732 773237 July 1-21 (2010).
- J. K. Lentz and **J. E. Harvey**, *Focal Length Invariance of Perceptual Image Quality for Long Range Imaging Applications*, OSA Topical Meeting on Imaging Systems (IS); Part of Imaging and Applied Optics (IAO), Tucson, AZ, June 7-10, Summary published in Conference Proceedings (2010).
- N. Choi, **J.E. Harvey** and A. Krywonos, *New Capabilities for Predicting Image Degradation from Optical Surface Metrology Data*, SPIE's International Symposium on Optics and Photonics, San Diego, CA, August (2010).
- J. K. Lentz, **J. E. Harvey**, K. H. Marshall, J. Salg and J. B. Houston, Jr., *Perceptual Image Quality and Telescope Performance Ranking*, SPIE's International Symposium on Optics and Photonics, San Diego, CA, Published as Proc. SPIE 7786 77860D pp. 1-9, August (2010).
- G. C. Curatu and **J. E. Harvey**, *Performance Analysis of a High-resolution, Wide-angle Foveated Optical System*, SPIE's International Symposium on Defense, Security & Sensing, Orlando, FL, published in Proc. SPIE 7682-23, April (2010).
- J. E. Harvey**, N. Choi, A. Krywonos and G. Peterson, *Predicting Image Degradation from Optical Surface Metrology Data*, OSA's Topical Meeting on Optical Fabrication and Testing (OF&T), Jackson Hole, WY, June 14, Summary published in Conference Digest (2010).
- J. E. Harvey**, N. Choi, A. Krywonos, S. Schroder and D. H. Penalver, *Scattering from Moderately Rough Interfaces between Two Arbitrary Media*, SPIE's International Symposium on Optics and Photonics, San Diego, CA, August, Proc. SPIE 7794 77940V, pp. 1-11 (2010).
- S. Schröder, A. Duparré, K. Fuchsels, N. Kaiser, A. Tünnermann, **J. E. Harvey**, *Scattering of Roughened TCO Films—Modeling and Measurement*, OSA Topical Meeting on Optical Interference Coatings, Tucson, AZ, June 7-9, Summary to be published in Conference Proceedings. (2010).
- G. Lim, T. Manzur and **A. Kar**, *Development of Wireless Gas Detector by Laser Doing Technique in Silicon Carbide*, SPIE Europe Remote Sensing, Toulouse, France, September 20-23 (2010).
- G. Lim, T. Manzur and **A. Kar**, *Effect of Laser Irradiation Passes for Fabricating Mid-Wave Infrared Silicon Carbide Detectors*, 29th International Congress on Applications of Lasers and Electro-Optics, September 26-30, Anaheim, CA, Best Student Paper Award (2010).
- G. Lim, T. Manzur and **A. Kar**, *Uncooled MWIR Photodetector Depend on Gallium Concentration of Laser-Doped Silicon Carbide*, SPIE Europe Remote Sensing, Toulouse, France, September 20-23 (2010).
- G. Lim and **A. Kar**, *Wireless Chemical Sensor for Combustion Species at High Temperatures using 4H-SiC*, The 34th ICACC (International Conference on Advanced Ceramics and Composites) conference, January 24 – 29 (2010).
- C. N. Grabill, H. E. Williams, D. J. Freppon, C. J. Clukay, A. Dutta, H. Heinrich, **S. Kuebler**, *Chemical and physical parameters for controlling the nanoscale morphology of electrolessly deposited meta.*, Florida Inorganic and Materials Symposium, Univ. of Florida, Gainesville, October 1-2. (2010).
- G. Li**, *Coherent Free-Space Optical Communication Using Electronic Wavefront Correction*, OSA Winter Topical Meeting (Invited) (2010).
- G. Li**, *Digital Compensation of Fiber Nonlinearities*, OSA Annual Meeting (Invited Paper) (2010).
- G. Li**, *Needle-in-the-Haystack Secure Optical Communication*, SPIE Defense and Security (Invited) (2010).
- L. Zhu, E. Mateo and **G. Li**, *Nonlinearity Compensation for Raman-amplified Optical Transmission Systems*, Enabling Photonics Technologies for Defense, Security, and Aerospace Applications Conference (2010).

F. Yaman, X. Xie, T. Wang, and **G. Li**, *Silicon Photonic Crystal Fiber*, ECOC 2010 (Invited) (2010).

J.E. Antonio-Lopez, M. Torres-Cisneros, J.A. Arredondo-Lucio, J.J. Sanchez-Mondragon, **P.L. LiKamWa**, and D.A. May-Arrioja, *Novel Multimode Interference Liquid Level Sensors*, Proc. SPIE 7839, 78391V, 2nd Workshop on Specialty Optical Fibers and Their Applications (WSOF-2), October (2010).

V.I. Ruiz-Pérez, M.A. Basurto-Pensado, G. Urquiza-Beltrán, D.A. May-Arrioja, E. Gasca-Herrera, J. Javier Sanchez Mondragón, and **P.L. LiKamWa**, *Optical Fiber Sensor for Pressure Based on Multimode Interference as Sensitive Element*, Conference Paper, Latin America Optics and Photonics Conference (LAOP) (2010).

J.E. Antonio-Lopez, I. Hernandez-Romano, D.A.M. Arrioja, J.J. Sanchez-Mondragon, **P.L. LiKamWa**, *Optofluidically Tunable Multimode Interference Erbium Doped Fiber Laser*, Proceeding of IEEE Photonics Society Summer Topical Meeting Series, pp. 80-81 (2010).

**N.A. Riza** and P.J. Marraccini, *Broadband Fiber-Optic 1x2 Switch Using an Electrically Controlled Liquid Lens*, Proc. SPIE 7675 Session: Photonics in the Transportation Industry: Auto to AeroSpace III (2010).

M. Sheikh, P. Marraccini, and **N.A. Riza**, *Laser Beam Characterization Using Agile Digital-Analog Photonics*, Proc. SPIE 7675 Session: Photonics in the Transportation Industry: Auto to AeroSpace III (2010).

**N.A. Riza**, *Advances in Hybrid Wireless-Wired Optics Physical Sensors for Extreme Environments*, SPIE Proc., Optical Sensing V Conference, Editors: F. Berghmans, A. G. Mignani, and C. A. van Hoof, SPIE International Photonics Europe Congress, Brussels, Belgium, April (Invited) (2010).

**N.A. Riza** and S.A. Reza, *Non-Contact Opto-Fluidics-based Liquid Level Sensor for Harsh Environments*, SPIE Conf. on Photonics in the Transportation Industry: Auto to Aerospace III, Editors: A. Kazemi and B. C. Kress, SPIE Defense Security and Sensing, 7675(2), April (2010).

N. Mohan, I. Stojanovic, W. C. Karl, **B.E.A. Saleh**, and M. C. Teich, *Compressed Sensing in Optical Coherence Tomography*, Proc. SPIE 7570 (Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing), edited by J.-A. Conchello, C. J. Cogswell, T. Wilson, and T. G. Brown, 75700L (2010).

**B.E.A. Saleh**, *Entangled Qubits in Photonic Spatial Parity Space for Digital Quantum Imaging*, SPIE

Optics and Photonics Conference, San Diego, CA (Invited) (2010).

M.F. Saleh, **B.E.A. Saleh**, and M.C. Teich, *Photonic Circuits for Quantum Information Processing in Two-Mode Integrated Diffused-Channel Waveguides*, Frontiers in Optics/Laser Science XXV Conference, Rochester, NY (2010).

J.W. Mares, C.R. Boutwell, A. Scheurer, M. Falanga, and **W.V. Schoenfeld**, *Cubic ZnMg1-xO and NiMg1-xO Thin Films Grown by Molecular Beam Epitaxy for Deep-UV Optoelectronic Applications*, Oxide-based Materials and Devices, SPIE Photonics West. vol. 7603, F. H. Teherani, D. C. Look, C. W. Litton, and D. J. Rogers, Eds. San Francisco, CA, SPIE, 76031B (Invited) (2010).

J.W. Mares, C.R. Boutwell, A. Scheurer, and **W.V. Schoenfeld**, *Cubic ZnMg1-xO and NiMg1-yO Thin Films Grown by Molecular Beam Epitaxy for Deep-UV Optoelectronic Applications*, Enabling Photonics Technologies for Defense, Security, and Aerospace Applications VI, SPIE Security and Defense, Orlando, FL (Invited) (2010).

C. Mazuir, and **W.V. Schoenfeld**, *Critical Nanofabrication Parameters for the E-Beam Assisted Design of a Sub Wavelength Aluminum Mesh*, Proceedings of SPIE Photonics West 2010 (2010).

M.D. Weed, H.P. Seigneur, and **W.V. Schoenfeld**, *Optimization of Complete Band Gaps for Photonic Crystal Slabs Through Use of Symmetry Breaking Hole Shapes*, SPIE Photonics West Proceedings vol. 7223, San Francisco, CA, February (2010).

M.D. Weed, H.P. Seigneur, and **W.V. Schoenfeld**, *Cladding Index Engineering of the Photonic Properties of Single-Mode Photonic Crystal Devices*, SPIE OPTO Proceedings v. 7764, Nanoengineering: Fabrication, Properties, Optics, and Devices VII, August (2010).

L. Xiong, P. Hofmann, **A. Schülzgen**, N. Peyghambarian, and J. Albert, *Photo-Thermal Growth of Unsaturated and Saturated Bragg Gratings in Phosphate Glass Fibers*, OSA Topical Meeting: Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP), BTuB1, OSA Technical Digest (2010).

X. Zhu, **A. Schülzgen**, H. Li, J. V. Moloney, and N. Peyghambarian, *Gaussian Beam Shaping Based on Multimode Interference*, Proceedings SPIE 7579, 75790M-1 (2010).

**A. Schülzgen**, L. Li, X. Zhu, V. L. Temyanko, and N. Peyghambarian, *Micro and Nanostructure Induced Birefringence in Phosphate Glass*, CLEO/QELS 2010,

JTuD64, OSA Technical Digest (2010).

H. Gebavi, M. Taher, J. Losteau, D. Milanese, S. Taccheo, **A. Schülzgen**, M. Ferraris, and N. Peyghambarian, *Spectroscopy of Yb:Tm Doped Tellurite Glasses for Efficient Infrared Fiber Laser*, Proceedings SPIE 7598, 759820-1 (2010).

H. C. Cheng and **S. T. Wu**, *Color Breakup Suppression in Field-Sequential Five-Primary-Color LCDs*, SID Int. Symp. Digest Tech. Papers 41, pp. 152-154 (2010).

J. Sun, H. Xianyu, S. Gauza, and **S. T. Wu**, *High Birefringence Dual-frequency Liquid Crystals*, The SID International Symposium Digest of Technical Papers 41, pp. 1758-1761 (2010).

M. Jiao, Y. Li, and **S.T. Wu**, *Low Voltage and High Transmittance Polymer-Stabilized Blue-Phase LCDs*, SID Int. Symp. Digest Tech. Papers 41, pp. 167-169 (2010).

K.M. Chen, S. Gauza, H. Xianyu, and **S. T. Wu**, *Submillisecond Gray-to-Gray Response Time of Polymer-Stabilized Blue Phase Liquid Crystals*, The SID International Symposium Digest of Technical Papers 41, pp. 173-176 (2010).

S. Mokhov, M. SeGall, D. Ott, V. Rotar, J. Lumeau, **B. Zeldovich**, **L.B. Glebov**, *Direct Recording of Phase Plates in Holographic Material with Using Probabilistic Amplitude Masks*, JMA11 in Digital Holography Digital Holography and Three-Dimensional Imaging, Miami Beach, FL, April 12-14

(2010).

S. Mokhov, J. Lumeau, V. Smirnov, **B. Zeldovich**, and **L.B. Glebov**, *High-aperture Narrowband Filter Based on Moiré Principle*, 7598-28 in Photonics West, San Francisco, CA, January 23-28 (2010).

G.H. Yang, M. K. Kim, B. G. Kang, S. Yoon, M. S. Kim, M. Chae, S. H. Lee, L. Rao, and **S. T. Wu**, *Optimization of Electrode Shapes for High Performance Optically Isotropic Liquid Crystal Display*, SID International Symposium Digest of Technical Papers 41, pp. 170-172 (2010).

M. K. Kim, M. S. Kim, Y. J. Lim, M. Kim, B. G. Kang, S. Yoon, H. Ren, S. H. Lee, L. Rao, and S. T. Wu, *Viewing Angle Switchable LCD Based on Kerr Effect*, SID International Symposium Digest of Technical Papers 41, pp. 1705-1708 (2010).

---

## Presentations and Lectures

**A.F. Abouraddy**, *Fabrication and Applications of Multi-Material Fibers*, Harris Corporation, Melbourne, FL (Invited) (2010).

G. Tao, S. Shabahang, and **A.F. Abouraddy**, *Mid-Infrared Fibers for Nonlinear Applications*, Workshop on Next-Generation Optical Fiber Technology, Cocoa Beach, FL, October 18 (2010).

S. Shabahang, J. Kaufman, and **A.F. Abouraddy**, *Observation of the Rayleigh-Plateau Instability in the Core of a Multi-Material Optical Fiber During Tapering*, OSA FiO, Rochester, NY, October (2010).

**A.F. Abouraddy**, *Optoelectronic-Fiber Sensing and Imaging*, Image Fusion Workshop Day, Institute for Defense and Government Advancement (IDGA), Washington, DC (Invited) (2010).

J. Kaufman, E.H. Banaei, S. Shabahang, and **A.F.**

**Abouraddy**, *Polymer Fibers for Nano-particle Fabrication and Solar Energy Capture*, Workshop on Next-Generation Optical Fiber Technology, Cocoa Beach, FL, October 18 (2010).

**A.F. Abouraddy**, *Surprises in the Fabrication of Multi-Material Fibers*, Workshop on Next-Generation Optical Fiber Technology, Cocoa Beach, FL (Invited) (2010).

**G. Boreman**, B. Lail, P. Krenz, R. Olmon, and M. Raschke, *Near-Field Imaging of Infrared Antennas*, OSA Imaging Conference, June 7-10, Tucson, AZ (Invited) (2010).

D. Bergstrom, I. Renhorn, T. Svensson, R. Persson, T. Hallberg, R. Lindell, and **G. Boreman**, *Noise Properties of a Corner-Cube Michelson Interferometer LWIR Hyperspectral Imager*, Proc

SPIE Vol. 7660, 76602F 1-8 (2010).

**G. Boreman**, J. Ginn, J. Gómez-Pedrero, and J. Alda, *Aberrations in Resonant Optical Elements*, RIAO/Optilas, September (Invited) (2010).

J. Alda, J. Ginn, and **G. Boreman**, *Infrared Focusing Mirror Based on Multilevel Reflectarray*, EUCAP, April 12-16 (Invited) (2010).

**G. Boreman** and D. Shelton, *Applications and Affects of Ceramic Thin Films in Infrared Metamaterials*, American Ceramic Society Annual Meeting, Lake Buena Vista, FL, January (Invited) (2010).

R. Olmon, P. Krenz, B. Lail, L. Saraf, **G. Boreman**, and M. Raschke, *Nano-Optical Vector Network Analyzer*, CFB4, CLEO (2010).

**Z. Chang**, *Attosecond MURI Program Overview*, Attosecond MURI Review, December 7, Orlando, FL (2010).

**Z. Chang**, *Attosecond Optics*, CREOL Industrial Affiliates Day, April 9, University of Central Florida (Invited) (2010).

H. Wang, M. Chini, S. Chen, and **Z. Chang**, *Attosecond XUV Transient Absorption Spectroscopy*, 37th International Conference on Vacuum Ultraviolet and X-ray Physics, Vancouver, Canada, July 11-16 (2010).

M. Chini, H. Wang, S. Chen, and **Z. Chang**, *Attosecond-Resolved Autoionization in Argon*, 37th International Conference on Vacuum Ultraviolet and X-ray Physics, Vancouver, Canada, July 11-16 (2010).

S.D. Khan, M. Chini, S. Gilbertson, and **Z. Chang**, *Characterization of Isolated Attosecond Pulses with Ultrabroad Bandwidth*, Snowmass Village, CO, July 18-23 (2010).

S. Gilbertson, M. Chini, S.D. Khan, Y. Wu, X. Feng, and **Z. Chang**, *Control of Electron Dynamics of Doubly Excited States from Isolated Attosecond Pulses*, Conference on Lasers and Electro-Optics Optics (CLEO), San Jose, CA (2010).

**Z. Chang**, *Double Optical Gating: An Easy Method for Generating Isolated Attosecond Pulses*, APS March Meeting, March 15-19, Portland, Oregon (Invited) (2010).

