Femtosecond Laser Microfabrication (LM)
Topical Meeting and Tabletop Exhibit

Technical Conference: October 13, 2009
The Fairmont San Jose
San Jose, California, USA

Submission Deadline: June 1, 2009 8:00 a.m. EDT (12.00 GMT)
Hotel Reservation Deadline: September 11, 2009
Pre-Registration Deadline: September 16, 2009

Part of the Fall OSA Optics & Photonics Congress
Featuring Five Topical Meetings Collocated with FiO 2009/LS XXV:

Frontiers in Optics/Laser Science XXV (FiO 2009/LS XXV)
Adaptive Optics: Methods, Analysis and Applications (AO)
Advances in Optical Materials (AIOM)
Computational Optical Sensing and Imaging (COSI)
Femtosecond Laser Microfabrication (LM)
Signal Recovery and Synthesis (SRS)

2009 Meeting Chairs

Eric Mazur, *Harvard Univ., USA*
Chris Schaffer, *Cornell Univ., USA*

About LM

Lasers permit selectively removing, modifying, or depositing materials, making them an attractive tool for materials processing. Recent developments in femtosecond laser development have greatly enhanced the spatial precision of laser microprocessing and given access to new interaction mechanisms that can be utilized to alter materials in new ways.

This one-day conference will provide a forum for discussion of the fundamentals of laser-materials interactions as well as of emerging applications of lasers for microfabrication. The meeting will include invited talks from renowned experts in the field, high-profile poster presentations, and a forum discussion of the future of laser micromachining. While covering a variety of microfabrication related research, the meeting will emphasize the use of ultrashort laser pulses in microfabrication. The topics will cover the fundamentals of femtosecond laser-matter interactions, novel microprocessing techniques and applications.

Topics to be Considered

- Fundamentals of laser-material interactions
  - Linear and nonlinear absorption
  - Ablation dynamics
  - Mechanisms for bulk modification of transparent materials
  - Laser mediated material deposition
- Applications in microfabrication
  - Surface processing
  - Waveguide writing
  - Laser welding, sintering
  - Localized material deposition
  - 3-D photopolymerization

- Real-time diagnostics for microprocessing

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    - Localized material deposition
    - 3-D photopolymerization
    - Real-time diagnostics for microprocessing

Program Committee

Program Chairs

Eric Mazur, *Harvard Univ., USA*
Chris Schaffer, *Cornell Univ., USA*

Committee Members

Craig Arnold, *Princeton Univ., USA*
Costas Grigoropoulos, *Univ, of California at Berkeley, USA*
Peter Herman, *Univ. of Toronto, Canada*
Minoru Obara, *Keio Univ., Japan*
Andreas Ostendorf, *Ruhr Univ. Bochum, Germany*
Hai-Lung Tsai, *Missouri Univ. of Science and Technology, USA*

Special Events

Panel Discussion: Challenges and Opportunities in Femtosecond Laser Micromachining
Tuesday, October 13, 5:00 p.m.–6:00 p.m.
Belvedere Room, Fairmont Hotel

Attend the closing technical session, which will begin with two invited speakers (Vassilia Zorba and Y. F. Lu; see the Invited Speakers page) and will end with an exciting panel discussion, where leaders in the field share their perspective on the most significant recent advances and the most important challenges and opportunities in femtosecond laser microfabrication.

Panel participants include:

Alan Arai; *IMRA, USA*
Eric Mazur; *Harvard Univ., USA*
Andreas Ostendorf; *Ruhr-Univ. Bochum, Germany*
Chris Schaffer; *Cornell Univ., USA*

Joint AO/COSI/LM/SRS Welcome Reception and Poster Session
Tuesday, October 13, 6:00 p.m.–7:30 p.m.
Regency Ballroom, Fairmont Hotel

Get the meeting off to a great start by attending the welcome reception and joint poster session. Meet with colleagues from around the world and tour the wide range of poster displays. The reception is open to all AO/COSI/LM/SRS registered attendees and will feature light fare.

Invited Speakers

LMTuA1, **Intense Field Science in Dielectrics**, M. *Gertsvolf[1,2], D. Grojo[1], M. Spanner[1], P. P. Rajeev[1], P. B. Corkum[1,2], D. M. Rayner[1]; [1]Natl. Res. Council Canada, USA, [2]Univ. of Ottawa, Canada*

LMTuA3, **Controlling Ultrafast Laser-Induced Refractive Index Changes in Optical Glasses via Adaptive Spatio-Temporal Beam Engineering**, *Razvan Stoian; Univ. Jean Monnet, France*

LMTuB1, **Three-Dimensional Structuring of Materials by Femtosecond Laser Pulses**, *Saulius Juodkazis, Hiroaki Misawa; Hokkaido Univ., Japan*

LMTuB3, **Multifunctional Volume Optics Generated by Direct Femtosecond Laser Writing**, *Timothy D. Gerke, Rafael Piestun; Univ. of Colorado at Boulder, USA*

LMTuC1, **Recent Developments in Monolithic Fibre and Waveguide, DBR and DFB Lasers Fabricated Using Ultrafast Laser Direct-Write Methods**, *G. D. Marshall, N. Jovanovic, M. Ams, D. J. Little, P. Dekker, A. Fuerbach, M. J. Withford; Ctr. for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Australia*

LMTuC3, **Femtosecond Laser Micromachining: An Enabling Tool for Optofluidics**, *R. Osellame, R. Martinez Vazquez, R. Ramponi, G. Cerullo; Inst. di Fotonica e Nanotecnologie, CNR, Italy*

LMTuD1, **Ultrafast Laser Surface Micro/Nano-Structuring and Applications**, *Vassilia Zorba; Lawrence Berkeley Natl. Lab, USA*

LMTuD2, **Optically-Controlled Growth of Carbon Nanotubes**, *Y. F. Lu, Y. S. Zhou, W. Xiong, M. Mahjouri-Samani, Y. Gao, M. Mitchell; Univ. of Nebraska, USA*

OSA's 93RD ANNUAL MEETING AND EXHIBIT

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WWW.FRONTIERSINOPTICS.ORG

EXHIBIT GUIDE

TECHNICAL CONFERENCE

October 11 – 15, 2009

EXHIBIT

October 13 – 14, 2009

Fairmont Hotel
San Jose, California, USA

EXHIBIT HOURS

Tuesday, October 13
10:00 a.m. – 4:00 p.m.

Wednesday, October 14
10:00 a.m. – 4:00 p.m.

EXHIBIT-ONLY TIME

Tuesday, October 13
12:00 p.m. – 1:30 p.m.

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EXHIBIT AND CONFERENCE INFORMATION

	SUNDAY October 11	MONDAY October 12	TUESDAY October 13	WEDNESDAY October 14	THURSDAY October 15
Registration *Fairmont Hotel, Market Street Foyer*	7:00 a.m. – 6:00 p.m.	7:00 a.m. – 6:00 p.m.	7:00 a.m. – 5:30 p.m.	7:30 a.m. – 5:30 p.m.	7:30 a.m. – 5:00 p.m.
E-Center *Fairmont Hotel, Market Street Foyer*	7:00 a.m. – 6:00 p.m.	7:00 a.m. – 6:00 p.m.	7:00 a.m. – 5:30 p.m.	7:30 a.m. – 5:30 p.m.	7:30 a.m. – 5:00 p.m.
Press Room *Fairmont Hotel, Redwood Room*	12:00 p.m. – 4:00 p.m.	8:00 a.m. – 5:00 p.m.	8:00 a.m. – 5:00 p.m.	8:00 a.m. – 5:00 p.m.	8:00 a.m. – 12:00 p.m.
1st International OSA Student Chapter Solar Mini-Car Competition *Fairmont Hotel, Imperial Ballroom*	4:00 p.m. – 7:00 p.m. Prelim. Race		12:00 p.m. – 2:00 p.m. Final Races		
FiO/LS Welcome Reception *Sainte Claire Hotel, Ballroom*	6:00 p.m. – 7:30 p.m.				
Joint FiO/LS Plenary Session/ Award Presentations *Fairmont Hotel, Regency Ballroom*		8:00 a.m. – 12:00 p.m.			
Export Regulation Fundamentals for the Optics and Photonics Industry (Registration Required) *Sainte Claire Hotel, Sainte Claire Room*				9:00 a.m. – 12:00 p.m.	
Exhibit *Fairmont Hotel, Imperial Ballroom*			10:00 a.m. – 4:00 p.m.	10:00 a.m. – 4:00 p.m.	
Exhibit Hall Coffee Breaks *Fairmont Hotel, Imperial Ballroom*			10:00 a.m. – 10:30 a.m.	10:00 a.m. – 10:30 a.m. 3:30 p.m. – 4:00 p.m.	
Exhibit-Only Time *Fairmont Hotel, Imperial Ballroom*			12:00 p.m. – 1:30 p.m.		
Refreshment Break *Fairmont Hotel, Imperial Ballroom*			3:30 p.m. – 4:00 p.m.		
OSA Member Reception *Sainte Claire Hotel, Ballroom*			7:00 p.m. – 8:30 p.m.		
Joint FiO/LS Poster Session *Fairmont Hotel, Imperial Ballroom*				12:00 p.m. – 1:30 p.m.	

The Fall OSA Optics & Photonics Congress 2009 is collocated with FiO 2009 / LS XXV and features the following topical meetings:

- Adaptive Optics: Methods, Analysis and Applications (AO)
- Advances in Optical Materials (AIOM)
- Computational Optical Sensing and Imaging (COSI)
- Femtosecond Laser Microfabrication (LM)
- Signal Recovery and Synthesis (SRS)

Look for these meetings October 13-15 at the Fairmont San Jose.

E-Center

Fairmont Hotel, Market Street Foyer

The E-Center, offering free Internet connectivity, will be open Sunday through Thursday during registration hours.

Business Center

Fairmont Hotel, B Level

The Fairmont Hotel's in-house Business Center offers one-stop shopping for all of your business needs, including e-mail and high-speed Internet access, secretarial/transcription services, photocopying, and faxing. The business center is open 24 hours a day with a guest room key. Attendees staying at other hotels should contact an operator from a house phone to gain access to the business center. All machines require a credit card swipe to activate a session.

Lost and Found

Fairmont Hotel, Registration Desk, Market Street Foyer

For lost and found items and/or questions, please check at the registration desk. Please put your name on all conference materials (Conference Program, Technical Digest CD-ROM and Short Course Notes), as they will only be replaced for a fee.

Special Needs

If you have a disability and require special accommodations in order to fully participate in this conference, please contact Conference Management at the registration desk. Your specific needs will be addressed.

Sponsoring Society Membership Booths

Fairmont Hotel, Market Street Side

Catch up on the latest product and service offerings of the conference's sponsoring societies, APS and OSA, by visiting their membership booths.

SUNDAY

1st International OSA Student Chapter Solar Mini-Car Competition

Preliminary race: Sunday, October 11, 4:00 p.m. – 7:00 p.m.

Fairmont Hotel, Imperial Ballroom

OSA Student Chapters compete to build their own mini solar cars and race them. The chapters will work to optimize light capturing efficiency, and demonstrate sustainability and aesthetic appeal.

FiO/LS Welcome Reception

Sunday, October 11, 6:00 p.m. – 7:30 p.m.

Sainte Claire Hotel, Ballroom

Free to all Technical Conference Attendees: Get the FiO 2009/LS XXV meeting off to a great start by attending the welcome reception! Meet with colleagues from around the world. Light hors d'oeuvres will be served.

A special thanks to Thorlabs for their sponsorship of the 2009 FiO/LS Welcome Reception.

TUESDAY

1st International OSA Student Chapter Solar Mini-Car Competition

Final races: Tuesday, October 13, 12:00 p.m. – 2:00 p.m.

Fairmont Hotel, Imperial Ballroom

OSA Student Chapters compete to build their own mini solar cars and race them. The chapters will work to optimize light capturing efficiency, and demonstrate sustainability and aesthetic appeal.

Refreshment Break

Tuesday, October 13, 3:30 p.m. – 4:00 p.m.

Fairmont Hotel, Imperial Ballroom

Free to all Attendees: Enjoy a light refreshment on the Exhibit Hall Floor.