**Z. Chang**, *Generalized Double Optical Gating for Generating Isolated Attosecond Pulses*, The 5th International Symposium on Ultrafast Phenomena and Terahertz Waves, September 12-16, Xi'an, China (Invited) (2010).

**Z. Chang**, *Generalized Double Optical Gating for Generating Isolated Attosecond Pulses*, Canadian Association of Physicists Congress, June 7-11, University of Toronto, Canada. (Invited) (2010).

Y. Wu, S. Gilbertson, S.D. Khan, M. Chini, K. Zhao, X. Feng, and **Z. Chang**, *Isolated Attosecond Pulses Generated Directly from a Femtosecond Chirped Pulse Amplifier*, Annual meeting of the Conference on Lasers and Electro-Optics Optics (CLEO), San Jose, CA (2010).

Y. Wu, S. Gilbertson, S. Khan M. Chini, K. Zhao X. Feng, and **Z. Chang**, *Isolated Attosecond Pulses Generated Directly from a Femtosecond Chirped Pulse Amplifier*, DAMOP, May 25-29, Houston, Texas. (2010).

Q. Zhang, K. Zhao, and **Z. Chang**, *Magnetic-Bottle Electron Spectrometer for Measuring 25 as Pulses*, DAMOP, May 25-29, Houston, Texas. (2010).

M. Chini, S. Gilbertson, S. Khan, and **Z. Chang**, *Michael OPTICAL: A New Method for Characterizing Ultra-Broadband Isolated Attosecond Pulses*, DAMOP, May 25-29, Houston, Texas. (2010).

**Z. Chang**, *Probing Autoionization Using Isolated Attosecond Pulses Generated with DOG*, X-ray Science in the 21st Century: August 2-6, Santa Barbara, CA (Invited) (2010).

**Z. Chang**, *Probing Correlated Electron Dynamics with Isolated Attosecond Pulses*, WE-Heraeus Seminar on Ultra fast Atomic Physics - Towards the Zeptosecond Regime, August 19-22, The Physikzentrum Bad Honnef, Germany (Invited) (2010).

**Z. Chang**, *Probing Two-Electron Dynamics In Helium With Isolated Attosecond Pulses*, DAMOP, May 25-29, Houston, Texas. (Invited) (2010).

S. Chen, Q. Zhang, K. Zhao, M. Chini, and **Z. Chang**, *ShoGeneration of Phase-Matched 20-25eV Single Attosecond Pulse by Double Optical Gating*, DAMOP, May 25-29, Houston, Texas (2010).

S. Chen, M. Chini, H. Wang, C. Yun, H. Mashiko, Y. Wu, and **Z. Chang**, *Stabilizing the Carrier-envelope Phase of a 30 fs, 1 kHz, 6 mJ Ti: Sapphire Regenerative Amplifier*, Conference on Lasers and Electro-Optics Optics (CLEO), San Jose, CA (2010).

**Z. Chang**, *XUV Time-Domain Spectroscopy Using Isolated Attosecond Pulses from Double Optical Gating*, OSA Annual Meeting, October 24-28, Rochester, NY (Invited) (2010).

**D.N. Christodoulides**, *Optical Airy Beams and*



Bullets, Dept. of Mathematics, US Naval Academy, Annapolis, October 14 (2010).

**D.N. Christodoulides**, *Optical Nonlinear Response of Colloidal Nano-Suspensions*, Department of Electrical Engineering, Florida State University, November 9 (2010).

N. Hoghooghi, I. Ozdur, M. Akbulut, and **P.J. Delfyett**, *Direct Phase Detection Technique Using an Injection-Locked VCSEL*, Conference on Laser Electro-Optics: Applications, OSA Technical Digest (CD), Optical Society of America (2010).

J. Davila-Rodriguez, C. Williams, M. Akbulut, and **P.J. Delfyett**, *Multi-heterodyne Characterization of Multi-Gigahertz Spaced Optical Frequency Comb Sources*, Conference on Lasers and Electro-Optics, OSA Technical Digest (CD), Optical Society of America (2010).

J. Davila-Rodriguez, M. Akbulut, C. Williams, and **P.J. Delfyett**, *Multi-Heterodyne Mixing of Frequency Stabilized Combs for Ultrafast Coherent Signal Processing*, SPIE Defense, Security and Sensing 2010, pp. 7700-7703 (2010).

I. Ozdur, M.U. Piracha, D. Mandridis, M. Akbulut, N. Hoghooghi, and **P.J. Delfyett**, *Optical Frequency Stability Measurement based on an Etalon Reference*, Conference on Lasers and Electro-Optics (CLEO) (2010).

S. Bhooplapur, M. Akbulut, F. Quinlan, and **P. J. Delfyett**, *Pattern Recognition of Electronic Bit-Sequences using A Semiconductor Mode-Locked Laser and Spatial Light Modulators*, Enabling Photonics Technologies for Defense, Security, and Aerospace Applications VI, (SPIE) pp. 770003-770009 (2010).

**P.J. Delfyett**, I. Ozdur, M. Akbulut, J. Davila-Rodriguez, *Stabilized Mode-Locked Diode Lasers & Applications*, Fiber Workshop Cocoa Beach (Invited) (2010).

M. Bagnell, J. Davila-Rodriguez, A. Ardey, **P.J. Delfyett**, *Group Delay Measurement of 1.3- $\mu$ m Quantum Dot Semiconductor Optical Amplifier Over 120 nm of Spectral Bandwidth*, SPIE Defense, Security and Sensing 2010, pp. 7700-7715 (2010).

D. Mandridis, M. Bagnell, I. Ozdur, and **P.J. Delfyett**, *High Precision Characterization of a High Finesse Fiberized Etalon*, IEEE PS Annual Meeting (2010).

K.M. Douglass, G. Biener, S. Sukhov, *Rotational Stochastic Resonance*, CLEO/IQEC, San Jose (2010).

D. Mandridis, I. Ozdur, C. Williams, and **P.J. Delfyett**, *100 MHz Chirped Pulse and Frequency*

*Comb Laser Source Using an Intracavity Etalon and Long Term Stabilization*, IEEE PS Annual Meeting (2010).

J. Davila-Rodriguez, I. Ozdur, C. Williams, and **P.J. Delfyett**, *A Frequency Stabilized Semiconductor Mode-locked Laser with a Phase Modulator and an Intra-cavity Etalon*, Conference on Lasers and Electro-Optics, OSA Technical Digest (CD), Optical Society of America (2010).

D. Mandridis, I. Ozdur, M. Akbulut and **P.J. Delfyett**, *A Photonic Method for Overcoming the Mode Partition Noise Contribution in the AM Noise Spectra of Periodic Electrical Signals*, Conference on Lasers and Electro-Optics (CLEO) and Quantum Electronics and Laser Science Conference (QELS), pp. 1-2 (2010).

**P.J. Delfyett**, *Academic Research with Industrial Partners - A Possible Model for Basic and Applied Research*, American Physical Society - Department Chairs Conference: Broadening Physics Career Paths: Industry, Education & Policy, June 11-13, The American Center for Physics College Park, Maryland (Invited) (2010).

**P.J. Delfyett**, *Academic Research with Industrial Partners - A Possible Model for Basic and Applied Research*, American Physical Society - Department Chairs Conference: Broadening Physics Career Paths: Industry, Education & Policy, June 11-13, The American Center for Physics College Park, Maryland (Invited) (2010).

I. Ozdur, M. Akbulut, N. Hoghooghi, D. Mandridis, M.U. Piracha, **P.J. Delfyett**, *An Etalon based Optoelectronic Oscillator*, Conference on Lasers and Electro-Optics (CLEO) (2010).

**P.J. Delfyett**, *Introduction to Optics (5 - 1 hour Lectures, with hands-on-demonstrations)*, NSF REU Program at CREOL (2010).

**P.J. Delfyett**, *Recent Advances in Semiconductor-Based Optical Frequency Comb Generation and Coherent Signal Processing Applications*, SPIE Defense, Security and Sensing 2010, Orlando, FL, pp. 7700-7717 (Keynote Presentation) (2010).

**P.J. Delfyett**, I. Ozdur, M. Akbulut, J. Davila-Rodriguez, *Stabilized Mode-Locked Diode Lasers & Applications*, OSA Latin America Optics and Photonics Congress, Recife, Brazil (Invited) (2010).

**P.J. Delfyett**, *Stabilized Optical Frequency Combs – Techniques and Applications*, NSBP Annual Meeting, Omni Shoreham Hotel, Washington DC, Feb 13 (Invited) (2010).

**P.J. Delfyett**, *Stabilized Ultrafast Mode-locked*

*Semiconductor Lasers - Applications*, Photonics Workshop, July 12-16, Cancun, Mexico (2010).

**P.J. Delfyett**, *Stabilized Ultrafast Mode-locked Semiconductor Lasers - Technologies*, Photonics 2010 Workshop, Cancun, Mexico, July 12-16 (2010).

**P.J. Delfyett**, *The Future of Semiconductor Lasers - The Quantum Dot Laser*, Photonics Workshop, July 12-16, Cancun, Mexico (2010).

I. Ozdur, D. Mandridis, N. Hoghooghi, and **P.J. Delfyett**, *Tunable Opto-Electronic Oscillator with an Intracavity Fabry-Perot Etalon*, IEEE PS Annual Meeting (2010).

**P.J. Delfyett**, *Ultrafast Coherent Optical Signal Processing using Stabilized Optical Frequency Combs from Mode-locked Semiconductor Diode Lasers*, Naval Air Weapons Center, China Lake, CA (Invited) (2010).

**P.J. Delfyett**, *Ultrafast Coherent Optical Signal Processing using Stabilized Optical Frequency Combs from Mode-locked Semiconductor Diode Lasers*, National Institute of Standards and Technology, Boulder, CO (Invited) (2010).

D. Nguyen, U. Piracha, **P.J. Delfyett**, *Time Domain Parabolic Pulse Creation of Ultrafast Chirped Pulses*, SPIE Defense, Security and Sensing 2010, pp. 7700-7718 (2010).

**D.G. Deppe**, *Lithographic VCSELs*, Lecture, Finisar, Allentown, TX, July 23 (2010).

**D.G. Deppe**, *New Technologies for RGB Light Emitters and VCSELs*, Lecture, Corning, Inc., Palo Alto, January 23 (2010).

**D.G. Deppe**, *Quantum Dot Lasers and Microcavity Technologies*, Faculty Seminar, University of Arkansas, Fayetteville, AR, September 25 (2010).

**A. Dogariu**, *Plenary lecture: Variable Coherence Sensing*, RIAO-OPTILAS, Lima, September (2010).

K.M. Douglass, T. Suezaki, S. John, and **A. Dogariu**, *Reflection of Subdiffusive Light from 3D Disordered Photonic Crystals*, CLEO/IQEC, San Jose (2010).

D. Haefner, S. Sukhov, and **A. Dogariu**, *Nonconservative Optical Torques*, CLEO/IQEC, San Jose (2010).

O. Lopatiuk-Tirpak, and **S. Fathpour**, *C-Shaped Subwavelength Apertures for Silicon Photonics Applications*, Conference on Integrated Photonics Research, Silicon and Nanophotonics (IPRSN),

ITuD3, Monterey, CA, July (2010).

O. Lopatiuk-Tirpak, and **S. Fathpour**, *Effects of the Substrate on the Optical Properties of Plasmonic Subwavelength Apertures*, Conference on Lasers and Electro-Optics, IEEE CLEO, CFM6, San Jose, CA, May (2010).

S. Khan and **S. Fathpour**, *Electronically Tunable Silicon Photonic Delay Lines*, 23rd IEEE Photonics Society Annual Meeting, Paper TuP4, Denver, CO, October (2010).

**S. Fathpour**, *Green Integrated Photonics*, SPIE Seminars, University of California, Berkeley, February (2010).

**S. Fathpour**, *Green Integrated Photonics*, ECE Department Seminar, Sharif University of Technology, Tehran, IR, July (2010).

**S. Fathpour**, *Green Integrated Photonics*, ECE Department Seminar, Tehran University, Tehran, IR, July (2010).

S. Fardad, L.A. Padilha, S. Webster, T. Ensley, R. Gvishi, N. Larina, V. Lokshin, V. Khodorkovsky, M. Sigalov, **D.J. Hagan**, and **E.W. Van Stryland**, *Förster Energy Transfer to a Spirooxazine Photochromic Molecule through One- and Two-Photon Absorption*, Quantum Electronics and Laser Science Conference (QELS) OSA Technical Digest (2010).

T. Ensley, D. Fishman, L. Padilha, S. Webster, **D. Hagan**, and **E.W. Van Stryland**, *Self-Trapping of Supercontinuum Generated by Femtosecond Pulses in a Noble Gas*, International Conference on Ultrafast Phenomena, OSA Technical Digest (CD) Optical Society of America (2010).

A. Painelli, F. Terenziani, O. Przhonska, H. Hu, **D.J. Hagan**, and **E.W. Van Stryland**, *Essential State Model for Polymethine Dyes: Symmetry Breaking and Spectra*, MOLMAT Conference, July 5-8, Montpellier, France (2010).

H. Hu, A. Gerasov, L. Padilha, O. Przhonska, S. Webster, M. Shandura, Y. Kovtun, A. Masunov, **D.J. Hagan**, and **E.W. Van Stryland**, *Two-Photon Absorption in Single Crystals of Cyanine-Like Dye*, Conference on Lasers and Electro-Optics, OSA Technical Digest (CD) Optical Society of America (2010).

D. Peceli, A.O. Gerasov, S. Webster, H. Hu, L. Padilha, V.V. Kurdyukov, Y.L. Slominsky, O.O. Viniychuk, A.D. Kachkovski, A.E. Masunov, O.V. Przhonska, **D.J. Hagan**, and **E.W. Van Stryland**, *Effective Generation of Triplet States and Singlet Oxygen by Sulfur-Containing Squaraines:*

*Experimental and Theoretical Study*, Conference on Lasers and Electro-Optics (CLEO) OSA Technical Digest (CD) (2010).

C.M. Cirloganu, L.A. Padilha, S. Webster, G. Nootz, **D.J. Hagan**, and **E.W. Van Stryland**, *Large Enhancement of Two-Photon Absorption in Semiconductors Using Highly Non-Degenerate Photons*, Conference on Lasers and Electro-Optics (CLEO), CFG6, OSA Technical Digest (CD) (2010).

C. Fuentes-Hernandez, J. Hsu, D.T. Owens, L.A. Padilha, J.M. Hales, S. Webster, S.R. Marder, J.W. Perry, **D.J. Hagan**, **E.W. Van Stryland**, and B. Kippelen, *Metal-Dielectric Multilayer Structures and their Applications in Nonlinear Optics*, 14th International conference on Laser Optics, St. Petersburg, Russia, June 28–July 2 (2010).

G. Nootz, L. Padilha, S. Webster, **D.J. Hagan**, **E.W. Van Stryland**, L. Levina, V. Sukhovatkin, and E. Sargent, *Nonlinear Optical Properties of PbS and PbSe Quantum Dots*, Optics and Photonics Congress: Nonlinear Photonics, OSA Technical Digest (CD), Optical Society of America, Karlsruhe, Germany June 21-24 (2010).

G. Nootz, L. Padilha, S. Webster, **D.J. Hagan**, **E.W. Van Stryland**, L. Levina, V. Sukhovatkin, and E. Sargent, *Resonance Enhancement of the Two-Photon Absorption in PbS Quantum Dots*, Frontiers in Optics, OSA Technical Digest (CD) Optical Society of America (2010).

L.A. Padilha, G. Nootz, S. Webster, **D.J. Hagan**, **E.W. Van Stryland**, L. Levina, V. Sukhovatkin, and E.H. Sargent, *Size-Dependence of Two-Photon Absorption and Multi-Exciton Generation in Lead Salt Quantum Dots*, 14th International conference on Laser Optics, St. Petersburg, Russia, June 28–July 2 (2010).

C. Cirloganu, P. Olszak, L. Padilha, S. Webster, **D.J. Hagan**, and **E.W. Van Stryland**, *Three-Photon Absorption In Semiconductors*, Laser Science, OSA Technical Digest (CD) Optical Society of America (2010).

**J.E. Harvey**, *A Global View of Diffraction and Surface Scatter Phenomena*, CREOL Faculty Highlights Seminar, University of Central Florida, Orlando, FL, April 23 (2010).

**J.E. Harvey**, *A Global View of Diffraction: Re-Visited*, Colloquium Talk at the Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany, March 10 (2010).