A special thanks to JK Consulting for sponsoring this event.

OSA Member Reception

Tuesday, October 13, 7:00 p.m. – 8:30 p.m.

Sainte Claire Hotel, Ballroom

Free to all OSA Members: The OSA Member Reception is a great opportunity to see old friends and establish new contacts. Appetizers and beverages will be served. Please note: Membership will be verified at the entrance.

WEDNESDAY

Export Regulation Fundamentals for the Optics and Photonics Industry

Presented by the OSA Corporate Associates

Wednesday, October 14, 9:00 a.m. – 12:00 p.m.

Sainte Claire Hotel, Sainte Claire Room

Instructor: Kay Allan Morrell, Esq.; Managing Partner and Counsel, MK Technology, USA

With the global nature of business, it is a necessity for every company employee involved in non-U.S. transactions to fully understand the regulations surrounding export controls. This program will provide the foundation by covering need-to-know information about International Traffic in Arms Regulations (ITAR), Export Administration Regulations (EAR) and your compliance, data management and licensing responsibilities. Registration required. Employees of OSA Corporate Associates receive a special registration rate.

Joint FiO/LS Poster Session

Wednesday, October 14, 12:00 p.m. – 1:30 p.m.

Imperial Ballroom, Fairmont Hotel

This year, rather than two poster sessions throughout the week, all FiO/LS posters will be presented in one session.

Make sure to visit the poster session in the Exhibit Hall to see the 75 FiO and 8 LS posters scheduled for presentation.

EXHIBIT HALL REGULATIONS

- All bags are subject to search.
- Neither photography nor videotaping is permitted without the express written consent of Show Management. Non-compliance may result in the surrendering of film or other storage device(s) and removal from the hall.
- Children under 18 are not permitted in exhibit hall during set-up and tear-down.
- Children 12 and under must be accompanied by an adult at all times.
- Strollers are not permitted on the exhibit floor at any time.
- Soliciting in the aisles or any public space is not permitted.
- Distribution of literature is limited to exhibitors and must done from within the confines of their booths. All other materials will be discarded.
- Smoking is permitted only in designated exterior areas of the facility.
- Alcohol is not permitted in the exhibit hall during set-up and tear-down hours.

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Amplitude Laser Inc.

Booth 208

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Email: rbraunschweig@amplitude-laser.com | **URL:** www.amplitude-laser.com

Amplitude Laser is the US based subsidiary for Amplitude Systemes, pioneer in Ytterbium laser technology, manufactures advanced diode-pumped ultrafast lasers for scientific, industrial and medical applications. Products include high energy oscillators (Mikan and t-Pulse series), amplifiers (s-Pulse series) and fiber amplifiers (Satsuma and Tangerine series). Today, by combining high quality manufacturing and aggressive R&D, Amplitude Systemes brings new solutions to your most demanding applications.

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CREOL, The College of Optics and Photonics

Booth 115

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Phone: 407.823.6800 | **Fax:** 407.823.6880
Email: info@creol.ucf.edu | **URL:** www.creol.ucf.edu/

CREOL, The College of Optics & Photonics at the University of Central Florida is an internationally recognized academic and research institution, offering MS and PhD degrees in Optics, and serving as a scientific and technical resource partner to industry. The College has 40 faculty, 69 research scientists, and 146 graduate students conducting research into all aspects of optics and photonics. CREOL, FPCE, and the Townes Laser Institute are centers within the College.

Optics Graduate Education: The College of Optics & Photonics offers Masters and Doctoral degrees in Optics. Additionally, optics tracks are offered within UCF's Physics and Electrical Engineering Bachelor and graduate Programs.

Elsevier

Booth 310

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FEMTOLASERS is the premier manufacturer of ultrafast laser oscillator and amplifier solutions, offering laser pulses down to sub-7 fs at MHz and multi-kHz repetition rates up to multi-mJ energies. FEMTOOPTICS features a patented optics line with ultra-broadband dispersive/non-dispersive components and custom solutions. Applications include ultrafast spectroscopy, OCT, THz-generation, MP-microscopy, micromachining and Attoscience.

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Fianium is a leading manufacturer of optical supercontinuum lasers, operating across 400-2400 nm spectral range and delivering up to 6 W of power in a collimated laser beam. These unique laser sources enable significant improvements in performance of imaging instruments, including confocal and STED microscopes, FLIM and flow-sytometry. Based on compact, maintenance free ultra-fast fiber lasers, the supercontinuum systems offer a versatile laser source for a variety of bio-medical applications.

Gooch & Housego

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Gooch & Housego is a global manufacturer of custom precision-optic, acousto-optic, crystal-optic, electro-optic and fibre-optic components, combined with material engineering, crystal growth, polishing and coating capabilities for the Aerospace & Defense, Industrial & Research and Biomedical & Life Sciences Markets.

Imagine Optic

Booth 208

Third Street, Suite 231 | San Francisco, CA 94107
Phone: 617.583.1350 | **Fax:** 617.758.4101
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URL: www.imagine-optic.com

Imagine Optic is the leading provider of Shack-Hartmann wavefront sensing hardware and software, adaptive optics technologies and professional services in applied optics. We work with scientists and industrials in domains including pure science, industrial quality control, space and defense, semiconductors and many others. Since 1996, we've been supplying industry leaders around the world with the high-quality products and services that they need to perform. From X-EUV, through the visible light spectrum and on to NIR (near infra-red), we develop, manufacture, distribute and support the largest range of wavefront measurement and correction technologies.

HASO First: The HASO First is a mono wavelegth calibration wavefront sensor taking benefits of both the calibration performances of Imagine Optic and the HASO V3 software for a very interesting price.

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Journal of Optics: As of 2010, the journal has been re-named (previously Journal of Optics A: Pure and Applied Optics).

Laser Focus World / Pennwell

Table 8

98 Spit Brook Road | Nashua, NH 03062-5737
Phone: 603.891.0123 | **Fax:** 603.891.0574
Email: aadler@pennwell.com
URL: www.laserfocusworld.com

Published since 1965, Laser Focus World is a global resource for engineers, researchers, scientists and technical professionals providing comprehensive coverage of optoelectronics and photonics technologies, applications and markets.

LaserFest

Booth 113

c/o The Optical Society
2010 Massachusetts Ave., NW | Washington, DC 20036
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Email: info@laserfest.org | **URL:** www.laserfest.org

Sponsored by Founding Partners, The Optical Society, the American Physical Society and SPIE, LaserFest is a yearlong celebration of the 50th anniversary of the laser. This celebration will recognize and honor the accomplishments of the scientists, engineers, inventors and entrepreneurs who made possible the discovery, development and application of the laser; inform students, educators, legislators, funding agencies and the general public about the impact that the laser has had on the economy and how it has affected and continues to affect their lives in many ways; and use the story of the laser to illustrate the importance of scientific discovery and technological innovation.

MPF Products, Inc.

Table 10

3046 Bramlett Church Road | Gray Court, SC 29645
Phone: 864.876.9853 | **Fax:** 864.876.2465
Email: sales@mpfpi.com | **URL:** www.mpfpi.com

MPF Products, Inc. specializes in ceramic-to-metal sealing technology. We offer UHV rated electrical feedthroughs, connectors, isolators and viewports. MPF stocks more than 1300 standard parts, and produces custom assemblies with highly competitive costs and lead times. MPF's Viewports are used for energy transmission into vacuum systems. MPF offers several material options – sapphire, fused silica, MgF^2, CaF^2, ZnSe and other advanced materials. Single and multi-layer coatings can be added to viewports to optimize transmission performance.

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Nature Publishing Group

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OPN

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Optics & Photonics News (OPN) is a global news and information source that is consistently ranked by OSA members as their #1 member benefit. OPN is published by The Optical Society (OSA), the association that brings together optics and photonics scientists, engineers, educators, technicians and business leaders. OPN's circulation consists of the members of OSA and The Society for Applied Spectroscopy as well as a select group of qualified professionals.

OP-TEC: National Center for Optics and Photonics Education

Table 6

324B Kelly Drive | Waco, TX 76710
Phone: 254.741.8338 | **Fax:** 254.399.6581
Email: op-tec@op-tec.org | **URL:** www.op-tec.org

OP-TEC, the National Center for Optics and Photonics Education, is funded by the National Science Foundation's Advanced Technological Education (ATE) program. OP-TEC has developed materials and strategies for infusing optics and photonics into curriculum for several industries and is committed to developing a robust supply of well-educated engineering technicians in photonics, lasers and related technologies. OP-TEC has also begun to plan and enlist colleges and employers to begin education/training programs for Precision Optics Technicians.

Optikos Corporation

OSA Corporate Member

Table 7

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Table 9

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Established in 2004 by The Optical Society (OSA), the OSA Foundation (OSAF) is a charitable organization dedicated to supporting programs that: advance youth science education, provide optics education and resources to underserved populations, provide career and professional development resources and support awards and honors that recognize technical and business excellence. Over the last six years, the OSAF has funded over 150 grant programs that have benefited thousands of individuals in more than 40 countries.

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Booth 203

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Email: info@osa.org | **URL:** www.opticsinfobase.org

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Photonics Media

Booth 302

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Email: photonics@laurin.com | **URL:** www.photonics.com

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Physics Today

Table 1

One Physics Ellipse | College Park, MD 20740
Phone: 301.209.3043 | **Fax:** 301.209.3692
Email: alcolema@aip.org | **URL:** www.physicstoday.org

Physics Today is the #1 publication for the physical sciences worldwide. Read by 125,000 scientists and engineers, *Physics Today* penetrates research labs better than other scientific trade publications.

PolarOnyx, Inc.

Booth 202

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Society of Vacuum Coaters

Table 1

171 Pinon Hill Place | Albuquerque, NM 87122
Phone: 505.856.7188 | **Fax:** 505.856.6716
Email: svcinfo@svc.org | **URL:** www.svc.org

Vision of the Society of Vacuum Coaters: To be the global source for learning, applying and advancing vacuum coating, surface engineering, and related technologies. Mission of the Society of Vacuum Coaters: To foster technical excellence by providing a global forum to inform and educate the members, the technical community, and the public on all aspects of vacuum coating, surface engineering and related technologies. Visit the SVC Web Site at www.svc.org.

Stanford Photonics Research Center

Booth 215

Ginzton Laboratory – AP 207 | Stanford University
Stanford, CA 94305-4088
Phone: 650.723.5627 | **Fax:** 650.725.1822
Email: photonics@stanford.edu
URL: http://photonics.stanford.edu

SPRC builds strategic partnerships between the Stanford photonics research community and member companies. SPRC, one of the largest photonics programs in the US, brings together approximately 200 core photonics professors, graduate students and postdoctoral research associates in the Schools of Engineering, Humanities & Sciences, and Medicine.

Swamp Optics, LLC

OSA Corporate Member

Table 3

6300 Powers Ferry R, Ste. 600-345 | Atlanta, GA 30339-2919
Phone: 404.547.9267 | **Fax:** +1 866.855.4518
URL: www.swampoptics.com
Email: linda.trebino@swampoptics.com

Swamp Optics offers compact, convenient devices for measuring ultrashort laser pulses in real time and which yield the most complete measurements ever and include the beam spatial profile and spatio-temporal distortions. Awards include an R&D100 award and a Circle of Excellence award. Swamp Optics also offers custom devices for nearly every pulse-measurement problem, and we recently introduced a compact pulse compressor automatically free of distortions and very inexpensive.