**J.E. Harvey**, *Deriving Optical Fabrication Tolerances to Meet Optical Performance Requirements: Beyond the Smooth Surface Limit*, TNT Symposium Series, Optics Branch, NASA Goddard

Space Flight Center (GSFC), Greenbelt, MD, December 9 (2010).

**J.E. Harvey**, *Deriving Optical Fabrication Tolerances to Meet Optical Performance Requirements: Beyond the Smooth Surface Limit*, Electro-Optics Technical Focus Group Meeting, Lockheed Martin Missiles & Fire Control, Orlando, FL, August 13 (2010).

**J.E. Harvey**, *Generalized Surface Scatter Theory for Moderately Rough Surfaces*, Colloquium talk at the Royal Institute of Technology, Stockholm, Sweden, March 16 (2010).

**J.E. Harvey**, *Predicting Image Degradation from Optical Surface Metrology Data*, Colloquium talk at the Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany, March 11 (2010).

**J.E. Harvey**, *Predicting Image Quality from Optical Surface Metrology Data: Plus—Generalizing Gary Peterson's Elegant Analytical Scatter Model*, Colloquium talk at Breault Research Organization, Tucson, AZ, January 7 (2010).

**P.G. Kik**, A. Ghoshal, M. Marquez, and M. Hu, *Metal Substrate Induced Control of Ag Nanoparticle Plasmon Resonances for Tunable SERS Substrates*, Fall MRS Meeting, Boston (2010).

**P.G. Kik**, A. Ghoshal, *Surface-coupled Metal Nanoparticle Arrays*, Fall MRS Meeting, Boston (Invited) (2010).

**P.G. Kik**, *Plasmon Enhanced Near - Field Interactions in Metallic Nanostructured and Devices*, SURFACE ANALYSIS 2010 Symposium of the Section of the American Vacuum Society, Orlando, FL (Invited) (2010).

**P.G. Kik**, *Plasmon Enhanced Nonlinear Absorption and Refraction*, Gordon Research Conference on Plasmonics, Waterville (2010).

**P.G. Kik**, *Plasmonics*, Photonics Workshop 2010, Cancun, Mexico (2010).

**P.G. Kik**, *Plasmonics for chemists*, UCF, two-hour guest lecture in course Chemistry of Materials (CHM 6711), Professor Kuebler (2010).

**P.G. Kik**, *Si Sensitization of Er-doped SiO<sub>2</sub> for Low Thermal Budget CMOS Compatible Sources Operating at 1.54  $\mu$ m*, Fall MRS Meeting, Boston (Invited) (2010).

**P.G. Kik**, *Silicon Compatible Rare-earth Doped Photonics*, Photonics Workshop 2010, Cancun,

Mexico (2010).

O. Savchyn, **P.G. Kik**, R.M. Todi, K.R. Coffey, L.K. Ono, B.Roldan Cuenya, *Demonstration of Excitation Wavelength Independent Concentration of Sensitized Er<sup>3+</sup> ions in as-deposited and Low-Temperature-Annealed Si-rich SiO<sub>2</sub> films*, SPIE Meeting, San Francisco, CA, pp. 7604-7610 (2010).

O. Savchyn, R.M. Todi, K.R. Coffey, L.K. Ono, B. Roldan Cuenya and **P.G. Kik**, *Excitation Wavelength-independent Sensitized Er<sup>3+</sup> Concentration in as-deposited and Low Temperature Annealed Si-rich SiO<sub>2</sub> Films*, Optoelectronics Industry Development Association (OIDA) meeting, Washington, DC (2010).

O. Savchyn, **P.G. Kik**, R.M. Todi, and K.R. Coffey, *Multi-level Sensitization of Er<sup>3+</sup> with Temperature-independent Internal Er<sup>3+</sup> Relaxation Efficiency in Si-rich SiO<sub>2</sub> Films*, Optoelectronics Industry Development Association (OIDA) meeting, Washington, DC (2010).

**S. Kuebler**, *Axial and transverse laser beam shaping using vector diffraction theory*, Invited talk presented to the Computational and Optical Sensing and Imaging (COSI) NSF-IGERT program, University of Colorado at Boulder, September 27 (2010).

M. A. Melino, H. E. Williams, D. J. Freppon, K. E. Lynch, T. G. Jabbour, R. C. Rumpf, **S. Kuebler**, *Fabrication of three dimensional photonic crystals on the end face of an optical fiber using direct laser writing*. Poster presented at Industrial Affiliates Day, CREOL, The College of Optics and Photonics, April 9 (2010).

C. A. Ament, T. G. Jabbour, **S. Kuebler**, *High numerical aperture axial and transverse beam shaping using diffractive optics*, Poster presented at Industrial Affiliates Day, CREOL, The College of Optics and Photonics, April 9 (2010).

C. A. Ament, T. G. Jabbour, **S. Kuebler**, *High numerical aperture axial and transverse beam shaping using diffractive optics*, Poster presented at the Showcase of Undergraduate Research 2010, UCF, April 1 (2010).

D. J. Freppon, M. Melino, H. E. Williams, **S. Kuebler**, *Optimization of SU-8 photoresist for fabrication of high-fidelity nanostructures using multi-photon direct laser writing*, Poster presented at the Showcase of Undergraduate Research 2010, UCF, April 1 (2010).

C. J. Clukay, D. J. Freppon, C. N. Grabill, A. Dutta, H. Heinrich, A. Robledo, A. Bhattacharya, **S. Kuebler**, *Studies toward the understanding and control of electroless deposition*, awarded 3rd prize in the poster contest. Poster presented at the Florida

Inorganic and Materials Symposium, Univ. of Florida, October 1-2 (2010).

D. J. Freppon, C. J. Clukay, C. N. Grabill, A. Dutta, H. Heinrich, A. Robledo, A. Bhattacharya, **S. Kuebler**, *Analysis of chemical systems used in controlled electroless deposition*. Poster presented at NanoFlorida 2010, UCF, September 25 (2010).

M. Hemmer, A. Vaupel, and **M.C. Richardson**, *A Compact Quasi-Single-Cycle, Phase Stabilized Laser System*, LEOS, Denver, CO, Volume 4, November 7-11 (2010).

**M.C. Richardson**, *A New Kid On The Block-The Thulium Fiber Laser*, Physics of Quantum Electronics Conference, Snowbird, UT, January, 40th Winter Colloquium on the Physics of Quantum Electronics (Invited) (2010).

C. Rinke, C.G. Brown, M. Baudelet, M. Sigman, and **M.C. Richardson**, *A New Paradigm for Substrate Independent Discrimination of Organic and Explosive Materials By Target Factor Analysis of Molecular Optical Signatures*, Chemical and Biological Defense Science and Technology Conference, Orlando, FL, November 15 (2010).

M. Weidman, M. Fisher, K. Lim, M. Baudelet, and **M.C. Richardson**, *Advanced LIBS Modalities for Stand-Off Detection of Explosive and Biological Threats*, 27th Army Science Conference, Orlando, FL, November 30 (2010).

**M.C. Richardson**, L. Shah, T.S. McComb, R.A. Sims, C. Willis, P. Kadwani, and V. Sudesh, *Advanced Tm:Fiber Laser Development*, DEPS Solid State Laser Technology Review, Bloomfield, CO, June (2010).

T.S. McComb, L. Shah, R.A. Sims, V. Sudesh, and **M.C. Richardson**, *Atmospheric Propagation Testing With A High-Power Tunable Thulium Fiber Laser System*, Photonics West LASE, San Francisco, CA, January 27 (2010).

Y. Liu, M. Baudelet, and **M.C. Richardson**, *Compact Laser-Based Spectroscopic Systems for Biological Analysis*, Chemical and Biological Defense Science and Technology Conference, Orlando, FL, November 15 (2010).

M. Hemmer, A. Vaupel, and **M.C. Richardson**, *Current Status Of The HERACLES, A Millijoule Level, Multi Khz, Few-Cycle, And CEP Stabilized OPCPA System*, Conference on Lasers and Electro-Optics (CLEO) San Jose, CA, May (2010).

**M.C. Richardson**, J. Ballato, and B.N. Samson, *Developments Of High Power Tm Fiber Lasers*, JTO Annual Presentation Review, Albuquerque, NM, June

(2010).

M. Wohlmuth, K. Altmann, M. Hemmer, M. Goehre, C. Pflaum, and **M.C. Richardson**, *Dynamic Multimode Analysis of High-Power Lasers with Super-Gaussian Beam Profile using Precombined Gaussian Modes*, Advanced Solid-State Photonics Topical Meeting, OSA, San Diego, CA, January 31-February 3 (2010).

Y. Liu, M. Baudelet, and **M.C. Richardson**, *Elemental Analysis on Ceramic and Soil Samples Using Microwave-Assisted Laser-Induced Breakdown Spectroscopy*, LIBS, Memphis, TN, September 16 (2010).

K. Lim, M. Baudelet, J. Eichenholz, and **M.C. Richardson**, *Far-UV LIBS for Biological And Organic Samples*, LIBS, Memphis TN, September 16 (2010).

J.Y. Choi, M. Ramme, T. Anderson, and **M.C. Richardson**, *Femtosecond Laser Written Embedded Diffractive Optical Elements And Their Applications*, Photonics West LASE, San Francisco, CA, January 26 (2010).

**M.C. Richardson**, M. Baudelet, and M. Sigman, *Fundamental Considerations for An Efficient Application Of LIBS In Forensics And Security*, LIBS, Memphis, TN, USA, September 14 (Invited) (2010).

M. Hemmer, and **M.C. Richardson**, *High Performances in Continuous-Wave and Q-Switch Operation of a Narrow Linewidth Nd:YVO4 Oscillator Using a Volume Bragg Grating*, Advanced Solid-State Photonics Topical Meeting, OSA, San Diego, CA, January 31-February 3 (2010).

M. Hemmer, A. Vaupel, and **M.C. Richardson**, *High Power, Quasi-Single Cycle Phase-Correlated Laser System for EUV And Attoscience Studies*, International Symposium on Ultra-fast Phenomena and Terahertz Waves, Xi'an, China, September 12-16 (Invited) (2010).

M. Hemmer, and **M.C. Richardson**, *High Repetition-Rate, Narrow Linewidth And Spatially Controlled Operation Of A Q-Switched Nd:YVO4 Laser*, SPIE Defense, Security, and Sensing (Orlando, FL, USA, 2009), April (2010).

L. Shah, C. Willis, T.S. McComb, R.A. Sims, V. Sudesh, and **M.C. Richardson**, *High-Energy Q-Switched Tm<sup>3+</sup>-Doped Polarization Maintaining Silica Fiber Laser*, Photonics West LASE, San Francisco, CA, January 25 (2010).

T.S. McComb, L. Shah, R. A. Sims, V. Sudesh, and **M.C. Richardson**, *High-Power Tunable Thulium Fiber Laser With Volume Bragg Grating Spectral*

*Control*, Photonics West LASE, San Francisco, CA, January 27 (2010).

M. Baudelet, L. Shah, and **M.C. Richardson**, *Laser-induced Breakdown Spectroscopy of Organic Materials with a Mid-IR Thulium-fiber-laser Nanosecond Pulse at 2  $\mu$ m*, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Orlando, FL, March 2 (2010).

K. Lim, Y. Liu, M. Baudelet, E. Slobodtchikov, P. Moulton, A. Miziolek, and **M.C. Richardson**, *LIBS of Biological Materials With A Compact Femtosecond System*, LIBS, Memphis, TN, September 15 (2010).

Y. Liu, M. Baudelet, and **M.C. Richardson**, *Microwave-Assisted Laser-Induced Breakdown Spectroscopy For Trace Detection In Soil And Food*, SPIE Defense, Security, and Sensing (Orlando, FL, USA, 2009), April 6 (2010).

Y. Liu, M. Baudelet and **M.C. Richardson**, *Microwave-Assisted LIBS: Extending the Laser Induced Plasma Lifetime for Trace Detection*, Pacificchem, Honolulu, HI, December 15-20 (2010).

M. Baudelet, Y. Liu, and **M.C. Richardson**, *Microwave-Assisted LIBS: Towards a New Tool for Trace Element Detection and Molecular Plasma Spectrochemistry*, Laser Application to Chemical Security and Environmental Analysis, OSA, San Diego, CA, February 3 (2010).

M. Baudelet, C. Willis, L. Shah, and **M.C. Richardson**, *Mid-IR Tm Fiber Laser For Laser-Induced Plasma Spectroscopy Of Organic And Biological Materials*, SPIE Defense, Security, and Sensing (Orlando, FL, USA, 2009), April 5 (2010).

Y. Liu, M. Baudelet, P.J. Dagdigian, and **M.C. Richardson**, *Molecular Emission Enhancement From Microwave-Assisted Laser-Induced Breakdown Spectroscopy*, LIBS, Memphis, TN, September 15 (2010).

Y. Liu, M. Baudelet, P.J. Dagdigian, and **M.C. Richardson**, *Molecular Emission Enhancement From Microwave-Assisted Laser-Induced Breakdown Spectroscopy on Alumina*, Winter Conference on Plasma Spectrochemistry, Fort Myers, FL, January 4-9 (2010).

OPCPA Amplifier System, M. Hemmer, A. Vaupel, B. Webb, and **M.C. Richardson**, *Multi-kHz, Multi-mJ, Phase Stabilized*, Proceedings of SPIE Photonics West - Lase, San Francisco, CA, vol. 7578, January 24-30 (2010).

M. Weidman, M. Baudelet, M. Sigman, P.J. Dagdigian, and **M.C. Richardson**, *Nd:YAG-CO2 Double-Pulse Laser Induced Breakdown Spectroscopy*



for *Explosive Detection*, Laser Application to Chemical Security and Environmental Analysis, OSA, San Diego, CA, February 3 (2010).

M. Weidman, M. Baudelet, M. Sigman, and **M.C. Richardson**, *Nd:YAG-CO<sub>2</sub> Double-Pulse Laser-Induced Breakdown Spectroscopy For Explosive Residues Detection*, SPIE Defense, Security, and Sensing (Orlando, FL, USA, 2009), 7 April (2010).

M. Weidman and M. Baudelet, Christina C. C. Willis, Lawrence Shah, **M.C. Richardson**, *Novel Laser Sources For LIBS: From Fiber Lasers, Self-Channeled Laser to Dual Pulse Configuration*, Pacificchem, Honolulu, HI, December 15-20 (2010).

M. Weidman, M. Baudelet, P.J. Dagdigian, M. Sigman, and **M.C. Richardson**, *Self-Channeled Laser-Induced Breakdown Spectroscopy For Detection Of Organic Compounds In Atmosphere Via Their Molecular Signature*, SPIE Defense, Security, and Sensing (Orlando, FL, USA, 2009), 7 April (2010).

M. Weidman, M. Baudelet, **M.C. Richardson**, and P.J. Dagdigian, *Spatial and Temporal Spectral Imaging Of Self-Channeled Laser-Induced Breakdown Spectroscopy On Carbon-Based Samples Molecular Chemistry In Air*, Pacificchem, Honolulu, HI, December 15-20 (2010).

M. Weidman, M. Baudelet, P.J. Dagdigian, and **M.C. Richardson**, *Spatial and Temporal Spectral Imaging of Self-Channeled Laser-Induced Breakdown Spectroscopy on Carbon-Based Samples: Thermochemistry leading to Molecular Formation in Air*, Winter Conference on Plasma Spectrochemistry, Fort Myers, FL, January 4-9 (2010).

R.A.Sims, C. Willis, P. Kadwani, T.S. McComb, L. Shah, V. Sudesh, Z. Roth, M. Poutous, E. Johnson, and **M.C. Richardson**, *Spectral Beam Combining Of Thulium Fiber Laser Systems*, Photonics West LASE, San Francisco, CA, January 28 (2010).

R.A. Sims, C. Willis, P. Kadwani, T.S. McComb, L. Shah, Vikas Sudesh, Z. Roth, M. Poutous, E. Johnson, and **M.C. Richardson**, *Spectral Beam Combining Tm Fiber Laser Systems*, Photonics West LASE (San Francisco, CA, USA), January 23-28 (2010).

R.A.Sims, T.Dax, Z. Roth, T.S. McComb, L. Shah, V. Sudesh, M. Poutous, E. Johnson, and **M.C. Richardson**, *Spectral Narrowing And Wavelength Stabilization Of Thulium Fiber Lasers Using Guided-Mode Resonance Filters*, Photonics West LASE (San Francisco, CA, USA), January 23-28 (2010).

M. Weidman, M. Baudelet, and **M.C. Richardson**, *Stand-Off Laser Sensing For Chemical and Biological Traces Detection*, Chemical and Biological Defense

Science and Technology Conference, Orlando, FL, November 15 (2010).

C.G. Brown, R. Kamtaprasad, M. Baudelet, M. Sigman, and **M.C. Richardson**, *Stoichiometric Study Of Organic Mass Limited Droplets*, LIBS, Memphis, TN, September 15 (2010).

M. Ramme, J.Y. Choi, T. Anderson, I. Mingareev, and **M.C. Richardson**, *Sub-Micron Machining Of Semiconductors*, Photonics West LASE, San Francisco, CA, January 26 (2010).

C. Rinke, C.G. Brown, D. Clark, M. Baudelet, **M. C. Richardson**, and M. Sigman, *Substrate Independent Discrimination of Organic and Explosive Materials Via Target Factor Analysis of Their Molecular Optical Signature*, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Orlando, FL, March 5 (2010).

M. Weidman, M. Baudelet, P.J. Dagdigian, and **M.C. Richardson**, *Temporally and Spatially Resolved Filament Induced Breakdown Spectroscopy of Carbon Based Samples*, LIBS, Memphis, TN, September 16 (2010).

**M.C. Richardson**, L. Sarger, (University of Bordeaux 1), S. Nolte (Friedrich Schiller University), K. Richardson (Clemson University), *The Atlantis-MILMI Program, International Masters Degree Program in Laser Materials Interaction*, ATLANTIS Projects Directors Conference, Bilateral Cooperation with Industrialised Countries Freie University, Henry Ford Building, Berlin, October 13-15 (2010).

**M.C. Richardson**, L. Sarger (University of Bordeaux 1), S. Nolte (Friedrich Schiller University), K. Richardson (Clemson University), *The Atlantis-MILMI Program, International Masters Degree Program in Laser Materials Interaction*, 23rd Annual Meeting of the IEEE Photonics Society Creative Teaching Methods Workshop Denver, Colorado, November 7-11 (2010).

M. Baudelet, C. Willis, L. Shah, and **M.C. Richardson**, *Tm-Fiber 2  $\mu$ m Laser for Laser-Induced Plasma Spectroscopy of Organic and Biological Materials*, Laser Application to Chemical Security and Environmental Analysis, OSA, San Diego, CA, February 3 (2010).

M. Baudelet, Y. Liu, and **M.C. Richardson**, *Trace Detection in Ceramics, Organic and Biological Samples by Microwave-assisted Laser-induced Plasma Spectroscopy*, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Orlando, FL, March 4 (2010).

M. Baudelet, Y. Liu, and **M.C. Richardson**, *Trace Detection in Ceramics, Organics, and Biological*

*Samples by Microwave Assisted Laser-Induced Breakdown Spectrometry*, Winter Conference on Plasma Spectrochemistry, Fort Myers, FL, January 4-9 (2010).

L. Sarger, B. Bousquet (University of Bordeaux1.) **M.C. Richardson** (UCF, Orlando, FL), K. Richardson (Clemson U. Clemson SC) S. Nolte (FSU, Jena), *Training in Entrepreneurship - A Pertinent Approach in Project Management for Graduate Students*, ATLANTIS Project Directors Conference, Bilateral Cooperation with Industrialised Countries Freie Universitiit Henry Ford Building, Berlin, October 13-15 (2010).

Nathan Bodnar, Julien Nil- lon, Eric Cormier and **M.C. Richardson**, *A Dual-pumping Geometry for Non-collinear Optical Parametric Amplification*, SYMPOSIUM ON UNDERGRADUATE RESEARCH, Division of Laser Science of A.P.S - LS XXVI - Rochester, NY October 25 (2010).

Rene Berlich, Jiyeon Choi, Mark Ramme, and **M.C. Richardson**, *A practical method to determine laser induced refractive index changes in transparent media using a Fourier approach*, 11th International Symposium on Laser Precision Manufacturing, (LPM 2010), Stuttgart, Germany June 7-10 (2010).

Jeffrey Chia, Pankaj Kadwani, Faleh Altal, Lawrence Shah, and **M.C. Richardson**, *Atmospheric Spectroscopy of 1.8-2.1  $\mu\text{m}$  Radiation using a Thulium-Doped Fiber System*, Symposium on Undergraduate Research, Division of Laser Science of A.P.S - LS XXVI Rochester, NY, October 25 (2010).

**M.C. Richardson**, *Chasing femtoseconds in the Ultrafast lane*, International Symposium on Chirped Pulse Amplification, Laval University, Quebec City, Canada, November 15-19 (2010).

**M.C. Richardson**, Jiyeon Choi, Mark Ramme, Troy Anderson, Rene Berlich, and Andrew Housman, *Femtosecond laser waveguide writing for customized micro optical elements*, 11th International Symposium on Laser Precision Manufacturing, (LPM 2010), Stuttgart, Germany June 7-10 (2010).

Danielle Simmons, Nathan Bodnar, Matthieu Baudelet, and **M.C. Richardson**, *Fourier Transform Infrared Spectroscopy*, Symposium on Undergraduate Research, Division of Laser Science of A.P.S - LS XXVI - Rochester, NY, October 25 (2010).

Lawrence Shah, Timothy R. McComb, R. Andrew Sims, Christina C.C. Willis, Pankaj Kadwani, Vikas Sudesh, and **M.C. Richardson**, *High Power Thulium Fiber Lasers*, International High Power Laser Ablation Conference, Taos, NM, April 18-22 (2010).

**M.C. Richardson**, Robert Bernath, Nicholas Barbieri,

and Jason Aspiosis, *Intense RF Emission from Filament Interaction*, 2010 DEPS Ultrashort Pulse Laser Workshop, June 13-16 (2010).

Amanda Webb, Jiyeon Choi, Mark Ramme, and **M.C. Richardson**, *Laser Induced Ag Nano-Clusters in Glass*, SYMPOSIUM ON UNDERGRADUATE RESEARCH, Division of Laser Science of A.P.S - LS XXVI , Rochester, NY, October 25 (2010).

**M.C. Richardson**, *Localized high power RF generation at large Distances using self-channeled laser beams*, National Consortium for MASINT Research (NCMR) Spring Technical Review, Maui, HI, March 30 – April 2, (2010).

**M.C. Richardson**, *Low temperature lasers plasmas - Conditions for LIBS sensing*, Workshop on LIBS and its Applications, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. April 27-29 (2010).

Mark Ramme, Jiyeon Choi, **M.C. Richardson**, Ilya Mingareev, Matthias Hermans, and Jens Gottmann, *Micro-processing of semiconductors using ultrafast laser radiation at 2  $\mu\text{m}$  wavelength*, 11th International Symposium on Laser Precision Manufacturing, (LPM 2010), Stuttgart, Germany June 7-10 (2010).

**M.C. Richardson**, Nicholas Barbieri, Matthew Weidman, Robert Bernath, Matthew Fisher, Matthieu Baudelet, **D.N. Christodoulides**, Eric Johnson, Menelaos Poutous, and Zachary Roth, *Multi-structured air filamentation and interaction investigations*, 2010 DEPS Ultrashort Pulse Laser Workshop, June 13-16 (2010).

**M.C. Richardson**, *New developments in Lasers - transparent ceramics*, Seminar presented to College of Ceramics, Alfred University, NYS, May 14 (2010).

**M.C. Richardson**, Lawrence Shah, Matthieu Baudelet, **D.N. Christodoulides**, and John Stryjewski, *New laser and long range optical technologies*, National Consortium for MASINT Research (NCMR) Spring Technical Review, Maui, HI, March 30 – April 2 (2010).

Christina C. C. Willis, L. Shah, **M.C. Richardson**, M. Weidman and M. Baudelet, *Novel Laser Sources For LIBS: From Fiber Lasers, Self-Channeled Laser to Dual Pulse Configuration*, Pacificchem, Honolulu, HI, December 15-20 (2010).

**M.C. Richardson**, *Pulsed lasers - An introduction to today's and tomorrow's lasers*, Workshop on LIBS and its Applications, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. April 27-29 (2010).

**M.C. Richardson**, *Pulsed lasers - An introduction to*

*today's and tomorrow's lasers*, Workshop on LIBS and its Applications, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. April 27-29 (2010).

**M.C. Richardson**, **M. Sigman**, and Matthieu Baudelet, *Standoff Detection of Trace Radio-Nuclides using New Laser Spectroscopy Techniques*, NNSA, University and Industry Technical Interchange (UITI2010) Review Meeting, Knoxville, Tennessee, December 7-9 (2010).

Caitlin Rinke, Christopher Brown, Douglas Clark, Matthieu Baudelet, **M.C. Richardson**, and Michael E. Sigman, *Substrate independent discrimination of organic and explosive materials via target factor analysis of their molecular optical signatures*, International Symposium on Spectral Sensing Research (ISSSR), Springfield, Missouri, June 21-24 (2010).

**M.C. Richardson** and Lawrence Shah, *The challenges ahead for high power fiber lasers*, Erlangen Graduate School in Advanced Optical Technologies (SAOT), Erlangen, Germany April 23-25 (2010).

**M.C. Richardson**, *The future for lasers, laser interaction with matter, and spectroscopic sensing*, Workshop on LIBS and its Applications, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. April 27-29 (2010).

**M.C. Richardson**, *The Townes Laser Institute at UCF And The Development Of Defense Laser Technologies*, Army Research Laboratories, Adelphi, MA, February 17 (2010).

C. Brown, M. Weidman, C. Rinke, D. Clark, M. Baudelet, **M. Sigman**, and **M.C. Richardson**, *Trace explosive detection by laser spectroscopy: from new laser excitation protocols for stand-off detection to substrate-independent data analysis*, TED Workshop (2010).

L. Sarger, **M.C. Richardson**, K. Richardson, S. Nolte, O. Fry and M. Catoire, *Training in Entrepreneurship - A pertinent approach in project management for Graduate students*, Project Directors Conference, Dept of Education (FIPSE)- EU Commission Meeting, Potsdam, Berlin, Germany, October 13-15 (2010).

**M.C. Richardson**, *Ultrafast laser materials processing*, Workshop on LIBS and its Applications, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. April 27-29 (2010).

**M.C. Richardson**, M. Ramme, J.Y. Choi, I. Mingreev, and **A. Kar**, *Ultrafast Laser Structuring of Materials*, 2nd International Conference on Laser and

Plasma Applications in Materials Science (LAPAMS'10), Algiers, November 29th - December 2nd (2010).

**N.A. Riza**, *Extreme Sensors*, Caltech (2010).

**N.A. Riza**, *Optical Sensors*, City Univ. London (2010).

**N.A. Riza**, *Robust Optical Sensors*, New Jersey Inst. of Tech (2010).

**B.E.A. Saleh**, *5th EOS Topical Meeting on Advanced Imaging Techniques (AIT 2010)*, Engelberg, Switzerland, Plenary Talk (2010).

**B.E.A. Saleh**, *My career in optics and Photonics*, Distinguished Speaker Honors Seminar, Burnett Honors College, February 23 (2010).

**B.E.A. Saleh**, *Entangled Qubits in Photonic Spatial Parity Space*, MITRE Seminar, Princeton University, April 12 (2010).

**B.E.A. Saleh**, *Celebrating the Graduation of the Center for Subsurfacing Sensing and Imaging*, CenSSIS, Boston, April 14 (2010).

**B.E.A. Saleh**, *Quantum Imaging: An Overview*, Invited talk, BAE Systems, Massachusetts, May 10 (2010).

**B.E.A. Saleh**, *Technology Transfer and Commercialization at CREOL*, Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, May 16-21 (2010).

**B.E.A. Saleh**, *On the Limits of Optics and Photonics*, University of Illinois, Urbana-Champaign, June 3 (2010).

**B.E.A. Saleh**, *Subsurface Imaging, and Sensing*, Invited talk, Lockheed Martin, Orlando, October 22 (2010).

**B.E.A. Saleh**, *Research at CREOL, The College of Optics and Photonics*, Invited talk, Lockheed Martin, Orlando, October 22 (2010).

Scheurer, C. Boutwell, J. Mares, and **W.V. Schoenfeld**, *Cubic Oxide Semiconductors for Deep Ultraviolet Applications*, NSF Engineering Education Awardees Conference, Reston, VA, January (2010).

A. Scheurer, C. Boutwell, J. Mares, and **W.V. Schoenfeld**, *Cubic Oxide Semiconductors for Deep Ultraviolet Applications (FIRST PLACE AWARD - ENGINEERING)*, UCF, Showcase of Undergraduate Research Excellence (SURE), Orlando, FL, April

(2010).

A. Scheurer, C. Boutwell, J. Mares, and **W.V. Schoenfeld**, *Cubic Oxide Semiconductors for Deep Ultraviolet Applications (First Place Award - Undergraduate Presentation and Paper)*, IEEE SoutheastCon 2010 (IEEE Regional Conference), Charlotte, NC, March (2010).

A. Scheurer, C. Boutwell, J. Mares, and **W.V. Schoenfeld**, *Cubic Oxide Semiconductors for Deep Ultraviolet Applications (Third Place Award)*, SHPE National Conference, Cincinnati, OH, October (2010).

L. Xiong, P. Hofmann, **A. Schülzgen**, N. Peyghambarian, and J. Albert, *Photo-thermal Growth of Unsaturated and Saturated Bragg Gratings in Phosphate Glass Fibers*, OSA Topical Meeting: Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP) Karlsruhe, Germany (2010).

X. Zhu, **A. Schülzgen**, H. Li, L. Li, J. V. Moloney, and N. Peyghambarian, *Gaussian Beam Shaping Based on Multimode Interference*, Photonics West, San Francisco (2010).

**A. Schülzgen**, *Highly-Doped Phosphate Glasses for Novel Fiber Lasers*, Workshop on Next-Generation Optical Fiber Technology, Cocoa Beach, FL (2010).

**A. Schülzgen**, L. Li, X. Zhu, V. L. Temyanko, and N. Peyghambarian, *Micro and Nanostructure Induced Birefringence in Phosphate Glass*, CLEO/QELS 2010, San Jose (2010).

P. Hofmann, T. Wang, C. Jollivet, N. Peyghambarian, A. Pirson-Chavez, L. Xiong, A. Laronche, J. Albert, and **A. Schülzgen**, *Single Frequency All-Phosphate Fiber Laser Devices*, Workshop on Next-Generation Optical Fiber Technology, Cocoa Beach (2010).

H. Gebavi, M. Taher, J. Losteau, D. Milanese, S. Taccheo, **A. Schülzgen**, M. Ferraris, and N. Peyghambarian, *Spectroscopy of Yb:Yb Doped Tellurite Glasses for Efficient Infrared Fiber Laser*, Photonics West, San Francisco (2010).

**S.T. Wu**, *Blue-Phase Liquid Crystals Displays: Materials, Devices, and Applications*, One-day Training Course, AU Optronics, Hsinchu, Taiwan, December 13 (2010).

**S.T. Wu**, *Emerging Blue Phase LCDs*, FPD China, Shanghai, China: March 16-17, Plenary (2010).

**S. T. Wu**, *Emerging Blue-phase LCDs*, Seminar M1, 41st SID annual meeting, Seattle, Washington, May 24 (2010).

**S.T. Wu**, *Emerging Blue-Phase Liquid Crystal*

*Displays*, Taiwan Display Conference, Tainan, Taiwan, April 28-29 (Invited) (2010).

**S.T. Wu**, *Emerging LCDs based on the Kerr effect*, 23rd Int'l Liquid Crystal Conference, Krakow, Poland, July 11-16, Tutorial (2010).

**S.T. Wu**, *Liquid Crystal Displays*, Southeast University, Nanjing, China, March 18 (Invited) (2010).

**S.T. Wu**, *New Liquid Crystal Displays*, Hefei University of Science and Technology, Hefei, China, March 19 (Invited) (2010).

**S.T. Wu**, *Next-wave Liquid Crystal Displays*, Tsinghua University, Beijing, China, March 23 (Invited) (2010).

**S. T. Wu**, *Optically-isotropic Liquid Crystals for Photonics and Display Applications*, Int'l Liquid Crystal Photonics Conference, Hong Kong, December 6-8 (2010).

**S.T. Wu**, *Polymer-Stabilized Blue-phase Liquid Crystal Displays*, University of Science and Technology Beijing, Beijing, China, March 22 (Invited) (2010).

**S.T. Wu**, *Submillisecond-Response Liquid Crystal Photonic Devices*, 3rd Int'l Liquid Crystal Photonics Conference, Elche, Spain, September 8-10, Plenary (2010).

**S.T. Wu**, *Submillisecond-Response Polymer Network Liquid Crystals*, MRS Fall Meeting, Boston, MA. November 29-December 1 (Invited) (2010).