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Booth 214

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Thorlabs

OSA Corporate Member

Booth 107

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Phone: 973.300.3000 | **Fax:** 973.300.3600
Email: sales@thorlabs.com | **URL:** www.thorlabs.com

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University of Arizona College of Optical Sciences

Booth 205

1630 E University Blvd. | PO Box 210094
Tucson, AZ 85721-0094
Phone: 520.621.4111 | **Fax:** 520.626.1480
URL: www.optics.arizona.edu

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University of Rochester, The Institute of Optics

Booth 105

Wilmot Bldg., R.C. | Rochester, NY 14627
Phone: 585.275.2322 | **Fax:** 585.271.1027
Email: gayle@optics.rochester.edu
URL: www.optics.rochester.edu

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Booth 200

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Zygo Corporation

Booth 206

21 Laurel Brook Road | Middlefield, CT 06455
Phone: 860.347.8506 | **Fax:** 860.347.3869
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Agenda of Sessions — Sunday, October 11

7:00 a.m.–3:00 p.m.	**OSA Student Chapter Leadership Meeting,** *Plaza Ballroom, Crowne Plaza Hotel*
7:00 a.m.–6:00 p.m.	**Registration,** *Market Street Foyer, Fairmont Hotel*
9:00 a.m.–12:30 p.m.	**Short Courses,** *Locations will be provided at registration* **SC235: Nanophotonics: Materials, Fabrication and Characterization,** *Joseph W. Haus, Andrew Sarangan, Qiwen Zhan; Univ. of Dayton, USA* **SC324: Plasmonics,** *Stefan Maier; Experimental Solid State Group, Dept. of Physics, Imperial College London, UK* **SC326: Patent Fundamentals,** *Mohammed N. Islam; Optics and Photonics and Solid State Electronics Lab, Dept. of Electrical Engineering and Computer Science, Univ. of Michigan, USA*
12:30 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*
1:30 p.m.–5:00 p.m.	**Short Courses,** *Locations will be provided at registration* **SC274: Polarization Engineering,** *Russell Chipman; Univ. of Arizona, USA* **SC322: Silicon Nanophotonics,** *Jelena Vučković; Edward L. Ginzton Lab, Stanford Univ., USA* **SC340: Tissue Optics and Optical Coherence Tomography,** *Kirill Larin[1], Valery V. Tuchin[2]; [1]Univ. of Houston, USA, [2]Saratov State Univ., Russian Federation*
4:00 p.m.–6:00 p.m.	**What's Hot in Optics Today?** *Regency Ballroom, Fairmont Hotel*
4:00 p.m.–7:00 p.m.	**1st International OSA Student Chapter Solar Mini-Car Preliminary Races,** *Imperial Ballroom, Fairmont Hotel*
6:00 p.m.–7:30 p.m.	**FiO/LS Welcome Reception,** *Ballroom, Sainte Claire Hotel*

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Frontiers in Optics | Laser Science | Joint | Fall OSA Optics & Photonics Congress

Agenda of Sessions — Monday, October 12

	Empire	Crystal	Gold	Valley	California
7:00 a.m.–6:00 p.m.	**Registration,** *Market Street Foyer, Fairmont Hotel*				
8:00 a.m.–12:00 p.m.	**2009 Joint FiO/LS Awards Ceremony and Plenary Session,** *Regency Ballroom, Fairmont Hotel*				
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Regency and Imperial Ballroom Foyer, Fairmont Hotel*				
12:00 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*				
12:00 p.m.–2:00 p.m.	**LSMA: Laser Science Symposium on Undergraduate Research Posters,** *Cupertino Room, Fairmont Hotel*				
1:30 p.m.–3:30 p.m.	**JMA: Entanglement Generation and Measurement I** (Joint FiO/LS)	**FMA: Metamaterials I**	**FMB: Optics for Renewable Energy**	**FMC: Anderson Localization I**	**FMD: RF Photonics**
3:30 p.m.–4:00 p.m.	**Coffee Break,** *Regency and Imperial Ballroom Foyer, Fairmont Hotel*				
4:00 p.m.–6:00 p.m.	**FMG: Quantum Optics in Waveguides I**	**FMH: Metamaterials II** (ends at 5:45 p.m.)	**JMB: Gravitational Wave Interferometers I** (Joint FiO/LS)	**FMI: High Peak Power Laser Technology I** (ends at 5:45 p.m.)	**FMJ: Integrated Optical Sensors**
6:30 p.m.–8:30 p.m.	**OSA Student Member Reception,** *O'Flaherty's Irish Pub, 25 N. Pedro Street, San Jose, California 95110, Phone: 408.947.8007*				

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Glen Ellen	Atherton	Sacramento	Piedmont	Hillsborough	Fairfield
Registration, *Market Street Foyer, Fairmont Hotel*					
2009 Joint FiO/LS Awards Ceremony and Plenary Session, *Regency Ballroom, Fairmont Hotel*					
Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*					
Lunch Break *(on your own)*					
LSMA: Laser Science Symposium on Undergraduate Research Posters, *Cupertino Room, Fairmont Hotel*					
FME: Tissue Imaging and Spectroscopy	**FMF: Spatial Nonlinearities: Solitons and Beams**	**LSMB: Advances in Chiroptical Spectroscopy I**	**LSMC: Micro- and Nanofluidics I** (ends at 3:15 p.m.)	**LSMD: Ultrafast X-Ray Science I**	**LSME: Laser Science Symposium on Undergraduate Research I** (2:00 p.m.–4:00 p.m.)
Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*					
FMK: Microscopy and OCT I	**FML: Silicon Photonics I**	**LSMF: Advances in Chiroptical Spectroscopy II** (ends at 5:30 p.m.)	**LSMG: Micro- and Nanofluidics II** (ends at 6:15 p.m.)	**LSMH: Ultrafast X-Ray Science II** (ends at 5:45 p.m.)	**LSMI: Laser Science Symposium on Undergraduate Research II** (4:30 p.m.–6:30 p.m.)
OSA Student Member Reception, *O'Flaherty's Irish Pub, 25 N. Pedro Street, San Jose, California 95110, Phone: 408.947.8007*					

Agenda of Sessions — Tuesday, October 13

	Empire	Crystal	Gold	Valley	California	Glen Ellen
7:00 a.m.–5:30 p.m.	**Registration,** *Market Street Foyer, Fairmont Hotel*					
8:00 a.m.–10:00 a.m.	**FTuA: 3-D Entertainment in the Marketplace** (ends at 9:30 a.m.)	**FTuB: Plasmonic Emitters and Resonators**	**JTuA: Gravitational Wave Interferometers II** (Joint FiO/LS) (ends at 10:15 a.m.)	**FTuC: Optical Communication** (ends at 10:15 a.m.)	**FTuD: Novel Fiber Devices I**	**JTuB: Entanglement Generation and Measurement II** (Joint FiO/LS)
8:00 a.m.–9:30 a.m.	**OSA Young Professionals Networking Event with Corporate Members,** *Courtyard Atrium, Sainte Claire Hotel*					
9:00 a.m.–12:00 p.m.	**Student Programming: Painless Publishing, Science Policy and OSA Traveling Lecturer,** *Regency Ballroom II, Fairmont Hotel*					
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Imperial Ballroom, Fairmont Hotel*					
10:00 a.m.–4:00 p.m.	**Exhibit Hall Open,** *Imperial Ballroom, Fairmont Hotel*					
10:30 a.m.–12:00 p.m.	**FTuF: 3-D Capturing, Visualization and Displays**	**FTuG: Wavefront Design for Information Transport and Sensing I** (ends at 11:45 a.m.)	**FTuH: Diffractive and Holographic Optics I**	**FTuI: All-Optical Signal Processing I**	**FTuJ: Anderson Localization II**	**FTuK: High Peak Power Laser Technology II**
12:00 p.m.–1:30 p.m.	**Exhibit Only Time,** *Imperial Ballroom, Fairmont Hotel*					
12:00 p.m.–2:00 p.m.	**1st International OSA Student Chapter Solar Mini-Car Final Races,** *Imperial Ballroom, Fairmont Hotel*					
12:00 p.m.–1:30 p.m.	**OSA Fellow Member Lunch,** *Silicon Valley Capital Club, 50 W. San Fernando, Suite 1700, San Jose, California 95113, Phone: 408.971.9300*					
12:00 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*					
1:30 p.m.–3:30 p.m.	**FTuM: Emerging 3-D Display Technologies and Research Frontiers I** (ends at 3:00 p.m.)	**FTuN: Negative Index Materials and Cloaking**	**FTuO: Diffractive and Holographic Optics II**	**FTuP: Optical Access**	**FTuQ: Light in the Eye**	**FTuR: Rogue Waves and Related Phenomena**
3:30 p.m.–4:00 p.m.	**Coffee Break/Exhibits,** *Imperial Ballroom, Fairmont Hotel*					
3:30 p.m.–5:30 p.m.	**Meet the Editors of the APS Journals,** *Bamboo Lounge, Fairmont Hotel*					
4:00 p.m.–5:30 p.m.	**FTuT: Emerging 3-D Display Technologies and Research Frontiers II**	**FTuU: Wavefront Design for Information Transport and Sensing II**	**FTuV: Metamaterials in Emerging Technologies**	**FTuW: All-Optical Signal Processing II**	**FTuX: Novel Optics of Periodic Structures**	**FTuY: Optical Biosensing** (ends at 5:45 p.m.)
4:30 p.m.–5:30 p.m.	**Minorities and Women in OSA (MWOSA) Tea,** *Sainte Claire Room, Sainte Claire Hotel*					
6:00 p.m.–7:00 p.m.	**OSA Annual Business Meeting,** *Piedmont Room, Fairmont Hotel*					
6:00 p.m.–7:00 p.m.	**DLS Annual Business Meeting,** *California Room, Fairmont Hotel*					
6:00 p.m.–7:30 p.m.	**JTuC: Joint AO/COSI/LM/SRS Welcome Reception and Poster Session,** *Regency Ballroom, Fairmont Hotel*					
7:00 p.m.–8:30 p.m.	**OSA Member Reception,** *Ballroom, Sainte Claire Hotel*					
7:00 p.m.–10:00 p.m.	**Laser Science Banquet,** *Gordon Biersch, 33 East San Fernando Street, San Jose, California, Phone: 408.294.6785*					

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				Fall OSA Optics & Photonics Congress			
				AO	LM	COSI	SRS
Atherton	**Sacramento**	**Piedmont**	**Hillsborough**	**Fairfield**	**Belvedere**	**Club Regent**	**Cupertino**
Registration, *Market Street Foyer, Fairmont Hotel*							
FTuE: Fiber Optics Sensors	**LSTuA: General Laser Science**	**LSTuB: Cavity Optomechanics I**	**LSTuC: Ultrafast X-Ray Science III**	**AOTuA: Adaptive Optics Systems I** (ends at 9:50 a.m.)	**LMTuA: Fundamentals of Femtosecond Laser Interactions with Materials**	**CTuA: Computational Imaging and Compressive Sensing**	**STuA: Imaging from Limited and Compressed Data**
OSA Young Professionals Networking Event with Corporate Members, *Courtyard Atrium, Sainte Claire Hotel*							
Student Programming: Painless Publishing, Science Policy and OSA Traveling Lecturer, *Regency Ballroom II, Fairmont Hotel*							
Coffee Break, *Imperial Ballroom, Fairmont Hotel*							
Exhibit Hall Open, *Imperial Ballroom, Fairmont Hotel*							
FTuL: Molecular Imaging and Nanomedicine	**LSTuD: Photophysics of Quantum Dots and Nanostructures I**	**LSTuE: Cavity Optomechanics II**	**LSTuF: Micro- and Nanofluidics III**	**AOTuB: Wavefront Sensing I**	**LMTuB: Three-Dimensional Micromachining with Femtosecond Lasers**	**CTuB: Light Field Representations**	**STuB: Inverse Scattering**
Exhibit Only Time, *Imperial Ballroom, Fairmont Hotel*							
1st International OSA Student Chapter Solar Mini-Car Final Races, *Imperial Ballroom, Fairmont Hotel*							
OSA Fellow Member Lunch, *Silicon Valley Capital Club, 50 W. San Fernando, Suite 1700, San Jose, California 95113, Phone: 408.971.9300*							
Lunch Break *(on your own)*							
FTuS: Short Wavelength Generation and Applications I: From EUV to X-Rays (ends at 3:15 p.m.)	**LSTuG: Optoelectronic Materials Characterization** (ends at 3:45 p.m.)	**LSTuH: Cavity Optomechanics III**	**LSTuI: High Field Dynamics I**	**AOTuC: High Contrast Imaging and Point Spread Function Calibration I** (ends at 3:10 p.m.)	**LMTuC: Fabrication of Waveguides with Femtosecond Laser Systems**	**CTuC: Constraints on Imaging**	**STuC: Atmospheric Imaging**
Coffee Break/Exhibits, *Imperial Ballroom, Fairmont Hotel*							
Meet the Editors of the APS Journals, *Bamboo Lounge, Fairmont Hotel*							
FTuZ: Short Wavelength Generation and Applications II: Spectroscopy and Microscopy	**LSTuJ: Photophysics of Quantum Dots and Nanostructures II**	**LSTuK: Cavity Optomechanics IV** (ends at 5:15 p.m.)	**LSTuL: High Field Dynamics II** (ends at 5:45 p.m.)	**AOTuD: System Simulation and Modeling I** (ends at 5:20 p.m.)	**LMTuD: Surface Processing and Panel Discussion on Femtosecond Laser Micromachining** (ends at 6:00 p.m.)	**CTuD: 3-D Imaging and PSF Design** (ends at 5:45 p.m.)	**STuD: Time-Frequency and Phase-Space Methods** (ends at 5:15 p.m.)
Minorities and Women in OSA (MWOSA) Tea, *Sainte Claire Room, Sainte Claire Hotel*							
OSA Annual Business Meeting, *Piedmont Room, Fairmont Hotel*							
DLS Annual Business Meeting, *California Room, Fairmont Hotel*							
JTuC: Joint AO/COSI/LM/SRS Welcome Reception and Poster Session, *Regency Ballroom, Fairmont Hotel*							
OSA Member Reception, *Ballroom, Sainte Claire Hotel*							
Laser Science Banquet, *Gordon Biersch, 33 East San Fernando Street, San Jose, California, Phone: 408.294.6785*							