**B. Zeldovich, M.J. Soileau**, *Bi-frequency Pendulum for teaching Optics and Physics*, Presentation at CREOL boot, 2\_full\_days at the exhibit at OSA Annual Meeting (Rochester.) About 40 people requested materials of the presentation (2010).

**B. Zeldovich**, *Polar Asymmetry of Optical Fields*, Colloquium presentation at Purdue University, invited by Prof. Vlad Shalaev (2010).

**B. Zeldovich**, *Spin-orbit Interaction of a Photon*, Colloquium presentation at Purdue University, invited by Prof. Vlad Shalaev (2010).

---

## Patents and Disclosures

### Patents

M. Bayindir, F. Sorin, **A.F. Abouraddy**, O. Shapira, J.R. Arnold, Y. Fink, J.D. Joannopoulos, "Thermal Sensing Fiber Devices," U.S. Patent # 7,805,029, September 28 (2010).

V. Sudesh, T. McComb, **M.C. Richardson**, W. Hagemann, **M. Bass**, J. Ballato, A. Siegman, "Waveguide-pumping gain guided index antiguided fiber laser," U.S. Patent 7,668,211 February 23 (2010).

**M. Bass**, T.Y. Chung, "Narrow Spectral Width Lasers Optimized and Temperature Stabilized with Volume Bragg Grating Mirrors," U.S. Patent 7,672,346 March 2 (2010).

**M. Bass**, **D.G. Deppe**, "Composite cavity for enhanced efficiency of up-conversion," U.S. Patent 7,804,640 September 28 (2010).

**G. Boreman**, D. Mullally, J. Tharp, "Elliptical Polarizers, Tags and Identification Systems Using Frequency Selective Surfaces," U.S. Patent 7,745,778 June 29 (2010).

S. Gee, **P.J. Delfyett**, S. Ozharar, F. Quinlan, "High Precision Measurement of the Free Spectral Range of an Etalon," US Patent 7,800,763 September 21 (2010).

J. DeSalvo, G. Burdge, B. FitzGerald, YK Chen, A. Leven, **P.J. Delfyett**, "Matched Optical Waveforms for Detection and Identification of Biological Pathogens," U.S. Patent 7,755,755 July 13 (2010).

S. Etemad, **P.J. Delfyett**, "Mode-Locked Optical Amplifier as a Source for a wdm-WDM Hierarchy Architecture," U.S. Patent 7,848,655 December 7 (2010).

**P.J. Delfyett**, F. Quinlan, S. Gee, S. Ozharper, "Optical Frequency Self Stabilization in a Coupled Optoelectronic Oscillator," US Patent 7,697,579 April 13 (2010).

S. Etemad, P. Toliver, J. Jackel, R. Menendez, S. Galli, T. Banwell, **P.J. Delfyett**, "Phase Chip Frequency-Bins Optical Code Division Multiple Access," US Patent 7,729,616 June 1 (2010).

**P.J. Delfyett**, S. Rozzo, "Extreme Chirped Pulse Amplification and Phase Control," U.S. Patent 7,777,940 August 17 (2010).

**A. Dogariu**, "Optical Coagulation Monitor and

Method of Use," U.S. Patent 7,821,620 October 26 (2010).

**L.B. Glebov**, V. Smirnov, "Double-Bragg-Grating Scanning Transmitter/Receiver," U.S. Patent 7,700,270 April 20 (2010).

K. Marshall, P. Currie, J. Salg, J. Houston, **J.E. Harvey**, "Telescope Interferometric Maintenance Evaluation (TIME) Tool," U. S. Patent No. 7,777.888 B1, August 17, 2010. (2010).

K. Marshall, P. Currie, J. Salg, J. Houston, **J.E. Harvey**, "Telescope Interferometric Maintenance Evaluation (TIME) Tool," U. S. Patent No. 7,760.362 B1, July 20, 2010. (2010).

K. Marshall, P. Currie, J. Salg, J. Houston, **J.E. Harvey**, "Telescope Interferometric Maintenance Evaluation (TIME) Tool," U. S. Patent No. 7,755.766 B1, July 13, 2010. (2010).

**A. Kar**, S. Bet, "Deposition of Crystalline Layers on Polymers Substrates Using Nanoparticals and Laser Nanoforming," U.S. Patent 7,691,731 B2 April 6 (2010).

N.R. Quick and **A. Kar**, "Apparatus and Method for increasing thermal conductivity of a substrate," U.S. Patent 7,811,914 B1, October 12 (2010).

**G. Li**, Y. Han, "Direct Detection Differential Polarization-Phase-Shift Keying For High Spectral Efficiency Optical Communication," U.S. Patent 7,643,760 January 5 (2010).

**G. Li**, "Systems and Methods for Adaptive Interference Cancellation," U.S. Patent 7,856,184 December 21 (2010).

R. Bernath, C. Brown, J. Duncan, K. Takenoshita, **M.C. Richardson**, J. Cunado, "Advanced Droplet and Plasma Targeting System," U.S. Patent 7,718,985, May 18 (2010).

V. Shaoulov, **J.P. Rolland**, Y. Ha, "Systems and Methods for Providing Compact Illumination in Head Mounted Displays," U.S. Patent 7,843,642 November 30 (2010).

Q.H. Wang, **S.T. Wu**, Q. Hong, and Y.H. Wu, "Transflective Liquid Crystal Display Using Separate Transmissive and Reflective Liquid Crystal Cells and



Materials with Single Cell Gap," U.S. Patent 7,855,768 December 21 (2010).

**S.T. Wu**, Q. Wang, T.X. Wu, X. Zhu, and Z. Ge, "Transflective LCD Using Multilayer Dielectric Transflector," U.S. Patent 7,688,409 B2 March 30 (2010).

Q. Hong, R. Lu, T.X. Wu, and **S.T. Wu**, "Head Mounted Display with Curved Display Screen, Curved Tunable Focus Liquid Crystal Micro-Lens and First and Second Curved Black Masks Corresponding Independently to One of the Right and the Left Eye," U.S. Patent 7,667,783 B2 February 23 (2010).

R. Lu, Q. Hong, **S.T. Wu**, and T.X. Wu, "Vertical Alignment Liquid Crystal Display with High Transmittance and Wide View Angle," U.S. Patent 7,804,571 September 28 (2010).

Z. Ge, X. Zhu, R. Lu, T.X. Wu, **S.T. Wu**, W.Y. Li, and C.K. Wei, "Transflective LCD with Reflective Layer Connected to Reference Voltage Greater than

0.5 Vrms and Less than LC Threshold Voltage," U.S. Patent 7,751,001 B2 July 6 (2010).

J.H. Lee, X. Zhu, and **S.T. Wu**, "Transflective Liquid Crystal Display," U.S. Patent 7,746,294 June 29 (2010).

---

## Provisionals

**A.F. Abouraddy**, "Microparticle and Nanoparticle Fabrication through Fluid Instabilities in Multi-Material Fibers," Utility Patent 61/406,872, Filed October 26 (2010).

**A.F. Abouraddy**, S. Banaei, "Optical Energy-Harvesting Photonic Bandgap Fibers," Utility Patent 61/333,469, Filed May 11 (2010).

**M. Bass**, "Pump Cavities for Diode Laser Array Pumped Laser Rods," Utility Application 12/893,076, Filed September 29 (2010).

**M. Bass, D.G. Deppe**, "Composite Cavity for Enhanced Efficiency of Up Conversion," Utility Application 12/833,440, Filed July 9 (2010).

**M. Bass, D.G. Deppe**, "Emissive Fibers Containing Up Converters Excited by GaAs Based Semiconductor Light Sources," Utility Patent 12/784,594 Filed May 21 (2010).

**P.J. Delfyett**, J. Davila-Rodriguez, N. Hoghooghi "Optical Modulator with Linear Response," Utility Application 99103618, Filed February 6 (2010).

**P.J. Delfyett**, I. Ozdur, "An Optoelectronic Oscillator Using A High Finesse Etalon," Utility Application 61/349,427, Filed May 28 (2010).

**P.J. Delfyett**, I. Ozdur, S. Ozharar, F. Quinlan, "Optoelectronic Logic Gate for Real Time Data Mining in a Bit Stream," Utility Application 12/791,708 Filed June 1 (2010).

**A. Dogariu**, G. Biener, "Systems and Methods for Regulating Cell Motility and Cell Differentiation," Utility Application 12/791,222 Filed June 1 (2010).

**L.B. Glebov**, O. Andrusyak, J. Lumeau, S. Mokhov, **B. Zeldovich**, "Laser Pulse Temporal, Spectral and Spatial Shaping Devices Based on Volume Diffractive Gratings with Variable Period," Utility Application 61/294,566, Filed January 13 (2010).

**L.B. Glebov**, J. Luemau, S. Mokhov, V. Smirnov, **B. Zeldovich**, "Volume Moiré Bragg Gratings in a Photosensitive Material," Utility Application 12/780,202, Filed May 14 (2010).

**A. Kar**, "Articles Comprising Crystalline Layers on Low Temperature Substrates," Utility Application 12/707,367, Filed February 17 (2010).

**A. Kar**, "Frequency-tuned Detectors Coupled with Optical Amplifiers for Weak Signal Detection," Utility Patent 61/378,498 Filed August 31 (2010).

**A. Kar**, "Photodetection," Utility Application 12/964,072, Filed December 9 (2010).

**G. Li**, G. Goldfarb, "Electronic Compensation of Impairments Using Wavelet Filters for Backward Propagation," Utility Patent 12/727,532 Filed March 19 (2010).

**G. Li**, X. Li, "Electronic Compensation of Semiconductor Optical Amplifiers," Utility Patent 12/728,404 Filed March 22 (2010).

**G. Li**, E. Mateo, "Compensation of Optical Transmission Impairments Using Digital backward Propagation," Utility Application 12/728,854, Filed March 22 (2010).

**G. Li**, F. Yaman, "Compensation of Transmission Impairments in Polarization Multiplexed Systems," Utility Application 12/727,542, Filed March 16 (2010).

**G. Li**, F. Yaman, "Composite Photonic Crystal Fibers," Utility Application 61/421,395, Filed December 9 (2010).

**G. Li**, X. Xie, F. Yaman, "Independent Component Demultiplexing for Optical Communication," Utility Application 61/317,131 Filed March 24 (2010).

**G. Li**, X. Xie, F. Yaman, L. Zhu "Nonlinearity-Tolerant Optical Transmission using Multi-Mode Optical Fiber," Utility Application 61/298,728, Filed January 27 (2010).

**N.A. Riza**, "Agile Optical Image Sensing, Control, and Measurement Modules," Utility Application 12/938,842, Filed November 03 (2010).

**N.A. Riza**, "Broadband Variable Photonic Delay Line For Photonic and RF Signal Processing An optoelectronic loop design with 1000 finesse Fabry-Perot etalon as the mode selector instead of an RF filter," Utility Application 61/387,804, Filed September 29 (2010).

**N.A. Riza**, "Compressive Optical Display," Utility Application 61/421,736, Filed December 10 (2010).

**N.A. Riza**, "Hybrid Differential Optical Sensing Imager," Utility Application 61/314,374, Filed March 16 (2010).

**N.A. Riza**, "Multi-Function Optical Microscope with High Resolution Signal Processing," Utility Patent 12/706,277 Filed February 16 (2010).

**N.A. Riza**, "Power Smart Optical Wireless Sink," Utility Application 61/387,810 Filed September 29 (2010).

## Patent Disclosures

**A.F. Abouraddy**, "Micro-Particle and Nano-Particle Fabrication through Fluid Instabilities in Multi-Material Fibers."

**M. Bass**, "Detection of Covert Writing using Inks Containing Up Converters with Devices containing 975 nm Diode or Diode Laser Light Sources."

**M. Bass**, Y. Chen "A Pump Cavity for Diode Laser Array Pumped Laser Rods with High Efficiency and Uniformity."

**M. Bass**, JH Cho, "Covert Writing and Detection using Inks Containing up Converters."

**N.A. Riza**, "Spatially Smart Optical Sensing and Scanning," Utility Application 12/717,459, Filed March 4 (2010).

**N.A. Riza, S. Fathpour**, "Hybrid Design Variable RF Delay Line using Silicon Photonics," Utility Application 12/977,434, Filed December 23 (2010)

**A. Santhanam**, "Method and System for Real-Time Radiation Delivery Dose Monitoring," Utility Patent 61/371,179, Filed August 6 (2010).

**W.V. Schoenfeld**, "Cubic Semiconductor Alloys for Deep UV Applications," Utility Patent 12/726,545, Filed March 18 (2010).

**W.V. Schoenfeld**, "Electrode Structure, Method, and Application," Utility Patent 61/382,187, Filed September 13 (2010).

**W.V. Schoenfeld**, "Smart Dynamic Geographic Control Backlight," Utility Application 61/326,284, Filed April 21 (2010).

**W.V. Schoenfeld**, H. Khallaf, "Three Terminal Structure with Common Cathode, Method, and Application," Utility Application 61/382,192 Filed September 13 (2010).

**S.T. Wu**, S. Gauza, "Liquid Crystals Composition and Liquid Crystal Display With Patterned Electrodes," Utility Application 12/793,451, Filed June 3 (2010).

**S.T. Wu**, Z. Ge, "Liquid Crystal Displays with Embedded Photovoltaic Cells," Utility Application 12/940,525, Filed November 05 (2010).

**S.T. Wu**, Z. Ge, "Transmissive LCD with Reflective Mode," Utility Application 12/940,719 Filed November 5 (2010).

**S.T. Wu**, JH. Lee, X. Zhu, "Transflective Liquid Crystal Display System and Operation Method Thereof," Utility Application 12/733,357, Filed April 23 (2010).

**S.T. Wu**, X. Zhu, "Liquid Crystal Display Device Having Patterned Electrodes for Repetitive Divided Horizontal Electric Field and Fringing Electric Field," Utility Application 12/771,733 Filed April 30 (2010).

**G. Boreman**, J. D'Archangel "Metamaterial Flakes for Dispersal in a Liquid Binder."

**P.J. Delfyett**, "Method of mode-locking and stabilizing a frequency comb source using an intracavity phase modulator and Fabry-Pérot."

**P.J. Delfyett**, I. Ozdur, "Optically Tunable Optoelectronic Oscillator."

**D.G. Deppe**, "Thermoelectrophotonic Device for Waste Heat Recovery."

**S. Fathpour**, S. Khan, "Electronically Tunable Silicon Photonic Delay Lines."

**G. Li**, “Electronic Phase Conjugation and its Applications.”

**G. Li**, E. Mateo, “Electronic Phase Conjugation for Optical Communication.”

**G. Li**, F. Yaman, “Composite Photonic Crystal Fibers.”

**G. Li**, X. Xie, F. Yaman, “Independent Component Demultiplexing for Optical Communication.”

**G. Li**, L. Zhu, “Efficient Nonlinearity Compensation for Dispersion-Managed Fiber-Optic Transmission Systems.”

**M.C. Richardson**, M. Hemmer, A. Vaupel, “Flexible and Tunable Third Order Adjustable Dispersion Stretcher.”

**N.A. Riza**, “Broadband Variable Photonic Delay Line For Photonic and RF Signal Processing.”

**N.A. Riza**, “Compressive Optical Display.”

**N.A. Riza**, “Hybrid Differential Optical Sensing (H-DOS) Imager.”

**N.A. Riza**, “Power Smart In-door Optical Wireless Link Design and Applications.”

**N.A. Riza**, “Spatially Smart Optical Sensing and Scanning.”

**A. Santhanam**, “Real-Time Radiation Delivery Dose Calculation Using Physics-Based Lung Models and Multiple GPU.”

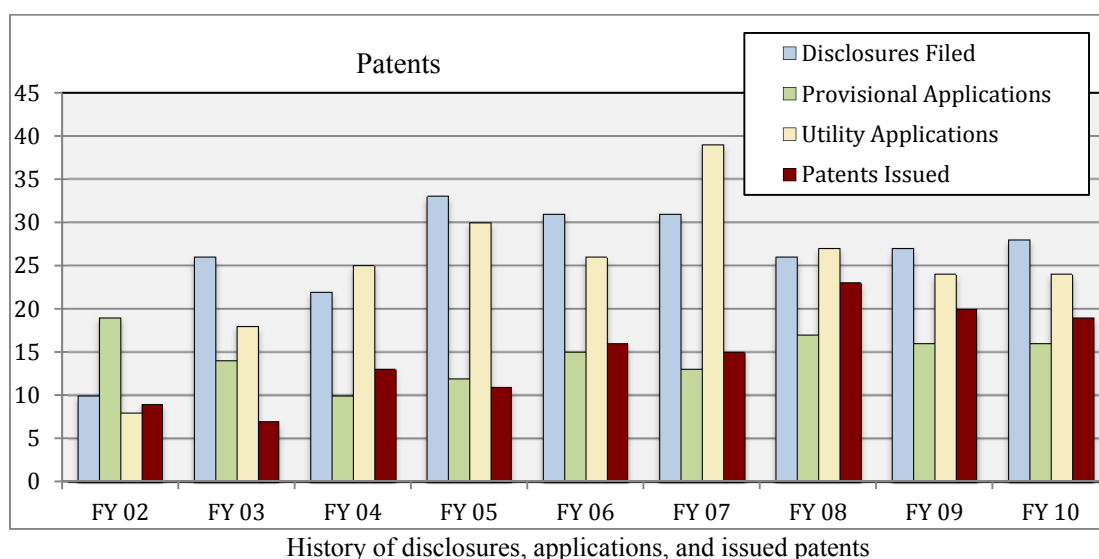
**A. Santhanam**, “Simulating 3D Lung Dynamics Using an iPad.”

**W.V. Schoenfeld**, H. Khallaf, “Improved Electrode Design for Organic Photo-voltaic Devices.”

**W.V. Schoenfeld**, H. Khallaf, “Three Terminal Organic Tandem Solar Cell with Al-doped ZnO (AZO) as a Common Cathode.”

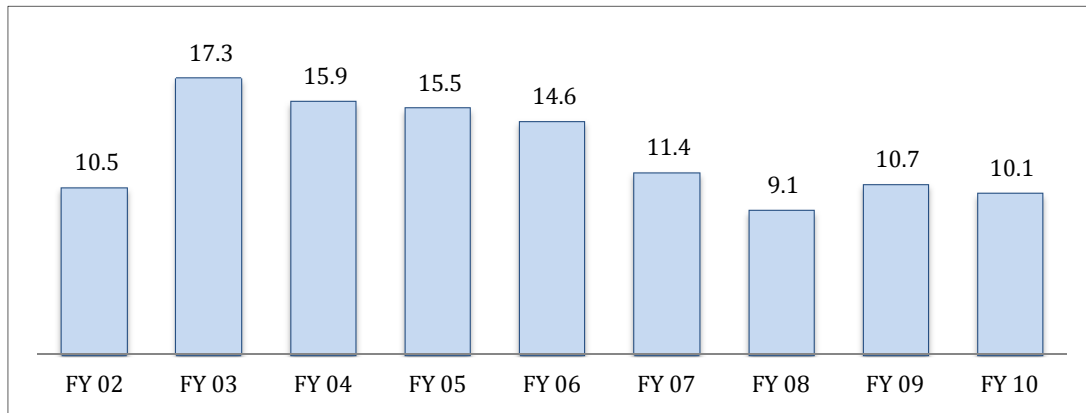
**S.T. Wu**, “Liquid crystal display devices with patterned electrodes.”

**S.T. Wu**, L. Rao, “Low Voltage Optically Isotropic Liquid Crystal Displays.”



## 3.4 Research Funding

Research has been steadily funded by a combination of federal, industrial, and state grants. State grants included \$10M in FY 04 for the Florida Photonics Center of Excellence (FPCE) and \$4.5M for the Townes Laser Institute (TLI). These funds continue to support the research and educational activities of these centers. The chart below shows the history of funds received from federal grants, including funds received through industry and other universities, as well as industrial grants, for the FY 2002 to FY 2010 period. The amounts shown represent actual funds received in each year, with each grant covering a different period. In FY 2010, the College received approximately \$7.6M of federal funds, including \$2.4M received through industry. It also received \$2.3M of industrial funding and \$211k from international sources. The following list describes new projects received in FY 2010. Active industrial projects are also listed in Sec. 4.4.



External funding in \$ million from FY 2002 to FY 2010, not including State grants.

## New Projects

Recipient	Source	Title of Award	Begin	End	Awarded 2010	Cumm Funding
Abouraddy, A	National Science Foundation	Mid-infrared, wide-bandwidth, stable coherent optical sources generated by multi-material, nonlinear chalcogenide-glass fibers	4/15/10	3/31/11	\$94,342	\$94,342
Bass, M	Trumpf Photonics, Inc.	Studies of Metal Vapor Lasers	2/14/08	8/29/08	\$7,184	\$57,184
Bass, M	Vectronix, Inc	Development of a small, rugged, Q-switched Nd :YAG laser	11/1/09	4/30/10	\$70,000	\$70,000
Boreman, G	DRS Optronics, Inc.	Optical Constraint Measurements	7/6/09	6/30/10	\$25,000	\$25,000
Boreman, G	DRS Optronics, Inc.	LWIR Meanderline Waveplate	9/8/08	12/31/09	\$10,000	\$110,000
Boreman, G	Florida High Tech Corridor Council	IR Flare	11/20/08	6/30/10	\$20,000	\$20,000
Boreman, G	Florida Institute of Technology	Support of PECASE Program	5/1/10	12/31/14	\$20,000	\$20,000
Boreman, G	General Dynamics	IR Flare Phase 2	8/17/09	12/31/09	\$40,000	\$40,000
Boreman, G	Georgia Tech Research Inst.	IR Antennas for GTRI project RACED	3/1/10	2/28/11	\$140,000	\$140,000

<b>Boreman, G</b>	Georgia Tech Research Inst.	Prototype Optical Phased Array Antenna Devices	9/30/09	9/29/10	\$193,977	\$193,977
<b>Boreman, G</b>	Johns Hopkins University	Infrared FSS	3/18/09	9/30/09	\$75,000	\$150,000
<b>Boreman, G</b>	Lockheed Martin	Infrared Metamaterial Antennas: A Path to Miniaturization of EO Systems	11/1/09	11/30/10	\$200,000	\$200,000
<b>Boreman, G</b>	Polaris Sensor Technologies, Inc	Analysis Support for Phase 1 Proposal: A09-005, "Polarimetric Sensor for Air-to-Surface Missile Systems	6/2/09	12/11/09	\$10,000	\$10,000
<b>Boreman, G</b>	Raytheon	Infrared Nano-Antenna Arrays	4/19/10	12/1/10	\$34,700	\$34,700
<b>Boreman, G</b>	Raytheon	VLWIR Sensor Characterization, Year 2	4/26/10	6/1/11	\$45,000	\$45,000
<b>Boreman, G</b>	Sandia National Labs	Releasable Metamaterials	11/20/09	10/31/10	\$100,000	\$100,000
<b>Christodoulides, D</b>	Lockheed Martin	Variable Acceptance Angle Structures	3/25/10	12/1/10	\$25,000	\$25,000
<b>Christodoulides, D</b>	United States-Israel Binational Science Foundation	Linear and Nonlinear Waves in Photonic Lattices	10/1/07	9/30/10	\$11,250	\$38,250
<b>Christodoulides, D</b>	University of Arkansas	Engineering the linear and nonlinear optical properties of periodic wave guide arrays	5/1/07	4/30/11	\$52,555	\$140,001
<b>Delfyett, P</b>	Army Research Office	Linear Interferometric Modulator for RF Links	6/28/10	6/27/11	\$349,189	\$349,189
<b>Delfyett, P</b>	Harris Corporation/GCSD Division	Optical Frequency Comb Source Development for Optical Injection Locking	11/13/09	11/12/10	\$30,000	\$30,000
<b>Delfyett, P</b>	Raydiance, Inc.	Parabolic Chirped Pulse Generation	7/1/09	1/25/10	\$21,000	\$21,000
<b>Delfyett, P</b>	Raydiance, Inc.	Parabolic Chirped Pulse Generation	5/13/10	7/14/10	\$9,000	\$9,000
<b>Delfyett, P</b>	University of Washington	Science and Technology Center at the University of Washington	8/1/05	7/31/10	\$70,000	\$340,000
<b>Deppe, D</b>	Zyvox Corporation	Atomically Precise Manufacturing	8/22/08	8/21/11	\$100,000	\$300,000
<b>Dogariu, A</b>	AFOSR	Sensing Random Electromagnetic Fields and Applications	5/1/10	4/30/15	\$162,462	\$162,462
<b>Dogariu, A</b>	US Army Research Laboratory	Unconventional Sensing using Correlations of Electromagnetic Fields	4/16/07	10/15/10	\$74,043	\$384,043
<b>Fathpour, S</b>	National Science Foundation	Cladding-Pumped Silicon Raman Amplifiers Integrated with In(Ga)As Quantum Dot Laser Pumps	8/15/09	7/31/11	\$262,776	\$262,776



<b>Glebov, L</b>	DARPA	Germanate PTR Glass	4/1/10	3/31/11	\$249,960	\$249,960
<b>Glebov, L</b>	Emory University	High Power Diode Pumped Alkali Vapor Lasers and Analog Systems	8/15/07	8/14/10	\$70,304	\$349,366
<b>Glebov, L</b>	OptiGrate	Compact single frequency volume Bragg lasers operating at 1.5 um	11/1/09	9/15/11	\$120,000	\$120,000
<b>Glebov, L</b>	Sandia National Labs	Raman Compression	5/5/10	9/4/10	\$50,000	\$50,000
<b>Glebov, L</b>	Sandia National Labs	Raman Compression of Emission Spectrum of Yb-Doped Fiber laser	8/26/09	9/30/09	\$10,000	\$10,000
<b>Glebov, L Zeldovich, B</b>	OptiGrate	Coherent Beam Combining of Fiber Lasers by Volume Bragg Gratings	2/15/10	2/14/12	\$200,000	\$20,000
<b>Hagan, D Van Stryland, E</b>	Israel Ministry of Defense	Development of new materials for strong, broadband nonlinear transmission Year 2	7/28/09	8/31/10	\$200,000	\$200,000
<b>Kar, A</b>	Naval Undersea Warfare Center	Advanced Uncooled Wideband Detector Phase I Follow-On	3/1/10	3/31/11	\$15,000	\$15,000
<b>Kar, A, Vaidyanathan, R</b>	Medtronic, Inc.	MRI Compatibility of Alloys and Devices	10/15/09	9/1/11	\$93,600	\$93,600
<b>Kuebler, S</b>	National Science Foundation	CAREER: Three-Dimensional Multi-Scale Metallodielectric Materials	2/15/08	1/31/11	\$34,490	\$344,904
<b>Kuebler, S</b>	National Science Foundation	Electroless Metallization onto Polymeric Surfaces: Synthesis, Analysis, and Modeling for Achieving Controlled Nanoscale Morphologies	7/1/08	6/30/11	\$21,286	\$213,429
<b>Li Kam Wa, P, Christodoulides, D</b>	University of Arkansas	Parity-time symmetric optical materials for multifunctional devices	1/4/10	1/3/11	\$97,500	\$97,500
<b>Li, G</b>	Air Force Research Laboratory	Secure Free-Space Optical Communication with Electronic Wavefront Correction	9/2/09	9/2/10	\$161,216	\$161,216
<b>Li, G</b>	AT&T	RF: Li - AT&T	6/1/09	4/15/13	\$25,000	\$25,000
<b>Li, G</b>	Lockheed Martin	Nano-Photonic Silicon Fiber for Infrared Generations	2/23/10	7/30/10	\$25,000	\$25,000
<b>Li, G</b>	NEC Laboratories America, Inc.	RF - Li Group Research	3/1/10	4/15/13	\$20,000	\$20,000
<b>Li, G</b>	Northrop Grumman Corporation	Millimeter-wave and THz Aperture-Plane Imaging using Digital Holography Techniques	5/1/10	4/30/11	\$15,000	\$15,000
<b>Lumeau, J</b>	OptiGrate	Measurements of absorption in thick RBG at 1085nm	3/31/10	5/14/10	\$2,400	\$2,400

<b>Lumeau, J</b>	OptiGrate	Rare earth doped PTR glass for monolithic lasers	2/15/10	7/25/10	\$30,000	\$30,000
<b>Moharam, M, Li Kam Wa, P</b>	Ocean Optics	Wideband High Efficiency Gratings for Spectrometer Applications	7/1/10	1/1/11	\$35,000	\$35,000
<b>Pearson, J</b>	Workforce Florida, Inc	Optics & laser Technician Certification Project	7/1/09	12/31/10	\$50,000	\$50,000
<b>Richardson, M</b>	National Science Foundation	Long Range Laser Measurements and Signatures Intelligence	9/1/08	8/31/12	\$75,000	\$150,000
<b>Richardson, M</b>	US Army Research Office	Ultrafast Laser Interaction Processes for Libs and other Sensing Technologies	6/15/06	2/14/11	\$817,839	\$4,155,276
<b>Richardson, M</b>	US Army Research Office	Engineered laser filaments in air for defense stand-off sensing and interaction applications	9/5/09	3/4/11	\$375,543	\$375,543
<b>Richardson, M, Shah, L</b>	Air Force Research Laboratory	MULTI-KW 2 uM EMISSION BY SPECTRALLY COMBINING MANY Tm FIBER LASERS	4/14/10	4/14/11	\$400,000	\$400,000
<b>Richardson, M, Bass M</b>	Clemson University	High Power Fiber Lasers	10/1/05	12/31/10	\$559,699	\$1,714,138
<b>Richardson, M, Hagan D</b>	US Department of Education-FIPSE	MILMI - International Masters in Laser Materials and Interactions	9/1/08	8/31/12	\$111,800	\$223,418
<b>Rolland, J</b>	Optical Research Associates	Fellowship Support for Florian Fournier	9/1/07	8/31/10	\$30,000	\$90,240
<b>Rotar, V</b>	OptiGrate	Recording of Phase Mask in PTR Glass	1/28/10	3/11/10	\$1,700	\$1,700
<b>Santhanam, A</b>	University of Rochester	NOAO - LSST Telescope Alignment	8/1/09	7/31/10	\$10,617	\$10,617
<b>Santhanam, A</b>	University of Rochester	Optical Testing Software - 1	7/16/09	11/30/09	\$29,562	\$29,562
<b>Schoenfeld, W, Hagan, D</b>	National Science Foundation	REU Site: Research Experiences for Undergraduates in Optics and Lasers	3/1/09	5/31/11	\$106,350	\$209,278
<b>Schoenfeld, W</b>	Prime Source Initiative	Advanced Hybrid Organic Photovoltaic Structures	9/1/09	11/20/09	\$1,124,683	\$1,500,000
<b>Schoenfeld, W</b>	SVT Associates, Inc.	Deep UV LEDs	7/1/09	12/31/10	\$48,420	\$48,420
<b>Schoenfeld, W</b>	US Army Research Office	Deep-UV Emitters and Detectors Based on Lattice-Matched Cubic Oxide Semiconductors	7/1/10	12/31/10	\$20,000	\$20,000
<b>Schoenfeld, W, Zhou, H</b>	PICO Technologies	Smart AMLCD Backlighting for Military Craft	9/18/08	9/18/10	\$66,302	\$331,513

Van Stryland, E Hagan, D Kik, P	US Army Research Office	Engineered Multifunctional Nanophotonic Materials for Ultrafast Optical Switching	8/15/06	1/14/11	\$1,503,871	\$4,688,539
Van Stryland, E	Kent State University	Self-Assembled Soft Optical NIMs	5/1/06	9/30/10	\$75,000	\$331,250
Van Stryland, E, Hagan, D	Georgia Tech Research Corporation	Zeno Project for Georgia Tech	9/30/09	5/30/11	\$103,572	\$103,572
Wu, ST	AFOSR	Fast response and low voltage dual frequency liquid crystals	3/1/09	11/30/10	\$150,000	\$300,000
Wu, ST	Arete Associates	Development of Adaptive Liquid Lens	9/15/09	3/5/10	\$200,000	\$200,000
Wu, ST	ITRI Display Technology Center	Blue-Phase Liquid Crystals	4/1/10	3/31/13	\$135,000	\$135,000
Wu, ST	Nova Photonics	Tunable Optical Filters	9/15/09	3/31/11	\$180,000	\$180,000
Wu, ST	Raytheon	Consulting Service of Liquid Crystals	10/1/09	12/31/09	\$15,000	\$15,000

<b>TOTAL</b>					<b>\$10,088,132</b>	<b>\$21,341,605</b>
--------------	--	--	--	--	---------------------	---------------------

#### New Grants with CREOL co-Pis

Recipient	Source	Title of Award	Begin	End	Awarded 2010	Cumm Funding
Belfield, K, Hernandez, E, Kuebler, S Gesquiere, A	National Science Foundation	ARRA: Purchase and Development of a Cyber-Enabled Broadly Tunable kHz Femtosecond Laser System	8/1/09	7/31/12	\$45,000	\$500,000