Agenda of Sessions — Wednesday, October 14

	Empire	Crystal	Gold	Valley	California	Glen Ellen
7:30 a.m.–5:30 p.m.	**Registration,** *Market Street Foyer, Fairmont Hotel*					
8:00 a.m.–10:00 a.m.	**FWA: Biomedical Applications of Ultrafast Lasers**	**FWB: Optical Information Processing and Transport in the Age of Nanophotonics and Metamaterials**	**FWC: Extraordinary Transmission and Structured Surface**	**FWD: Turbulence and Other Nonlinear Phenomena**	**FWE: Novel Fiber Devices II** (ends at 9:45 a.m.)	**FWF: Photonic Bandgap Devices** (ends at 9:45 a.m.)
9:00 a.m.–12:00 p.m.	**Export Regulation Fundamentals for the Optics and Photonics Industry,** *Sainte Claire Room, Sainte Claire Hotel*					
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Imperial Ballroom, Fairmont Hotel*					
10:00 a.m.–4:00 p.m.	**Exhibit Hall Open,** *Imperial Ballroom, Fairmont Hotel*					
10:30 a.m.–12:00 p.m.	**FWH: Coherence and Fundamental Optics I** (ends at 12:15 p.m.)	**FWI: Optics in Information Sciences**	**FWJ: Quantum Optics in Waveguides II** (ends at 12:15 p.m.)	**FWK: All-Optical Signal Processing III**	**FWL: Optical Communication Devices**	**FWM: Optical Trapping and Micromanipulation I** (ends at 11:45 a.m.)
12:00 p.m.–1:30 p.m.	**JWC: Joint FiO/LS Poster Session,** *Imperial Ballroom, Fairmont Hotel*					
12:00 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*					
1:30 p.m.–3:30 p.m.	**JWD: Entanglement Generation and Measurement III** (Joint FiO/LS)	**FWO: OSA Topical Meeting Highlights I**	**FWP: Metamaterials III**	**FWQ: Phase Space Optics—Optical System Theory for the 21st Century I** (ends at 3:15 p.m.)	**FWR: Novel Optical Architectures in Emerging Technologies I**	**FWS: Optical Trapping and Micromanipulation II**
3:30 p.m.–4:00 p.m.	**Coffee Break/Exhibits,** *Imperial Ballroom, Fairmont Hotel*					
4:00 p.m.–5:30 p.m.	**FWU: Coherence and Fundamental Optics II**	**FWV: OSA Topical Meeting Highlights II**	**JWE: Entanglement Generation and Measurement IV** (Joint FiO/LS) (ends at 6:00 p.m.)	**FWW: Phase Space Optics—Optical System Theory for the 21st Century II**	**FWX: Novel Optical Architectures in Emerging Technologies II**	**FWY: Optical Trapping and Micromanipulation III**
6:30 p.m.–8:00 p.m.	**FiO Postdeadline Paper Sessions,** *See the Postdeadline Papers Book in your registration bag for exact times and locations*					
6:30 p.m.–8:00 p.m.	**AIOM Welcome Reception,** *Regency Ballroom I, Fairmont Hotel*					

Key to Shading

Frontiers in Optics | Laser Science | Joint | Fall OSA Optics & Photonics Congress

				AO	AIOM	COSI	SRS
Atherton	**Sacramento**	**Piedmont**	**Hillsborough**	**Fairfield**	**Belvedere**	**Club Regent**	**Cupertino**
Registration, *Market Street Foyer, Fairmont Hotel*							
FWG: Photonic Sensing Devices	**LSWA: Single-Molecule Biophysics I**	**LSWB: Second-Order Nonlinear Optics I**	**LSWC: Multidimensional Spectroscopy I**		**AWA: Semiconductor Materials** (ends at 9:45 a.m.)	**JWA: Joint AO/COSI/SRS Session**	
Export Regulation Fundamentals for the Optics and Photonics Industry, *Sainte Claire Room, Sainte Claire Hotel*							
Coffee Break, *Imperial Ballroom, Fairmont Hotel*							
Exhibit Hall Open, *Imperial Ballroom, Fairmont Hotel*							
FWN: Silicon Photonics II	**LSWD: Single-Molecule Biophysics II**	**LSWE: Second-Order Nonlinear Optics II**	**LSWF: Multidimensional Spectroscopy II**	**AOWA: High Contrast Imaging and Point Spread Function Calibration II** (ends at 11:50 a.m.)	**AWB: Laser-Material Interactions** (ends at 11:45 a.m.)	**CWA: Polarization Sensing and Imaging**	**JWB: Advances in Adaptive Optics Imaging of the Living Retina I** (Joint AO/FiO)
JWC: Joint FiO/LS Poster Session, *Imperial Ballroom, Fairmont Hotel*							
Lunch Break *(on your own)*							
FWT: Plasmonic Sensors (ends at 3:15 p.m.)	**LSWG: Ultrafast Spectroscopy I**	**LSWH: Second-Order Nonlinear Optics III** (ends at 3:15 p.m.)	**LSWI: Multidimensional Spectroscopy III** (ends at 3:00 p.m.)	**AOWB: Control Algorithms and Architecture**	**AWC: Oxide Crystals** (ends at 3:15 p.m.)	**CWB: Multi Aperture Systems** (ends at 3:15 p.m.)	**SWA: Phase Retrieval Methods** (ends at 3:15 p.m.)
Coffee Break/Exhibits, *Imperial Ballroom, Fairmont Hotel*							
FWZ: Silicon Photonics III	**LSWJ: Ultrafast Spectroscopy II** (ends at 6:15 p.m.)	**LSWK: Second-Order Nonlinear Optics IV** (ends at 5:45 p.m.)		**JWF: Advances in Adaptive Optics Imaging of the Living Retina II** (Joint AO/FiO)	**AWD: Optical Ceramics**		
FiO Postdeadline Paper Sessions, *See the Postdeadline Papers Book in your registration bag for exact times and locations*							
AIOM Welcome Reception, *Regency Ballroom I, Fairmont Hotel*							

Agenda of Sessions — Thursday, October 15

	Empire	Crystal	Gold	Valley	California
7:30 a.m.–5:00 p.m.	**Registration,** *Market Street Foyer, Fairmont Hotel*				
8:00 a.m.–10:00 a.m.	**LSThA: X-Ray Imaging I**	**FThA: Nanofocusing Optics I**	**FThB: Diffractive and Holographic Optics III**	**FThC: Micro-Cavity Devices I**	**FThD: High-Power Fiber Lasers I**
10:00 a.m.–10:30 a.m.	**Coffee Break,** *Regency and Imperial Ballroom Foyer, Fairmont Hotel*				
10:30 a.m.–12:00 p.m.	**LSThC: X-Ray Photon Correlation Spectroscopy**	**FThG: Nanofocusing Optics II**	**FThH: Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment I** (ends at 11:45 a.m.)	**FThI: Novel Nonlinear Optical Phenomena**	**FThJ: High-Power Fiber Lasers II**
12:00 p.m.–1:30 p.m.	**Lunch Break** *(on your own)*				
1:30 p.m.–3:30 p.m.	**LSThE: X-Ray Imaging II** (ends at 2:45 p.m.)	**FThM: Nanoscale Methods and Instruments I**	**FThN: Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment II**	**FThO: Micro-Cavity Devices II**	**FThP: Optics in Interventional Medicine**
3:30 p.m.–4:00 p.m.	**Coffee Break,** *Regency and Imperial Ballroom Foyer, Fairmont Hotel*				
4:00 p.m.–6:00 p.m.	**FThS: Optical Nonlinear Properties of Materials** (ends at 5:45 p.m.)	**FThT: Nanoscale Methods and Instruments II** (ends at 5:15 p.m.)		**FThU: Micro-Cavity Devices III**	
5:30 p.m.–8:00 p.m.	**Science Educators' Day,** *McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021*				

Key to Shading

Frontiers in Optics | Laser Science | Joint | Fall OSA Optics & Photonics Congress

			Fall OSA Optics & Photonics Congress		
			AO	AIOM	COSI
Glen Ellen	**Atherton**	**Sacramento**	**Fairfield**	**Belvedere**	**Club Regent**
Registration, *Market Street Foyer, Fairmont Hotel*					
FThE: Integrated Optics	**LSThB: Single-Molecule Biophysics III**	**FThF: Polarization and Birefringence in Optical Design I**	**AOThA: Adaptive Optics Systems II** (ends at 9:40 a.m.)	**AThA: Nanostructured Materials** (ends at 9:30 a.m.)	**CThA: New Imaging Concepts**
Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*					
FThK: Optoelectronics	**LSThD: Single-Molecule Biophysics IV**	**FThL: Polarization and Birefringence in Optical Design II** (ends at 11:45 a.m.)	**AOThB: System Simulation and Modeling II** (ends at 11:30 a.m.)	**AThB: Applications of Nanophotonics**	**CThB: Pupil Encoding Methods** (ends at 12:15 p.m.)
Lunch Break *(on your own)*					
FThQ: Molecular Imaging in the Eye	**LSThF: Single-Molecule Biophysics V** (ends at 3:00 p.m.)	**FThR: Computational Imaging and Photography I**	**AOThC: Wavefront Sensing II** (ends at 3:10 p.m.)	**AThC: Glass Synthesis and Properties** (ends at 3:15 p.m.)	**CThC: Imaging through Complex Media and Spectroscopy** (ends at 3:00 p.m.)
Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*					
FThV: Microscopy and OCT II	**FThW: Plasmonic Waveguides and Devices** (ends at 5:45 p.m.)	**FThX: Computational Imaging and Photography II**	**AOThD: Wavefront Correction Technology** (ends at 5:30 p.m.)	**AThD: Optical Fibers**	**CThD: COSI Panel Discussion** (4:00 p.m.–5:00 p.m.)
Science Educators' Day, *McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021*					

Fairfield — AO

8:00 a.m.–9:50 a.m.
AOTuA • Adaptive Optics Systems I
Richard M. Myers; Univ. of Durham, UK, Presider

AOTuA1 • 8:00 a.m. Invited
A New Sodium Guidestar Adaptive Optics System for the Starfire Optical Range 3.5m Telescope, *Robert Johnson[1], Dennis Montera[1], Timothy Schneeberger[2], James Spinhirne[2]; [1]Starfire Optical Range, AFRL/DES, USA, [2]Boeing Co., USA.* A new adaptive optics system is being installed on the Starfire 3.5m telescope, using the existing 50W pump to create a sodium guidestar. Transmission to the wavefront sensor is improved from 0.16 to 0.67.