<b>GRAND TOTAL</b>					<b>\$10,133,132</b>	<b>\$21,841,605</b>
--------------------	--	--	--	--	---------------------	---------------------

#### 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
Glebov, L Bass, M Dogariu, A Zeldovich, B	DARPA	High brightness multiwavelength laser architecture based on volume diffractive gratings in PTR glass (ADHELs Phase 2)	5/18/09	11/17/10
Bass, M	Sandia National Labs	Temperature Independent Lasers	2/24/09	9/9/09
Boreman, G	Northrop Grumman Corporation	Subsurface Millimeter Wave Imaging Through Soil	6/21/04	6/30/10
Boreman, G	Raytheon Company	VLWR Sensor Characterization	4/6/09	9/1/09
Boreman, G	Sandia National Labs	Metrology of Metamaterials	10/22/08	9/28/09
Kik, P Dogariu, A Cho, H	University of South Florida	Tunable Optical Sensors for Microarray Technology	9/26/07	10/25/10

<b>Richardson, M, Christodoulides, D, Stegeman, G</b>	National Science Foundation	Application of Organic Materials in 3D Optical Circuitry	10/1/04	9/30/09
<b>Delfyett, P</b>	DARPA	Phonic Arbitrary Waveform Generation (PAWG)	8/6/02	1/9/10
<b>Delfyett, P</b>	Harris Corporation	Optical Arbitrary Waveform Generation via Spectral Synthesis (OAWGSS)	6/27/07	8/18/09
<b>Delfyett, P</b>	Harris Corporation	Ultra-stable photonic oscillators for cryogenically-cooled superconducting Analog-to-Digital Converters	5/12/09	7/31/09
<b>Delfyett, P</b>	Raydiance, Inc	Chirped Laser Radar	1/2/08	8/31/09
<b>Deppe, D</b>	National Science Foundation	Collaborative Research: On-Chip Solid-State Cavity QED for Quantum Information Science	9/1/06	8/31/10
<b>Deppe, D</b>	sdPhotonics, LLC	SBIR Phase 2: Compact Quantum Dot Mode Locked Lasers for Arbitrary Waveform Generation	6/23/08	3/23/11
<b>Deppe, D</b>	US Army RDECOM	Chip-Edge C2Oi VCCSEL Technology	7/27/08	1/26/10
<b>Dogariu, A</b>	AFOSR	Sensors for 3D Optical Radiation and Applications	06/15/06	11/30/09
<b>Dogariu, A</b>	DOD	Spatially Resolved system for controlling the properties fo electromagnetic beams	5/1/09	10/30/10
<b>Dogariu, A Christodoulides</b>	Lockheed Martin	Airy Beam Behavior in Turbulent Environments	4/9/09	1/30/10
<b>Dogariu, A</b>	Lockheed Martin	Polarization Image Multiplexing	2/6/08	12/31/09
<b>Dogariu, A</b>	Mayo Clinic	Intraoperative, Real-Time Monitoring of Coagulation with Laser Spectroscopy	8/15/07	2/28/11
<b>Freisem, S</b>	BD Displays	New Technology for High Efficiency Low Voltage Microdisplays	9/1/08	8/31/10
<b>Georgiopoulos, M, Hagan, D Belfield, K, Schober, C Qu, M</b>	National Science Foundation	UCF STEP Pathways to STEM: From Promise to Prominence	10/2/06	12/31/09
<b>Glebov, L</b>	Air Force Research Laboratory	Spectral Combining of five 150-W fiber lasers by volume Bragg gratings in PTR flass	1/30/09	2/1/10
<b>Glebov, L</b>	Army Research Laboratory	Development of a tunable volume bragg laser system for solid state lasers pumping at 1535nm	9/27/08	8/26/09
<b>Hagan, D</b>	French American Fund for Universities	French American Cultural Exchange	7/19/07	7/31/09
<b>Harvey, J</b>	ITT Industries Inc Systems Division	Technical Support on the Testing and Maintenance of Launch Vehicle Imaging Telescopes	1/19/06	10/31/09
<b>Harvey, J</b>	Lockheed Martin Adv Technologies	Solar Ultra-Violet Imager (SUV)	3/24/08	2/28/10
<b>Kar, A</b>	Naval Undersea Warfare Center	Laser doping for MWIR detector fabrication	5/6/09	8/31/10
<b>Kar, A</b>	Siemens AG Power Generation	A Feasibility study of a highly sensitive wireless optical sensor for combustion species analysis at high temperature	6/1/08	9/30/09
<b>Kik, P</b>	National Science Foundation	CAREER: Silicon Compatible Hybrid Nanophotonic Systems	2/1/07	1/31/12

<b>Leuenberger, M; Schoenfeld, W</b>	National Science Foundation	QMHP: Modeling of a Photonic Crystal Hosting a Quantum Network Made of Single Spins in Quantum Dots that Interact....	9/1/07	8/31/10
<b>Li, G; Shepard, S</b>	Corban Associates, LLC	A Solar Energy Converter With Improved Photovoltaic Efficiency, Frequency Conversion and Thermal Management Permitting..	6/1/08	8/14/09
<b>Li, G</b>	DARPA	Coherent Optics for Military Communications & Signal Processing	8/6/02	1/9/10
<b>Li, G</b>	National Science Foundation	IGERT: Optical Communications and Networking	9/15/01	8/31/09
<b>Li, G</b>	NSG America, Inc	10 Gb/s APD Packaging	6/1/09	5/31/11
<b>Pearson, J</b>	FL Department of Education	Emergency Notification Technology for Public Universities and Colleges	2/4/09	8/31/09
<b>Richardson, M</b>	ChemImage Corporation	TSR-Shield: Time and Spatially Resolved Standoff Hyperspectral Imaging Explosives	11/20/07	9/9/09
<b>Richardson, M</b>	Clemson University	Laser Writing in CF for Integrated Sensors	9/15/07	9/14/09
<b>Richardson, M</b>	National Science Foundation	REU Site: International Program on Optics, Lasers, Photonics and Optical Materials	4/15/07	3/31/11
<b>Richardson, M</b>	Naval Undersea Warfare Center	Trade study of femtosecond laser self-channeling effects	3/11/09	7/8/09
<b>Richardson, M</b>	US Army Research Office	Laser Ignition Facility for Energetic Materials (LIFEM)	6/1/08	11/30/09
<b>Richardson, M</b>	US Department of Energy	X-ray Photonics Facility: A technology platform for the new field of X-ray Photonics: Construction of a Coherent EUV Facility	9/30/06	7/31/09
<b>Riza, N</b>	US Department of Energy - NETL	Extreme Environment Silicon Carbide Hybrid Temperature=Pressure Optical Sensors	7/1/07	9/1/10
<b>Rolland, J</b>	HEDZOPT	HEDZOPT Eyeglass Display	7/15/08	9/30/10
<b>Rolland, J</b>	MD Anderson Cancer Center Orland	Dynamic Medical Imaging Analysis: Application to Radiotherapy	6/1/06	5/31/10
<b>Rolland, J</b>	NASA Kennedy Space Center	Measurement of Particles Suspended in High Velocity Gas	7/9/08	7/8/09
<b>Schoenfeld, W</b>	KISLED	Optical Test of Surface Enhanced InGaN Light Emitting Diodes	5/7/09	12/31/10
<b>Schoenfeld, W Leuenberger, M</b>	National Science Foundation	QMHP: Modeling of a Photonic Crystal Hosting a Quantum Network Made of Single Spins in Quantum Dots that Interact....	9/1/07	8/31/10
<b>Schoenfeld, W</b>	PICO Technologies	SBIR Phase 1: Light Emitting Diodes for Aviation Lighting	1/13/09	10/20/09
<b>Van Stryland, E Hagan, D</b>	Georgia Institute of Technology	Nonlinear Materials and Device Characterization	6/1/06	12/31/09
<b>Van Stryland, E Hagan, D</b>	National Science Foundation	Nonlinear Spectroscopy: Absorption and Refraction	9/1/05	8/31/09
<b>Van Stryland, E Hagan, D</b>	US Army Research Laboratory	Nonlinear Optics for Optical Limiting	3/29/04	3/31/10
<b>Venus, G</b>	OptiGrate	Stablized Narrow Band Laser Diode	1/15/09	10/14/09
<b>Webster, S Hagan D</b>	Fibertek, Inc	Raman Gain in Oxide Glasses	5/15/09	8/30/09
<b>Wu, ST</b>	Raytheon Company	Development of Advanced Materials	3/24/09	9/20/09
<b>Wu, ST</b>	Rockwell Scientific	Dual Frequency Liquid Crystal Mixture	9/1/03	10/1/11
<b>Wu, ST</b>	Vescent Photonics, Inc	Liquid Crystal Mixture and Device Modeling	9/30/08	7/29/09
<b>Zeldovich, B</b>	OptiGrate	US Air Force SBIR Phase 1: Fiber Laser Beam Combining	2/16/09	11/15/09



## 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 Defence 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 instituted 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 64 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 The 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

Agilent Technologies  
Breault Research  
Northrop Grumman Laser

Newport Corporation  
Optical Research Associates  
Paul G. Suchoski, Jr

Powerlase Limited  
Zemax Development Corp.

### Senior Members

Coherent, Inc.  
CST of America  
Edmund Optics  
ER Precision Optical  
Lambda Research Corporation  
LightPath Technologies

LAS-CAD GmbH  
Lockheed Martin  
Newport Corporation  
Ocean Optics  
Ophir-Spiricon

Optimax Systems  
Tektronix  
TRUMPF, Inc.  
Vectronix Inc.  
Veeco Instruments-Metrology  
Zygo Corporation

### Affiliate Members

American Photonics Co.  
Analog Modules  
Applicote Associates, LLC  
Cubic Defense Applications  
DILAS Diode Laser, Inc.  
Gooch & Housego, LLC.  
Harris Corporation  
HORIBA Jobin Yvon  
Insight Technology  
JENOPTIK Optical Systems Inc.  
Kaufman & Robinson, LLC  
L-3 Communications  
Laser Institute of America  
Lee Laser  
Luna Innovations, Inc.  
Northrop Grumman Aerospace Systems

OKO Technologies  
Optigrate Corp.  
Photonics Spectra  
Photonics Online  
Princeton Instruments  
Quioptic  
QPC Lasers/Laser Operations LLC  
R-Soft Design Group  
Ray Williamson Consulting  
Sciperio, Inc.  
SPIE- The Int'l Society for Optics & Photonics  
The Optical Society  
Tower Optical Corporation  
TwinStar Optics, Coatings & Crystals  
Vytran LLC  
Yokogawa Corporation of America



## 4.3 Industrial Affiliates Day

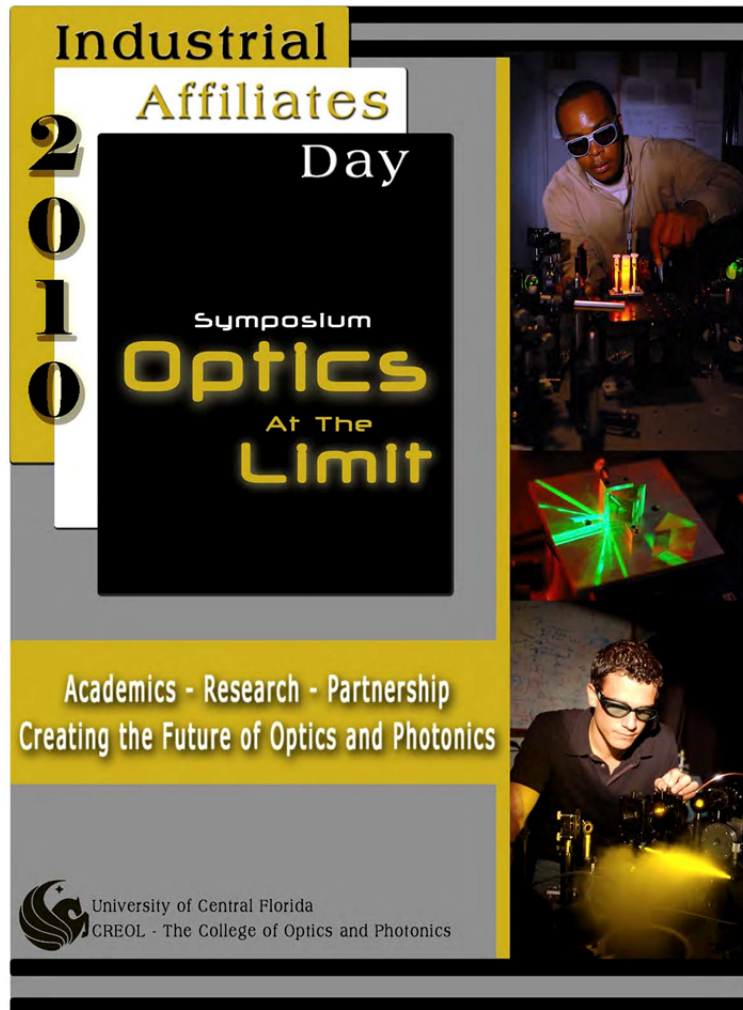
The Industrial Affiliates Day was held on April 9, 2010 and included a symposium on “*Optics at the Limit*.” Invited talks were presented by distinguished speakers and a panel discussion on the future of optics and photonics was led by participants from industry and academia.

The event drew over 200 registrants, 23 exhibitors, and 21 student poster participants.

A spectacular custom laser light show entertained guests in the CREOL lobby to commemorate “LaserFest”, 50 years of advancing the laser.



Industrial Affiliates Day morning session held at the UCF Alumni Center.



## 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	MJ Soileau	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
9:25	<i>"Fundamental Limits for Optical Devices"</i>	David Miller	Director, Solid State and Photonics Lab, Co-Director, Stanford Photonics Res. Cntr, W.M. Keck Foundation Prof. of Electrical Engineering, Stanford University
10:00	BREAK		
10:20	<i>"Optical Nanocircuits"</i>	Nader Engheta	H. Nedwill Ramsey Professor of Electrical and Systems Engr, and Professor of Bioengineering, Univ. of Pennsylvania
10:55	<i>"Single-Molecule Imaging"</i>	Sam Hess	Assoc. Professor of Physics, University of Maine, Dept. of Physics & Astronomy
11:30	Panel Discussion – <i>"Where is optics and photonics going in the next 5-10 years?"</i>	Ralph James Paul S. Drzaic David Miller Nader Engheta Sam Hess Moderator: Jim Pearson	Brookhaven National Lab. Drzaic Consulting Services Stanford University Univ. of Pennsylvania University of Maine  CREOL
12:30	LUNCH		Alumni Center

### Afternoon Session

Presentations-Business Admin Bldg, BA 107

Posters, Award presentations, Reception & Light Show-CREOL Bldg

1:15	Walk to Business Admin Bldg.		
1:30	<i>"Atto-Second Optics"</i>	Zenghu Chang	Professor of Physics, Kansas State University
2:05	<i>Student of the Year- "Spin Transfer &amp; Power Flow at Subwavelength"</i>	David Haefner	CREOL, The College of Optics and Photonics
2:40	<i>"Industry Partnerships with CREOL"</i>	Jim Pearson	CREOL, The College of Optics and Photonics
3:00	Walk to CREOL Building		
3:10	Poster Sessions ; Lab Tours; Exhibits Open; (contiguous)	CREOL Graduate Students	CREOL rooms 102 & 103; tours start from lobby; exhibits in lobby
5:10-6:30	Poster award presentation; laser light show; reception	Bahaa Saleh	Dean & Director, CREOL, The College of Optics and Photonics

### **Tabletop Exhibits – CREOL Lobby & Alumni Center**



## 4.4 Industrial Projects

Recipient	Source	Title of Award	Begin	End	Awarded 2010	Cumm Funding
Wu, ST	Arete Associates	Development of Adaptive Liquid Lens	09/15/09	03/05/10	\$200,000	\$200,000
Li, G	AT&T	RF: Li - AT&T	06/01/09	04/15/13	\$25,000	\$25,000
Boreman, G	DRS Optronics, Inc.	Optical Constraint Measurements	07/06/09	06/30/10	\$25,000	\$25,000
Boreman, G	DRS Optronics, Inc.	LWIR Meanderline Waveplate	09/08/08	12/31/09	\$10,000	\$110,000
Boreman, G	General Dynamics	IR Flare Phase 2	08/17/09	12/31/09	\$40,000	\$40,000
Van Stryland, E, Hagan, D	Georgia Tech Research Corporation	Zeno Project for Georgia Tech	09/30/09	05/30/11	\$103,572	\$103,572
Delfyett, P	Harris Corporation/GCSD Division	Optical Frequency Comb Source Development for Optical Injection Locking	11/13/09	11/12/10	\$30,000	\$30,000
Wu, ST	ITRI Display Technology Center	Blue-Phase Liquid Crystals	04/01/10	03/31/13	\$135,000	\$135,000
Boreman, G	Lockheed Martin	Infrared Metamaterial Antennas: A Path to Miniaturization of EO Systems	11/01/09	11/30/10	\$200,000	\$200,000
Christodoulides, D	Lockheed Martin	Variable Acceptance Angle Structures	03/25/10	12/01/10	\$25,000	\$25,000
Li, G	Lockheed Martin	Nano-Photonic Silicon Fiber for Infrared Generations	02/23/10	07/30/10	\$25,000	\$25,000
<b>Santhanam, A,</b> Rolland J, Ilegbusi, O, Kassab, A, Divo, E, Hoffman-Ruddy, B	MD Anderson Cancer Center Orlando	INCORPORATING 3D LUNG DYNAMICS INTO LUNG RADIOTHERAPY FOR NON-SMALL CELL LUNG CANCER	07/01/08	12/31/10	\$169,940	\$629,240
Kar, A, Vaidyanathan, R	Medtronic, Inc.	MRI Compatibility of Alloys and Devices	10/15/09	09/01/11	\$93,600	\$93,600
Li, G	NEC Laboratories America, Inc.	RF - Li Group Research	03/01/10	04/15/13	\$20,000	\$20,000
Li, G	Northrop Grumman Corporation	Millimeter-wave and THz Aperture-Plane Imaging using Digital Holography Techniques	05/01/10	04/30/11	\$15,000	\$15,000
Wu, ST	Nova Photonics	Tunable Optical Filters	09/15/09	03/31/11	\$180,000	\$180,000
Moharam, M, Li Kam Wa, P	Ocean Optics	Wideband High Efficiency Gratings for Spectrometer Applications	07/01/10	01/01/11	\$35,000	\$35,000
Rolland, J	Optical Research Associates	Fellowship Support for Florian Fournier	09/01/07	08/31/10	\$30,000	\$90,240
Glebov, L	OptiGrate	Compact single frequency volume Bragg lasers operating at 1.5 um	11/01/09	09/15/11	\$120,000	\$120,000
Glebov, L Zeldovich, B	OptiGrate	Coherent Beam Combining of Fiber Lasers by Volume Bragg Gratings	02/15/10	02/14/12	\$200,000	\$20,000
Lumeau, J	OptiGrate	Measurements of absorption in thick RBG at 1085nm	03/31/10	05/14/10	\$2,400	\$2,400
Lumeau, J	OptiGrate	Rare earth doped PTR glass for monolithic lasers	02/15/10	07/25/10	\$30,000	\$30,000
Rotar, V	OptiGrate	Recording of Phase Mask in PTR Glass	01/28/10	03/11/10	\$1,700	\$1,700
Schoenfeld, W, Zhou, H	PICO Technologies	Smart AMLCD Backlighting for Military Craft	09/18/08	09/18/10	\$66,302	\$331,513

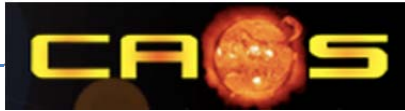
Boreman, G	Polaris Sensor Technologies, Inc	Analysis Support for Phase 1 Proposal: A09-005, "Polarimetric Sensor for Air-to-Surface Missile Systems	06/02/09	12/11/09	\$10,000	\$10,000
Schoenfeld, W	Prime Source Initiative	Advanced Hybrid Organic Photovoltaic Structures	09/01/09	11/20/09	\$1,124,683	\$1,500,000
Delfyett, P	Raydiance, Inc.	Parabolic Chirped Pulse Generation	07/01/09	01/25/10	\$21,000	\$21,000
Delfyett, P	Raydiance, Inc.	Parabolic Chirped Pulse Generation	05/13/10	07/14/10	\$9,000	\$9,000
Boreman, G	Raytheon	Infrared Nano-Antenna Arrays	04/19/10	12/01/10	\$34,700	\$34,700
Boreman, G	Raytheon	VLWIR Sensor Characterization, Year 2	04/26/10	06/01/11	\$45,000	\$45,000
Wu, ST	Raytheon	Consulting Service of Liquid Crystals	10/01/09	12/31/09	\$15,000	\$15,000
Schoenfeld, W	SVT Associates, Inc.	Deep UV LEDs	07/01/09	12/31/10	\$48,420	\$48,420
Bass, M	Trumpf Photonics, Inc.	Studies of Metal Vapor Lasers	02/14/08	08/29/08	\$7,184	\$57,184
Bass, M	Vectronix, Inc	Development of a small, rugged, Q-switched Nd :YAG laser	11/01/09	04/30/10	\$70,000	\$70,000
Deppe, D	Zyvex Corporation	Atomically Precise Manufacturing	08/22/08	08/21/11	\$100,000	\$300,000




---

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

Date: February 20, 2010

Impact: ~200 Middle School girls

Lead: *Chris Brown*

Volunteers: *Chris Brown, Casey Boutwell, Dan Ott, Vani Kamtaprasad, Lane Martin, Lauren Rich, Chuck Williams, Apurva Jain*

Expanding Your Horizons (EYH) is a day long program that supports young girls' interest in science, engineering, and mathematics through hands-on demonstrations and lectures. Approximately 200 girls in grades six through eight attended this year's EYH program at the University of Central Florida. Members of CREOL's SPIE student chapter organized and performed three sections of demonstrations, two optical and one with liquid nitrogen. Principles of waveguiding were introduced through a discussion on total internal reflection and reflection/refraction phenomena with various demonstrations. Additionally, an introduction to diffraction and the Fourier nature of waves interacting with obstructions was provided. Finally, the crowd pleaser, students learned about and froze marshmallows in liquid nitrogen.

### Science Night – Millennia Elementary

Date: February 25, 2010

Impact: ~75 mainly 4<sup>th</sup>/5<sup>th</sup> grade students, parents and teachers

Lead: *Matt Weed*

Volunteers: *Matt Weed, Casey Boutwell*

Elementary students and their parents visited this fair-like event at Millennia Elementary School to see static displays and activities to promote excitement about science. CREOL students displayed demonstrations of laser operation and reflection/refraction in water.

<http://www.orlandosentinel.com/community/ucf/orl-ucf-elementary-science-night.0,4094790.story>

### Science Night – Corner Lake Middle School

Date: March 24, 2010

Impact: ~75 mainly Middle School students, parents and teachers

Lead: *Matt Weed*

Volunteers: *Matt Weed, Lane Martin, Lauren Rich*

Students and their parents visited this fair-like event at Corner Lake Middle School to see static displays and activities to promote excitement about science. CREOL students displayed demonstrations of laser operation, reflection/refraction in water, and liquid nitrogen.

### SWEet College Day

Date: March 27, 2010

Impact: ~25 High School Girls, parents and teachers

Lead: *UCF Society of Women Engineers*

CREOL Contact: *Matt Weed*

Volunteers: *Matt Weed, Casey Boutwell, Lane Martin, Josh Kaufman, Kyle Douglass*

High school girls, parents, and teachers will visit UCF for a day long Society of Women Engineers (SWE) event to increase awareness and excited about engineering and science fields for women. CREOL student tour guides hosted mini visits of CREOL to both students and teachers/parents that showed demonstrations and laboratories that frame the optical telecommunications industry – semiconductor optical devices and fiber.

### Optics Day – LaserFest

Date: April 2, 2010  
Impact: ~200 students, teachers, and community members  
Lead: *Matt Weed, Casey Boutwell*  
Main Volunteers: *Matt Weed, Kyle Douglass, Casey Boutwell, Marcus Bagnell*



Each year the CREOL Association of Optics Students (CAOS) organizes and hosts a day-long event called Optics Day. This year's Optics Day, held on April 2, was a tribute to the Laser in honor of LaserFest, the 50<sup>th</sup> anniversary of the first demonstration of the Laser. The entire campus community, as well as local residents and educators were invited to learn both about CREOL and the field of optics.

Four brand new demonstrations were unveiled for this year's event that showed operational gas, diode, fiber, and solid state laser systems. CREOL students stood by each demonstration to both explain how the phenomenon worked and to answer any questions visitors had.

In addition to the demonstrations, two speakers were invited to talk. The first speaker was Dr. Bahaa Saleh, the current CREOL dean, who spoke about the history of CREOL and what the optics community has contributed to many modern technologies. This year's keynote speaker was Dr. Jason Eichenholz, a CREOL alumni and CTO of Ocean Optics, who spoke about optics and laser technologies that have had recent impact on society with a focus on spectroscopic technologies.

<http://www.orlandosentinel.com/community/ucf/orl-ucf-creol-laser-fest.0.6319474.story>

<http://www.orlandosentinel.com/community/ucf/orl-ucf-laser-fest-event-attendees-increase.0.7545129.story>

### Elementary Science Olympiad

Date: April 17, 2010  
Impact: ~150 students, teachers, and parents  
Lead: *Dorianne Pagnotti*  
Volunteers: *Matt Weed, Lane Martin, Apurva Jain, Andrew Sims*

During the score tabulation session of the Science Olympiad, CREOL students showcased our field through demonstration of total internal reflection as applicable to fiber optic operation in a lecture hall setting for about 45 minutes followed by the ever popular liquid nitrogen frozen marshmallows.

### LaserFest Congressional Visit Day

Date: April 29, 2010  
Impact: ~75 members of congressional staffs and lobbying agencies  
Lead: *Chuck Williams*  
Volunteers: *Matt Weed, Chuck Williams*

Every year, the scientific community is invited, through their professional societies, to Washington D.C. to interface with congressmen and women and their staffs about science policy issues. As part of the event this year, CREOL students joined with optics graduate students from other universities around the nation to demonstrate total internal refraction during a reception for the congressional staffs.

### Journeys Academy

Date: June 3, 2010  
Impact: 10 at risk High School students  
Lead: *Matt Weed*  
Volunteers: *Matt Weed, Kyle Douglass, Chuck Williams, Dan Ott, Lane Martin*

CREOL students visited this school for students with histories of disciplinary problems to discuss being a student of science, careers potential in high technology fields, and to demonstrate our fields of research with simple examples of nano-fabrication, optical communications, and microscopy.

### Castle Creek Elementary

Date: June 4, 2010  
Impact: 13 students, their teacher and 2 parents  
Lead: *Matt Weed*  
Volunteers: *Matt Weed, Casey Boutwell, Dan Ott, Marc SeGall, Pankaj Kadwani, Lane Martin*

A local 5<sup>th</sup> grade class had just finished a unit on optics that discussed diffraction, interference, and absorption. Their teacher contacted us through the National Lab Day initiative to make a visit to CREOL. CREOL students set up demonstrations that showed wave interference in a wave tank, reflection/refraction in a waterfall, diffraction using gratings, and a show and tell about how both gas and diode lasers work.

### CREOL Summer Camps

Date: June 14-25, 2010  
Impact: 20 campers  
Lead: *Matt Weed*  
Volunteers: *Matt Weed, Chuck Williams, Lane Martin, Marc SeGall, Dan Ott*

CREOL students supplemented the Optics, Forensics, and Chemistry camps throughout the week with demonstrations and discussions of how various technologies work including fiber optics, lasers, LEDs, spectroscopy, and liquid nitrogen.

### Snell's Law for High School Project

Date: October 15, 2010  
Impact: 2 HS students, 1 middle school student, 2 parents  
Lead: *Matt Weed*  
Volunteers: *Matt Weed*

Two students and their parents from Windermere, FL visited CREOL to learn about Snell's Law for a class project. CREOL students showed them, through demonstration and on paper, the properties of materials that allow refraction to occur.

### Home School Student

Date: October 27, 2010  
Impact: 1 HS student, 1 parent  
Lead: *Matt Weed*  
Volunteers: *Matt Weed*

A local home schooled student with an interest in optics and lasers visited CREOL to see firsthand what a research establishment in optics looks like. CREOL students showed the student and his mother active research in labs as well as demonstrations of refraction and laser operation in order to expand their expose and understanding of our field.

### Webelos Visit

Date: November 8, 2010  
Impact: 1 HS student, 1 parent  
Lead: *Lane Martin*  
Volunteers: *Lane Martin*

### Orange County Teach-In

Date: November 17, 2010  
Impact: ~150 middle school students, 3 teachers  
Lead: *Matt Weed*  
Volunteers: *Matt Weed*



As part of an Orange County wide initiative to bring community members into the classroom, CREOL was invited to give presentations to middle school students at Corner Lake Middle School to discuss optics and the career path of a scientist. A CREOL student showed various ways to make light NOT travel in a straight line in order to challenge the students' conceptions of the behaviors of light.

### **Avalon Middle School Science Night**

Date: November 30, 2010  
Impact: ~200 middle school students, 8 teachers  
Lead: *Matt Weed*  
Volunteers: *Matt Weed*

Community members and science teachers from Avalon put on a demonstrational fair at the middle school to show a variety of exciting, hands on topics ranging from astronomy to kinematics, to lasers. CREOL was invited and demonstrated how lasers work as well as diffraction gratings.

## **5.3 Conferences**

### **Congressional Visit Day**

Congressional Visit Day is an annual event sponsored by several professional societies comprising the Science, Engineering, and Technology industries. The purpose of CVD is two-fold: expose scientists and engineers to public science policy, and provide feedback to lawmakers and their staffs about how public research funding impacts their districts. Matt Weed and Chuck Williams attended as representatives from the **OSA** section at UCF for the April 28-30 2010 visit, which featured a LaserFest event where students and professionals celebrated the 50<sup>th</sup> anniversary of the Laser with members of Congress and their staffs.



Rep. Suzanne Kosmas meeting with CREOL Students during the CVD in Washington, D.C.



CREOL students presenting demonstrations during the CVD in Washington, D.C.

### **OSA Fronteers in Optics**

This year's student chapter of OSA, The Optical Society, was honored as a top-3 international finalist of the Student Chapter Excellence Award for large chapters and gave an invited presentation about effective chapter leadership at the Student Session of the Frontiers in Optics, held in October 23-28, 2010. Casey Boutwell, chapter Vice President, attended and gave a presentation about how the UCF chapter has approached educational outreach in our local community.



CREOL students honored at the OSA 2010 FIO meeting in Rochester, N.Y.

## 5.4 Seminars

1/29/2010	Hirotsugu Kikuchi Institute for Materials Chemistry and Engineering, Kyushu University, Japan	Material properties and electro-optics of polymer-stabilized blue phases, SID Student Chapter Seminar Series
2/26/2010	Jean-luc Doumont Stanford University	Making the most of your presentation.
3/1/10	Hongrui Jiang University of Wisconsin	Liquid microlenses and their biomedical applications. IEEE Student Chapter Seminar Series
3/5/2010	John Miner- Keith Engh UCF Research & Commercialization	Patents & PhDs. SPIE Professional Development Series
3/17/2010	Cun-Zheng Ning Arizona State University	Nanolasers with wires and plasmonic shells: how small can they be? IEEE Student Chapter Seminar Series
4/12/2010	Belyakov V. Aleksseevich L.D.Landau Institute for Theoretical Physics, Moscow	Localized modes in CLC and low threshold DFB lasing. IEEE & SID Student Chapter Seminar Series
4/13/2010	Sajeev John University of Toronto, Canada	Photonic band gap materials: light trapping crystals. IEEE Student Chapter Seminar Series
4/23/10	John C. Cartledge Queen's University at Kingston and Corning, Inc.	Optical and electronic signal processing for fiber-optic communications. IEEE Student Chapter Seminar Series
4/27/2010	Tetsuya Mizumoto Tokyo Institute of Technology	Optical isolator: application to photonic integrated circuits. IEEE Student Chapter Seminar Series
6/14/2010	Alan Willner University of Southern California	Towards robust and reconfigurable optical communication systems. IEEE Student Chapter Seminar Series
8/20/2010	Norbert Fruehauf University of Stuttgart, Germany	Active matrix technologies for AMLCDs and AMOLEDs. SID Student Chapter Seminar Series
9/29/2010	Yasuhiro Haseba	Optically isotropic liquid crystals for electro-optical devices. SID Student Chapter Seminar Series
10/19/10	Margaret Murnane JILA/NIST and U. of Colorado	Attosecond light and science at the timescale of the electron-coherent x-ray from tabletop ultrafast lasers.
11/10/2010	Janglin (John) Chen	E-paper technology and future development. SID Student Chapter Seminar Series