AOTuA2 • 8:30 a.m.
High-Resolution Lidar Observations of Mesospheric Sodium and Implications for Adaptive Optics, *Paul Hickson, Thomas Pfrommer; Univ. of British Columbia, Canada.* We describe new observations of sodium density variability obtained with a high-resolution lidar system. These show significant mean altitude variations extending to frequencies above 1 Hz with a near-Kolmogorov spectrum.

AOTuA3 • 8:50 a.m.
ARGOS: The LBT's Laser-Guided Adaptive Optics System, *Michael Hart[1], Sebastian Rabien[2], Simone Esposito[3], Lorenzo Busoni[3]; [1]Steward Observatory, Univ. of Arizona, USA, [2]Max-Planck-Inst. fuer Extraterrestrische Physik, Germany, [3]Osservatorio Astrofisico di Arcetri, Italy.* The Large Binocular Telescope is adding a constellation of Rayleigh laser guide stars to implement ground-layer AO over a 4 arc minute field. A further upgrade will add sodium lasers to provide diffraction-limited operation.

AOTuA4 • 9:10 a.m.
Laboratory Experiments of Laser Tomographic Adaptive Optics at Visible Wavelengths, *Mark Ammons, Luke Johnson, Donald T. Gavel, Renate Kupke, Claire E. Max; Ctr. for Adaptive Optics, Univ. of California at Santa Cruz, USA.* We review laboratory experiments of Laser Tomographic Adaptive Optics (LTAO) on a simulated 10-meter telescope testbed at 710 nm. The system maintains 20-35% Strehl across 45" over the equivalent of 0.8 seconds of operation.

Belvedere — LM

8:00 a.m.–10:00 a.m.
LMTuA • Fundamentals of Femtosecond Laser Interactions with Materials
Eric Mazur; Harvard Univ., USA, Presider

LMTuA1 • 8:00 a.m. Invited
Intense Field Science in Dielectrics, *M. Gertsvolf[1,2], D. Grojo[1], M. Spanner[1], P. P. Rajeev[1], P. B. Corkum[1,2], D. M. Rayner[1]; [1]Natl. Res. Council Canada, USA, [2]Univ. of Ottawa, Canada.* We develop the relationship between intense field ionization in the gas phase and the interaction of femtosecond laser pulses with bulk dielectrics. We establish that sub-cycle dynamics can be observed in solids.

LMTuA2 • 8:30 a.m.
Interference Measurements of Parallel Femtosecond-Laser-Induced Phenomena, *Yoshio Hayasaki, Mitsuhiro Isaka, Akihiro Takita; Utsunomiya Univ., Japan.* Time-resolve pump-probe interference microscope was performed to investigate laser-induced phenomena in parallel femtosecond laser processing. We observed the dynamics of the phenomena and their interaction including microplasma and shockwaves.

LMTuA3 • 8:45 a.m. Invited
Controlling Ultrafast Laser-Induced Refractive Index Changes in Optical Glasses via Adaptive Spatio-Temporal Beam Engineering, *Razvan Stoian; Univ. Jean Monnet, France.* Spatio-temporal beam engineering can adaptively regulate the energy exposure, enabling a synergetic interaction between light and matter. We discuss the possibility of controlling refractive index changes and explore the potential for parallel photo inscription.

LMTuA4 • 9:15 a.m.
Effect of Pulse Shaping on Micromachining Transparent Dielectrics, *Jay D. Shah, Tissa C. Gunaratne, Xin Zhu, Vadim Lozovoy, Marcos Dantus; Michigan State Univ., USA.* Successful efforts made with silicon micromachining prompts novel methods to study the femtosecond-laser induced ablation of transparent dielectrics. Characterized AFM images of the ablated surfaces will be presented.

Club Regent — COSI

8:00 a.m.–10:00 a.m.
CTuA • Computational Imaging and Compressive Sensing
Michael A. Fiddy; Univ. of North Carolina, USA, Presider

CTuA1 • 8:00 a.m. Invited
Computational Photography, *Ramesh Raskar; MIT, USA.* The goal is to create an entirely new class of imaging platforms that have an understanding of the world that far exceeds human ability and produce meaningful abstractions that are well within human comprehensibility.

CTuA2 • 8:30 a.m. Invited
Task-Specific Compressive Imaging, *Mark Allen Neifeld; Univ. of Arizona, USA.* Compressive imaging enables optimal use of collected photons. We discuss the implications on image fidelity and task-specific implementations for motion detection, target recognition, and object tracking using both static and adaptive measurements.

CTuA3 • 9:00 a.m.
Millimeter-Wave Imaging Using *k*-Space Compression, *Christy Fernandez-Cull[1], David Brady[1], David A. Wikner[2], Joseph N. Mait[2]; [1]Duke Univ., USA, [2]US ARL, USA.* We apply compression in the spatial frequency domain to generate millimeter wave images. Simulations indicate the efficacy of the approach. We are in the process of testing the system experimentally.

CTuA4 • 9:15 a.m.
An Efficient Method for Multi-Dimensional Compressive Imaging, *Yair Rivenson, Adrian Stern; Ben-Gurion Univ. of the Negev, Israel.* In previous work we have demonstrated that using a separable imaging operator overcomes practical difficulties of 2-D compressive imaging. Here we extend the separability notion to multidimensional imaging and present the implementation issues it addresses.

Cupertino — SRS

8:00 a.m.–10:00 a.m.
STuA • Imaging from Limited and Compressed Data
Markus Testorf; Dartmouth College, USA, Presider

STuA1 • 8:00 a.m. Invited
Image Reconstruction from Highly Sparse Data in Advanced Tomographic Imaging, *Xiaochuan Pan; Univ. of Chicago, USA.* Tomographic imaging techniques are found widely in applications in biomedicine, industrial non-destructive, and security applications. We discuss some of the recent algorithm developments for accurate image reconstruction from highly sparse data in advanced tomographic imaging.

STuA2 • 8:30 a.m.
Bayesian Multiresolution Method for Local Tomography, *Kati Niinimäki[1], Ville P. Kolehmainen[1], Samuli Siltanen[2]; [1]Univ. of Kuopio, Finland, [2]Dept. of Mathematics, Univ. of Helsinki, Finland.* We present a wavelet based multiresolution model for local tomography. Reconstruction model is reduced by discarding fine-scale wavelets outside the region-of-interest (ROI). The approach allows significant model reduction without loss of accuracy in the ROI.

STuA3 • 8:45 a.m.
On Improved Temporal Resolution for Magnetic Resonance Angiography, *Phil Bones, Bing Wu, Bahereh Vafadar, Anthony Butler, Richard Watts; Univ. of Canterbury, New Zealand.* Use of a support constraint derived from a complete k-space acquisition combined with progressive k-space sampling allows improved and adaptive time resolution to be achieved in parallel magnetic resonance angiography (MRA).

STuA4 • 9:00 a.m.
Sparse Reconstruction of Complex Signals in Compressed Sensing Terahertz Imaging, *Zhimin Xu[1], Wai Lam Chan[2], Daniel M. Mittleman[2], Edmund Y. Lam[1]; [1]Dept. of Electrical and Electronic Engineering, Univ. of Hong Kong, Hong Kong, [2]Dept. of Electrical and Computer Engineering, Rice Univ., USA.* In reconstructing complex signals, many existing methods apply regularization on magnitude only. We show that by adding control on phase, reconstruction quality can be improved. This is demonstrated in a compressed sensing terahertz imaging system.

STuA5 • 9:15 a.m.
Multi-Frequency Inverse Scattering by Compressed Sensing, *Albert Fannjiang; Univ. of California at Davis, USA.* Inverse-scattering schemes based on the restricted isometry property (RIP) in compressed sensing are proposed and analyzed. The methods employ randomly and repeatedly (multiple-shot) the single-input-single-output measurements and can recover exactly targets of sufficiently low sparsity.

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield	Belvedere	Club Regent	Cupertino
AO	LM	COSI	SRS

AOTuA • Adaptive Optics Systems I—Continued

AOTuA5 • 9:30 a.m.
CANARY: An On-Sky Laser Guide Star Multiple Object AO Demonstrator, *Tim Morris[1], Zoltan Hubert[2], Richard Myers[1], Eric Gendron[2], Andy Longmore[3], Gerard Rousset[2], Gordon Talbot[1], Thierry Fusco[4], Nigel Dipper[1], Fabrice Vidal[2], David Henry[3], Damien Gratadour[2], Tim Butterley[1], Fanny Chemla[2], Dani Guzman[1], Eddy Younger[1], Aglae Kellerer[2], Mark Harrison[1], Michel Marteaud[2], Deli Geng[1], Ali Basden[1], Andres Guesalaga[5], Colin Dunlop[1], Stephen Todd[3], Colin Dickson[3]; [1]Univ. of Durham, UK, [2]Observatoire de Paris, France, [3]UK Astronomy Technology Ctr., UK, [4]ONERA, France, [5]Pontificia Univ. Catolica de Chile, Chile.* CANARY is the on-sky LGS MOAO demonstrator for the proposed EAGLE E-ELT instrument. The CANARY design is described here for the initial experimental phases. Simulations of system performance predict an H-band Strehl ratio of 0.27-0.33.

LMTuA • Fundamentals of Femtosecond Laser Interactions with Materials—Continued

LMTuA5 • 9:30 a.m.
Femtosecond Laser Direct Writing in P, Ge Doped Silica Glasses: Time Resolved Plasma Measurements, *Matthieu Lancry[1], Stéphane Guizard[2], Bertrand Poumellec[1]; [1]Univ. of Paris Sud, France, [2]Lab des Solides Irradiés, CEA/DRECAM, École Polytechnique, France.* Time resolved spectral interferometry shows that the mean trapping time of electrons excited in the conduction band was significantly lower in doped silica and especially in Ge-doped silica when compared to pure silica.

LMTuA6 • 9:45 a.m.
Cascaded Nonlinear Absorption of Laser Pulse Energy in Femtosecond Microfabrication: Experiment, Numerics, and Theory, *Andrey G. Okhrimchuk, Vladimir Mezentsev, Mykhaylo Dubov, Holger Schmitz, Ian Bennion; Aston Univ., UK.* A dedicated study of nonlinear absorption in femtosecond laser micro fabrication is presented. Experimental, numerical and theoretical data are analyzed and compared. The results are presented for a range of dielectrics.

CTuA • Computational Imaging and Compressive Sensing—Continued

CTuA5 • 9:30 a.m.
Compressive Sensing Hyperspectral Imager, *Ting Sun, Kevin Kelly; Rice Univ., USA.* Compressive sensing based hyper spectral imaging is investigated and compared with its raster scan counterpart. Data acquisition and compression are realized simultaneously which greatly decreases the measurement time and storage volume while increasing the signal fidelity.

CTuA6 • 9:45 a.m.
Compressive Coherence Sensing, *Ashwin A. Wagadarikar, Daniel Marks, Kerkil Choi, David J. Brady; Fitzpatrick Ctr. for Photonics, Duke Univ., USA.* The 4-D cross spectral density function is recovered using 2-D rotational shear interferometer measurements and a matrix completion algorithm for low rank matrices. Imaging of point sources through turbulence is demonstrated.

STuA • Imaging from Limited and Compressed Data—Continued

STuA6 • 9:30 a.m.
Superresolution with Plenoptic 2.0 Cameras, *Todor G. Georgiev[1], Andrew Lumsdaine[2]; [1]Adobe Systems, USA, [2]Indiana Univ., USA.* We have demonstrated working superresolution with Plenoptic 2.0 camera without need for traditional image registration in software. This paper describes our method, which is based only on the camera and microlens parameters.

STuA7 • 9:45 a.m.
Optical Design for Improving Matrix Condition, *Iftach Klapp, David Mendlovic; Tel Aviv Univ., Israel.* The problem of image restoration of space variant blur is common and important. In many cases the restoration is limited by the optical system matrix condition. We present optical design for improving this figure.

9:30 a.m.–12:00 p.m. Student Programming: Painless Publishing, Science Policy and OSA Traveling Lecturer, *Regency Ballroom II, Fairmont Hotel*

10:00 a.m.–10:30 a.m. Coffee Break, *Imperial Ballroom, Fairmont Hotel*

10:00 a.m.–4:00 p.m. Exhibit Hall Open, *Imperial Ballroom, Fairmont Hotel*

NOTES

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield — AO

10:30 a.m.–12:00 p.m.
AOTuB • Wavefront Sensing I
Lisa Poyneer; Lawrence Livermore Natl. Lab, USA, Presider

AOTuB1 • 10:30 a.m. Invited
Polar Coordinate CCD Array for LGS Wavefront Sensing, *Sean Adkins; W. M. Keck Observatory, USA.* Abstract not available.

AOTuB2 • 11:00 a.m.
Comparison of Self-Referenced Center of Gravity, Quad-Cell and Matched Filter Algorithms for Laser Guide Star Wavefront Sensing, *Rodolphe Conan, Olivier Lardière, Kate Jackson; Univ. of Victoria, Canada.* The UVic AO laboratory has built an optical test-bed reproducing LGS wavefront sensing with Shack-Hartmann WFSs on ELTs. The test bench has been used to compare self-referenced version of the center-of-gravity, quad-cell and matched-filter algorithms.

AOTuB3 • 11:20 a.m.
Pyramid Wave-Front Sensing with a Laser Guide Star for an ELT, *Brice Le Roux; Astronomy Observatory of Marseilles Provence, Univ. of Provence, France.* We present a study of the behavior and performance of the pyramid WFS when the guide star is a laser GS on an ELT. Simulation results are presented.

Belvedere — LM

10:30 a.m.–12:00 p.m.
LMTuB • Three-Dimensional Micromachining with Femtosecond Lasers
Chris Schaffer; Cornell Univ., USA, Presider

LMTuB1 • 10:30 a.m. Invited
Three-Dimensional Structuring of Materials by Femtosecond Laser Pulses, *Saulius Juodkazis, Hiroaki Misawa; Hokkaido Univ., Japan.* Current trends in three-dimensional laser fabrication of materials and their structural modifications will be discussed. Strategies for achieving a sub-100 nm resolution via engineering a light delivery and localization are described.

LMTuB2 • 11:00 a.m.
Patterning of Functional Polymers by Femtosecond Lasers, *Andrea Camposeo[1], Marco Polo[1,2], Antonio A. R. Neves[1], Roberto Cingolani[1], Dario Pisignano[1,2]; [1]Natl. Nanotechnology Lab, CNR-INFM, Italy, [2]Inst. Superiore di Formazione Interdisciplinare ISUFI, Univ. del Salento, Italy.* We investigated possible routes for the patterning of conjugated polymers by fs laser pulses. In particular, we analyzed the impact of the exposure to fs laser on the emission properties of the light-emitting conjugated polymers.

LMTuB3 • 11:15 a.m. Invited
Multifunctional Volume Optics Generated by Direct Femtosecond Laser Writing, *Timothy D. Gerke, Rafael Piestun; Univ. of Colorado at Boulder, USA.* We present a three-dimensional scattering approach to the design of aperiodic volume optical elements and explore new functionalities utilizing the available degrees of freedom. We demonstrate volume diffractive elements that multiplex spatial and spectral information.

Club Regent — COSI

10:30 a.m.–12:00 p.m.
CTuB • Light Field Representations
Ramesh Raskar; MIT, USA, Presider

CTuB1 • 10:30 a.m. Invited
Frequency Analysis in the Light Field and Time Space Domains, *Fredo Durand; MIT, USA.* Computational imaging can reduce motion and defocus blur. New analysis in the Fourier domain of the 4-D light field (light rays) and 3-D space-time sheds new insights and leads to new practical solutions.

CTuB2 • 11:00 a.m.
Lightfield Photography and Phase-Space Tomography: A Paradigm for Computational Imaging, *Markus E. Testorf[1], Michael A. Fiddy[2]; [1]Dartmouth College, USA, [2]Univ. of North Carolina at Charlotte, USA.* The interpretation of lightfield photography as phase-space tomography is used to introduce a formalism for analyzing and optimizing computational imaging systems. We illustrate this concept by discussing lightfield wavefront sensing and computational imaging applications.

CTuB3 • 11:15 a.m.
Resolution in Plenoptic Cameras, *Todor G. Georgiev[1], Andrew Lumsdaine[2]; [1]Adobe, USA, [2]Indiana Univ., USA.* Derivation and analysis of sampling patterns of traditional and focused plenoptic cameras show the former rotates pixels Π/2 in phase space, while the latter does not. These results are interpreted regarding the cameras' spatial resolution.

CTuB4 • 11:30 a.m.
Multichannel, Agile, Computationally Enhanced Camera Based On PANOPTES Architecture, *Predrag Milojkovic[1,2], John Gill[1], Dan Frattin[1], Kevin Coyle[1], Karl Haack[1], Marc P. Christensen[2], Dinesh Rajan[2], Scott Douglas[2]; [1]Northrop Grumman Info. Systems, USA, [2]Southern Methodist Univ., USA.* Abstract not available.

Cupertino — SRS

10:30 a.m.–12:00 p.m.
STuB • Inverse Scattering
Andrew Lambert; Univ. of New South Wales, Australia, Presider

STuB1 • 10:30 am. Invited
Inverse Problems with Interior Control, *John Schotland; Univ. of Pennsylvania, USA.* We report recent work on inverse scattering problems in which manipulation of internal degrees of freedom of a scattering medium leads to improvements in image resolution.

STuB2 • 11:00 a.m.
***Ab initio* Determination of Virus Electron Density in X-Ray Crystallography**, *Victor L. Lo, Rick P. Millane; Univ. of Canterbury, New Zealand.* The electron density of an icosahedral virus with 5-fold non-crystallographic symmetry is reconstructed *ab initio* from crystal X-ray diffraction amplitudes using the difference map projection algorithm.

STuB3 • 11:15 a.m.
Resolution Enhancement and Classification of Virus Particles in Cellular Tomography, *Kang Wang, Peter Doerschuk; Cornell Univ., USA.* The tomographic reconstruction from whole-cell electron tomography, which is used in the study of viruses *in situ*, is generally noisy and geometrically distorted due to low electron dose and incomplete projection data.

STuB4 • 11:30 a.m.
3-D Reconstruction from Electron Microscope Images of Heterogeneous Particles, *Peter Doerschuk, Yili Zheng; Cornell Univ., USA.* A statistical estimation problem for determining 3-D reconstructions from a single 2-D projection image of each of multiple objects when the objects are heterogeneous is described.

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield	Belvedere	Club Regent	Cupertino
AO	LM	COSI	SRS

AOTuB • Wavefront Sensing I—Continued

AOTuB4 • 11:40 a.m.
Off-Axis Beacon Sharpening, *Erez N. Ribak[1,2], Ruth Mackey[2]; [1]Technion-Israel Inst. of Technology, Israel, [2]Natl. Univ. of Ireland, Ireland.* We design an atmospheric beacon which can be observed at an angle with reduced loss of resolution along its main axis. We employ direct inversion or iterative optimization, either by computer or in the laboratory.

LMTuB • Three-Dimensional Micromachining with Femtosecond Lasers—Continued

LMTuB4 • 11:45 a.m.
The Role of Metaphosphate Glass Composition on Changes to the Glass Network Structure after Modification by Femtosecond Laser Pulses, *Luke B. Fletcher[1], Jon J. Witcher[1], Denise M. Krol[1], Richard K. Brow[2]; [1]Univ. of California at Davis, USA, [2]Missouri Univ. of Science and Technology, USA.* Changes to the glass structure after femtosecond laser modification have been studied in multiple metaphosphate glass systems using white light and laser microscopy. Results indicate initial glass structure is important to the resulting morphological changes.

CTuB • Light Field Representations—Continued

CTuB5 • 11:45 a.m.
Quasi Light Fields: A Model of Coherent Image Formation, *Anthony Accardi, Gregory Wornell; MIT, USA.* We develop a model of coherent image formation that strikes a balance between the simplicity of the light field and the comprehensive predictive power of Maxwell's equations, by extending the light field to coherent radiation.

STuB • Inverse Scattering—Continued

STuB5 • 11:45 a.m.
New Computational Methodology for the Recovery of Facial Images Retained in Human Memory, *Christopher J. Solomon[1,2], Stuart J. Gibson[1], Matthew I. S. Maylin[1]; [1]Univ. of Kent, UK, [2]Natl. Univ. of Ireland, Ireland.* We present a new computational methodology for the construction of facial composites from eyewitness memory for criminal investigation. The conceptual and theoretical basis is described and results from both laboratory and real-world applications are presented.

12:00 p.m.–1:30 p.m. Exhibit Only Time, *Imperial Ballroom, Fairmont Hotel*

12:00 p.m.–2:00 p.m. 1st International OSA Student Chapter Solar Mini-Car Final Races, *Imperial Ballroom, Fairmont Hotel*

12:00 p.m.–1:30 p.m. OSA Fellow Member Lunch, *Silicon Valley Capital Club, 50 W. San Fernando, Suite 1700, San Jose, California 95113, Phone: 408.971.9300*

12:00 p.m.–1:30 p.m. Lunch Break *(on your own)*

NOTES

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield — AO

1:30 p.m.–3:10 p.m.
AOTuC • High Contrast Imaging and Point Spread Function Calibration I
Jean-Pierre Veran; Inst. Herzberg d'Astrophysique, Canada, Presider

AOTuC1 • 1:30 p.m.
Differential Photometry through PDF Deconvolution, *Szymon Gladysz[1], Julian Christou[2]; [1]European Southern Observatory, Germany, [2]Gemini Observatory, USA.* We present a novel approach to differential photometry in high-contrast observations. Our algorithm exploits the difference in statistics between the on-axis and off-axis intensity. We test the method on data from the Lick Observatory's 3m telescope.

AOTuC2 • 1:50 p.m.
Statistical Signal Enhancement in Adaptive-Optics Observations of Exoplanets, *Szymon Gladysz[1], Patrice Martinez[1], Emmanuel Aller-Carpentier[1], Julian Christou[2]; [1]European Southern Observatory, Germany, [2]Gemini Observatory, USA.* We present a new class of algorithms for the detection of faint companions to stars. The new approach was tested on astronomical observations and on high-contrast corona graphic data recorded in a laboratory experiment.

AOTuC3 • 2:10 p.m.
Optimal Method for Exoplanet Detection by Spectral and Angular Differential Imaging, *Alberto Cornia[1,2], Laurent Mugnier[1], Jean-François Sauvage[1], Thierry Fusco[1], Marcel Carbillet[3], David Mouillet[4], Gérard Rousset[2], Anthony Boccaletti[2]; [1]ONERA Chatillon, France, [2]Observatoire de Meudon, LESIA, France, [3]Lab Fizeau, Univ. de Sophia-Antipolis, France, [4]Lab d'Astrophysique de l'Observatoire de Grenoble, France.* We propose a method based on maximum-likelihood for the direct detection of exoplanets from the ground using spectral-angular differential imaging. We can estimate the position and intensity of potential planets orbiting the observed star.

Belvedere — LM

1:30 p.m.–3:30 p.m.
LMTuC • Fabrication of Waveguides with Femtosecond Laser Systems
Presider to Be Announced

LMTuC1 • 1:30 p.m. Invited
Recent Developments in Monolithic Fibre and Waveguide, DBR and DFB Lasers Fabricated Using Ultrafast Laser Direct-Write Methods, *G. D. Marshall, N. Jovanovic, M. Ams, D. J. Little, P. Dekker, A. Fuerbach, M. J. Withford; Ctr. for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Australia.* We report on active photonic devices, both in bulk and fiber glass formats, fabricated using ultrafast laser direct writing. Recent demonstrations include a monolithic 100 mW DFB waveguide laser and a 100W fiber laser.

LMTuC2 • 2:00 p.m.
Demonstration of a fs-Laser Written Highly Efficient Yb:YAG Channel Waveguide Laser, *Jörg Siebenmorgen, Thomas Calmano, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Univ. Hamburg, Germany.* Using a femtosecond laser tracks were written in Yb:YAG. Due to stress induced birefringence waveguiding was possible in channels surrounding the tracks. Laser oscillation was achieved with an output-power of 719mW at 1223mW of pump-power.

LMTuC3 • 2:15 p.m. Invited
Femtosecond Laser Micromachining: An Enabling Tool for Optofluidics, *R. Osellame, R. Martinez Vazquez, R. Ramponi, G. Cerullo; Inst. di Fotonica e Nanotecnologie, CNR, Italy.* Femtosecond-laser-written optical waveguides are integrated into a commercial micro-fluidic chip. A fluorescence detection scheme is implemented, resulting in a compact device. Testing is performed by electrophoresis and optical detection of a 1-nM oligonucleotide plug.

Club Regent — COSI

1:30 p.m.–3:30 p.m.
CTuC • Constraints on Imaging
Mark Allen Neifeld; Univ. of Arizona, USA, Presider

CTuC1 • 1:30 p.m. Invited
Fundamental Limit for Optical Devices, *David A. B. Miller; Stanford Univ., USA.* We examine a basic general limit to optical components that scatter, separate, disperse, or delay light, an upper bound that depends on material properties and device volume, independent of design details.

CTuC2 • 2:00 p.m. Invited
Holographic Ghost Imaging, *M. J. Padgett[1], B. Jack[1], J. Leach[1], J. Romero[1], S. Franke-Arnold[1], M. Ritsch-Marte[2], S. M. Barnett[3]; [1]Univ. of Glasgow, UK, [2]Innsbruck Medical Univ., Austria, [3]Univ. of Strathclyde, UK.* We demonstrate a new form of ghost-imaging, where holograms placed non-locally with respect to the object can enhance the contrast of the coincident image. In this configuration the system unambiguously exhibits its quantum properties.

Cupertino — SRS

1:30 p.m.–3:30 p.m.
STuC • Atmospheric Imaging
Rick P. Millane; Univ. of Canterbury, New Zealand, Presider

STuC1 • 1:30 p.m. Invited
Information Theoretic Based Image Quality Evaluation, *David R. Gerwe[1], Carlos E. Luna[1], Brandoch Calef[2]; [1]Boeing Directed Energy Systems, USA, [2]Boeing Laser Technical Services, USA.* A new mutual information based metric for characterizing the influence of sensor design, imaging geometry, environmental conditions, and enhancement processing on image quality is shown to better match visual ratings than the current GIQE metric.

STuC2 • 2:00 p.m.
Statistical Turbulence Approach to the Covariance Matrices in the Shiftmap Prediction Using Kalman Filter, *Murat Tahtali, Andrew J. Lambert; Univ. of New South Wales, Australian Defence Force Acad., Australia.* We consider the statistical estimation of the covariance matrices required in the prediction of restoration shift-maps using Kalman filter. Anisoplanatic warp of imagery through atmospheric turbulence is modeled at pixel level as a simple oscillator.

STuC3 • 2:15 p.m.
Computationally Efficient Image Dewarping Algorithm, *Samuel T. Thurman; Lockheed Martin Coherent Technologies, USA.* Imagery of scenes viewed through atmospheric turbulence often exhibits dynamic distortion or warping. A computationally efficient method for co-registering this type of imagery is described.

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield — AO

AOTuC • High Contrast Imaging and Point Spread Function Calibration I—Continued

AOTuC4 • 2:30 p.m.
Long Exposure PSF Reconstruction for GPI, *Jérôme Maire[1], Jean-Pierre Véran[2], Lisa A. Poyneer[3]; [1]Univ. of Montreal, Canada, [2]Herzberg Inst. of Astrophysics, Canada, [3]Lawrence Livermore Natl. Lab, USA.* We investigate the performance and limitations of two different methods to reconstruct the Gemini Planet Imager long-exposure PSF based on a statistical analysis of the AO WFS data provided by the GPI AO simulation tool.

AOTuC5 • 2:50 p.m.
Enhanced Faint Companion Photometry and Astrometry Using Wavelength Diversity, *Daniel Burke[1], Nicholas Devaney[1], Szymon Gladysz[2], Chris Dainty[1]; [1]Natl. Univ. of Ireland, Galway, Ireland, [2]European Organisation for Astronomical Res. in the Southern Hemisphere, Germany.* We propose a new method to enhance the differential photometry and astrometry of faint companions in adaptive optics images. Our approach combines PSF estimation from multi-wavelength data with a pre-whitening matched filter.

Belvedere — LM

LMTuC • Fabrication of Waveguides with Femtosecond Laser Systems—Continued

LMTuC4 • 2:45 p.m.
Annealing Behavior of Femtosecond Laser-Written Waveguides in Fused Silica, *Jonathan Witcher, Luke Fletcher, Wilbur Reichman, Denise Krol; Univ. of California at Davis, USA.* We have studied thermal annealing of fs-laser fabricated waveguides in fused silica using confocal fluorescence and Raman microscopy. The results show that laser-induced NBOHC defects disappear at much lower temperatures than three-membered SiO rings.

LMTuC5 • 3:00 p.m.
Femtosecond Laser Writing of Phase-Shifted Bragg Grating Waveguides in Fused Silica, *Luís A. Fernandes[1,2], Jason R. Grenier[1], Peter R. Herman[1], J. Stewart Aitchison[1], Paulo V. S. Marques[2]; [1]Univ. of Toronto, Canada, [2]INESC Porto, Dept. de Física, Univ. do Porto, Portugal.* Phase-shifted Bragg grating waveguide filters were formed in bulk glass for the first time by femtosecond laser direct writing. A narrow, tunable 0.1-nm transmission window at 1550-nm is demonstrated for tunable π and other phase-shifts.

LMTuC6 • 3:15 p.m.
Curvilinear Low-Loss Waveguides in Borosilicate Glass Fabricated by Femtosecond Chirp-Pulse Oscillator, *Mykhaylo Dubov, T. Allsop, S. R. Natarajan, V. K. Mezantsev, I. Bennion; Aston Univ., UK.* Results on direct femtosecond inscription of straight low-loss waveguides in borosilicate glass are presented. The refractive index contrast obtained allowed us to fabricate low-loss curvilinear waveguides, which are main building blocks for integrated optics circuits.

Club Regent — COSI

CTuC • Constraints on Imaging—Continued

CTuC3 • 2:30 p.m.
An Information Theoretic Analysis of Support Assisted Optical Superresolution in One and Two Dimensions, *Sudhakar Prasad, Xuan Luo; Univ. of New Mexico, USA.* A Fisher-information-theoretic analysis is presented of the fidelity of optical superresolution of low-resolution image sequences in one and two dimensions based on object support. Both rectangular and circular support geometries are treated.

CTuC4 • 2:45 p.m.
Surpassing the Diffraction Limit of Digital Imaging Systems Using Sinusoidal Illumination Patterns, *Prasanna V. Rangarajan, Vikrant R. Bhakta, Marc P. Christensen; Dept. of Electrical Engineering, Southern Methodist Univ., USA.* This work presents experimental evidence on surpassing the diffraction limit of digital imaging systems using sinusoidal illumination patterns. Unique contributions of the work include aliasing-management and the notion of incoherent band-pass filtering using sinusoidal modulation.

CTuC5 • 3:00 p.m.
Signal-to-Noise-Ratio Limit to the Depth-of-Field Extension for Task-Specific Imaging Systems with an Arbitrary Pupil Function, *Saeed Bagheri; IBM T. J. Watson Res. Ctr., USA.* The rigorous trade-off between achieving an extended depth-of-field and improved spectral signal-to-noise-ratio for a task-specific imaging system using arbitrary phase and/or amplitude pupil function is presented.

CTuC6 • 3:15 p.m.
Non-Rectangular Sampling Topologies for Fast Joint Digital-Optical System Optimization, *Kathrin Berkner, M. Dirk Robinson; Ricoh Innovations, Inc., USA.* Approximation errors of the MSE merit function for joint digital-optical system optimization are caused by use of rectangular sampling grids. We overcome this problem by adapting the MSE calculations to use flexible non-rectangular sampling topologies.

Cupertino — SRS

STuC • Atmospheric Imaging—Continued

STuC4 • 2:30 p.m.
Wavelength Diversity in Restoration from Atmospheric Turbulence Effected Surveillance Imagery, *Andrew J. Lambert[1], Geoffrey Nichols[2]; [1]Australian Defence Force Acad., Univ. of New South Wales, Australia, [2]Defence Science and Technology Organisation, Australia.* We investigate the fusion of imagery taken at long-range and high-magnification in four wavelength bands, and consider the localised tip-tilt variance that shifts regions of the images differently in each wavelength range.

STuC5 • 2:45 p.m.
Speckle Imaging with a Partitioned Aperture, *Brandoch Calef; Boeing LTS, USA.* We describe a generalization of aperture masking interferometry that improves the speckle imaging performance of a telescope in the large D/r_0 regime while making use of all collected photons.

STuC6 • 3:00 p.m.
Laboratory Demonstration of Sharpness Metric Approach to Correct Multiple-Plane Phase Errors, *Abbie E. Tippie, James R. Fienup; Univ. of Rochester, USA.* We describe a laboratory experiment for correction of anisoplanatic blurring effects due to phase screens in multiple planes. A nonlinear optimization method maximizing a modified sharpness metric estimates two phase screens and sharpens the image.

STuC7 • 3:15 p.m.
Image Restoration Using Natural Image Statistics, *Zhiying Wen, Donald Fraser, Andrew Lambert; Australian Defence Force Acad., Univ. of New South Wales, Australia.* This paper proposes to use the natural image statistics to reconstruct a potential image from a blurred image. The compressive sensing theory and l_1 minimization technique is employed to iteratively estimate the image gradient.

3:30 p.m.–4:00 p.m. Coffee Break/Exhibits, *Imperial Ballroom, Fairmont Hotel*

3:30 p.m.–5:30 p.m. Meet the Editors of the APS Journals, *Bamboo Lounge, Fairmont Hotel*

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield — AO

4:00 p.m.–5:20 p.m.
AOTuD • System Simulation and Modeling I
Michael Lloyd Hart; Univ. of Arizona, USA, Presider

AOTuD1 • 4:00 p.m.
Extreme Adaptive Optics Simulations for the European ELT, *Visa Korkiakoski, Christophe Vérinaud; Lab d'Astrophysique de Grenoble, France.* EPICS is a project for a high contrast imaging instrument dedicated to direct imaging of exo-planets with the European Extremely Large Telescope. We present end-to-end simulation results of a Foucault-like sensors based XAO system.

AOTuD2 • 4:20 p.m.
High Fidelity Sky Coverage Analysis and Long Exposure PSF Modeling for Multi-Conjugate AO, *Lianqi Wang, Brent Ellerbroek; Thirty Meter Telescope, Caltech, USA.* We report a method for long exposure PSF modeling using the previously reported time domain sky coverage simulation. The enclosed energy and point source sensitivity PSF metrics are used as measures of sky coverage.

AOTuD3 • 4:40 p.m.
VLT Adaptive Optics Facility Simulations, *Miska LeLouarn, Pierre-Yves Madec, Jerome Paufique, Stefan Stroebele; European Organisation for Astronomical Res., Germany.* We detail the simulated performance of two new instruments providing three observing modes (GLAO in the visible and IR and LTAO in the visible) of the Adaptive Optics Facility for the Very Large Telescope.

Belvedere — LM

4:00 p.m.–6:00 p.m.
LMTuD • Surface Processing and Panel Discussion on Femtosecond Laser Micromachining
Andreas Ostendorf; Ruhr-Univ. Bochum, Germany, Presider

LMTuD1 • 4:00 p.m. Invited
Ultrafast Laser Surface Micro/Nano-Structuring and Applications, *Vassilia Zorba; Lawrence Berkeley Natl. Lab, USA.* We study the interaction of femtosecond laser pulses with Si surfaces in the optical far- and near-field. The formation of biomimetic structures in the far-field leads to one of the most water repellent surfaces ever reported.

LMTuD2 • 4:30 p.m. Invited
Optically-Controlled Growth of Carbon Nanotubes, *Y. F. Lu, Y. S. Zhou, W. Xiong, M. Mahjouri-Samani, Y. Gao, M. Mitchell; Univ. of Nebraska, USA.* Controllable growth and integration of single-walled carbon nanotubes (SWNTs) were achieved using an optically controlled approach. By applying optical near-field effects in a laser-assisted chemical vapor deposition process, controllable growth of SWNTs was realized.

Club Regent — COSI

4:00 p.m.–5:45 p.m.
CTuD • 3-D Imaging and PSF Design
David Brady; Duke Univ., USA, Presider

CTuD1 • 4:00 p.m. Invited
Three-Dimensional Superresolution Using Single-Molecule Photoswitches and a Double-Helix PSF, *W. E. Moerner[1], Michael Thompson[1], Matthew Lew[1], Majid Badieirostami[1], Samuel J. Lord[1], Nicholas R. Conley[1], Hsiao-lu D. Lee[1], Sri Rama Prasanna Pavani[2], Rafael Piestun[2]; [1]Stanford Univ., USA, [2]Univ. of Colorado at Boulder, USA.* Superresolution detail provided by fluorescence imaging of optically controllable single-molecule emitters can be extended to three dimensions using a novel double-helix point-spread function. The molecules and methods enabling this advance will be reviewed.

CTuD2 • 4:30 p.m.
Optimization of Double-Helix Point Spread Function for Photon-Limited 3-D Imaging Systems, *Ginni Sharma, Sri Rama Prasanna Pavani, Rafael Piestun; Univ. of Colorado at Boulder, USA.* We present a double-helix point spread function (DH-PSF) optimized for particle superlocalization in three-dimensions. The DH-PSF has the lowest Cramer-Rao bound for axial estimation. The limitations to the rotation rate are investigated.

CTuD3 • 4:45 p.m.
Broadband Three-Dimensional Imaging Using a Double-Helix Point Spread Function, *Sean Quirin, Rafael Piestun; Univ. of Colorado at Boulder, USA.* A double-helix point spread function is implemented for optically sensing a three-dimensional scene using an image capture device and matched post-processing. Operation characteristics of the system are presented showing precision ranging under broadband illumination.

Cupertino — SRS

4:00 p.m.–5:15 p.m.
STuD • Time-Frequency and Phase-Space Methods
Phil Bones; Univ. of Canterbury, New Zealand, Presider

STuD1 • 4:00 p.m. Invited
Signal Reconstruction Techniques for Optical Pulse Characterization, *Christophe Dorrer; Lab for Laser Energetics, USA.* Optical pulse characterization techniques are reviewed in the framework of phase-space representations. The principle and field-reconstruction algorithms for spectrography, tomography, and interferometry are described.

STuD2 • 4:30 p.m.
Iterative Phase Retrieval from Wigner Distribution Projections, *Tatiana Alieva[1], José A. Rodrigo[2]; [1]Univ. Complutense de Madrid, Spain, [2] Imaging and Vision Dept., Inst. de Óptica (CSIC), Spain.* The application of the Gerchberg-Saxton algorithm for phase recovery of optical field, which is an eigenfunction of the fractional Fourier transform, is considered. This analysis is useful for determination of the Laguerre-Gaussian mode topological charge.

STuD3 • 4:45 p.m.
Experimental Reconstruction of Wigner Distribution, *Tatiana Alieva[1], Alejandro Cámara[1], José A. Rodrigo[2], María L. Calvo[1]; [1]Univ. Complutense de Madrid, Spain, [2] Imaging and Vision Dept., Inst. de Óptica (CSIC), Spain.* Flexible optical setups for the phase-space tomography are discussed. The experimental reconstruction of the Wigner distribution of an optical beam separable in the Cartesian coordinates is demonstrated.

4:30 p.m.–5:30 p.m. Minorities and Women in OSA (MWOSA) Tea, *Sainte Claire Room, Sainte Claire Hotel*

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield

AO

AOTuD • System Simulation and Modeling I—Continued

AOTuD4 • 5:00 p.m.
Monte-Carlo Simulation of EAGLE, *Alastair G. Basden, Richard M. Myers, Timothy Butterley; Durham Univ., UK.* The EAGLE instrument for the E-ELT is a multi-IFU spectrograph that uses a MOAO system for wavefront correction. We present Monte-Carlo AO simulation results, comparisons with an analytical code and details of the simulation package.

Belvedere

LM

LMTuD • Surface Processing and Panel Discussion on Femtosecond Laser Micromachining—Continued

5:00 p.m.
Panel Discussion: Challenges and Opportunities in Femtosecond Laser Microfabrication
Attend the closing technical session, which will begin with two invited speakers (see LMTuD1 and LMTuD2 on page 122) and will end with an exciting panel discussion, where leaders in the field share their perspective on the most significant recent advances and the most important challenges and opportunities in femtosecond laser microfabrication.

Panel participants include:

Alan Arai; *IMRA, USA*
Eric Mazur; *Harvard Univ., USA.*
Andreas Ostendorf; *Ruhr Univ. Bochum, Germany*
Chris Schaffer; *Cornell Univ., USA*

Club Regent

COSI

CTuD • 3-D Imaging and PSF Design—Continued

CTuD4 • 5:00 p.m.
Wigner Analysis of 3-D Coherence Imaging, *Se Baek Oh, George Barbastathis; MIT, USA.* We interpret 3-D coherence imaging with Wigner analysis. The mutual intensity and the Wigner distribution function are associated with the Fourier slice theorem, where the 3-D manifold of 4-D space is sufficient for 3-D imaging.

CTuD5 • 5:15 p.m. Invited
Illuminating Cameras, *Srinivasa Narasimhan; Carnegie Mellon Univ., USA.* Light sources and cameras are optical duals: sources emit light rays while the cameras capture them. This talk will argue that light sources can serve as better cameras advancing many computer vision technologies.

Cupertino

SRS

STuD • Time-Frequency and Phase-Space Methods—Continued

STuD4 • 5:00 p.m.
The Averaged Wigner Distribution Function and Subsurface Target Detection, *Markus E. Testorf[1], Nadege Thirion[2], Marc Saillard[2]; [1]Dartmouth College, USA, [2]Univ. de Toulon et du Var, LSEET, France.* The Wigner function is used for detecting subsurface targets underneath a rough surface. The target is detected by averaging the Wigner functions of the scattered field obtained with different wavelength and source configurations.

6:00 p.m.–7:00 p.m. OSA Annual Business Meeting, *Piedmont Room, Fairmont Hotel*

6:00 p.m.–7:00 p.m. DLS Annual Business Meeting, *California Room, Fairmont Hotel*

7:00 p.m.–8:30 p.m. OSA Member Reception, *Ballroom, Sainte Claire Hotel*

7:00 p.m.–10:00 p.m. Laser Science Banquet, *Gordon Biersch, 33 East San Fernando Street, San Jose, California, Phone: 408.294.6785*

For FiO/LS presentations on Tuesday, see pages 56-75.

JOINT AO/COSI/LM

6:00 p.m.–7:30 p.m.
JTuC • Joint AO/COSI/LM Poster Session and Welcome Reception

AO Posters

JTuC1
Direct Slope Reconstruction Algorithm for Woofer-Tweeter Adaptive Optics Systems, *Chaohong Li, Nripun Sredar, Hope Queener, Kevin M. Ivers, Jason Porter; Univ. of Houston, USA.* We present a direct slope reconstruction algorithm to control dual-deformable mirror adaptive optics systems. A global response matrix was derived from the response matrices of each deformable mirror. Simulation results validated this control method.

JTuC2
Type II Woofer-Tweeter Control for NFIRAOS on TMT, *Jean-Pierre Véran, Glen Herriot; Herzberg Inst. of Astrophysics, Canada.* This paper presents a type II control architecture that will be use in NFIRAOS on TMT to control tip-tilt and the plate scale modes measured by the on-instrument wave-front sensors.

JTuC3
Open-Loop Shaping of a 4K MEMS with Fourier-Domain Pre-Compensation, *Lisa A. Poyneer[1], Andrew Norton[2], Daren Dillon[2]; [1]Lawrence Livermore Natl. Lab, USA, [2]UCO Lick Observatory, Lab for Adaptive Optics, Univ. of California at Santa Cruz, USA.* We describe a computationally efficient Fourier-domain algorithm for influence function compensation and an improved voltage-phase calibration technique that together enable precise open-loop shaping of a 64x64 MEMS deformable mirror.

JTuC4
Implementing a Low Cost Upgrade of a Single Laser Guide Star Adaptive Optics System, *Mark Harrison, Tim Morris, Richard Myers; Ctr. for Advanced Instrumentation, Dept. of Physics, Durham Univ., UK.* We present a method of implementing a low cost upgrade of a single laser guide star adaptive optics system using a diffractive optical element to create and recombine multiple laser guide stars.

JTuC5
Application of Cavity Deformable Mirror in PW Laser Facility with U-Turn Reverser, *Feng Jing, Dongxia Hu, Qihua Zhu, Wanjun Dai, Xudong Xie, Wei Zhou, Kainan Zhou, Junpu Zhao, Xiaojun Huang, Kun Zhang, Xuejun Jiang, Wu Deng; Res. Ctr. of Laser Fusion, Chinese Acad. of Engineering Physics, China.* Deformable mirror is applied as cavity mirror for wavefront correction. We describe a new mathematical method to prove its feasibility and compare two different schemes of cavity deformable mirror in XG-PW facility with U-turn reverser.

JTuC6
Adaptive Optics Retinal Imaging System Using a Pyramid Wavefront Sensor, *Sabine Chiesa, Christopher Dainty; Applied Optics, School of Physics, Natl. Univ. of Ireland, Galway, Ireland.* A pyramid wavefront sensor based adaptive optics system for retinal imaging has been constructed. We demonstrate its dynamic range for sensing and first closed-loop results.

COSI Posters

JTuC7
Computational Confocal Scanning Tomography, *Keith J. Dillon, Yeshaiahu Fainman; Univ. of California at San Diego, USA.* We demonstrate a technique to perform computed tomographic reconstruction of a refractive and attenuative sample using a confocal laser scanning microscope that employs a spatial heterodyne to perform coherent detection of the entire aperture signal.

JTuC8
Six-Dimensional Joystick Based on Detection of Optical Spot, *Meng-Che Tsai, Pin-Hao Hu; ITRI, Industrial Technology Res. Inst., Taiwan.* We demonstrated a six-dimensional (6-D) joystick by using a CMOS sensor array to image the cross-spot from a LED. It is simple and cheap to sensor signals of 3-D planar and 3-D rotational motion.

JTuC9
Computer Generated a Three-Dimensional Holography from Two-Dimensional Photos, *Nicholas Hageman, Xiaomin Jin; California Polytechnic State Univ., USA.* We present 3-D holography from 2-D photos using computer generated hologram (CGH). The photo is segment into foreground/middle-ground/background. Matlab is used to create the CGH. Both single-laser/dual-laser setups are investigated for the 3-D image recovering.

JTuC10
Optical Imaging of Objects in Turbid Media Using Principal Component Analysis and Time Reversal Matrix Methods, *Binlin Wu[1], Mohammad Alrubaiee[1], Wei Cai[1], Min Xu[2], Swapan K. Gayen[1]; [1]City College of New York, CUNY, USA, [2]Fairfield Univ., USA.* Principal component analysis and time reversal matrix methods were used to develop approaches for imaging of targets in turbid media. The efficacy is demonstrated by imaging two targets embedded in intralipid-10% suspension in water.

JTuC11
EMCCD Based Photon Imaging in Ultra Low Light Level, *Weiji He, Qian Chen, Guohua Gu, Juanfeng Huang; Nanjing Univ. of Science and Technology, China.* An EMCCD based photon imaging strategy for ultra low light level scene was present. 3-D threholding scheme was develop and experimentally tested for distinguishing photon events above noise.

JTuC12
Utilization of the Laser-Induced Breakdown Spectroscopy (LIBS) for Spectrochemical Analysis of Plant Samples with High Spatial Resolution, *Jozef Kaiser[1], Radomír Malina[1], Jan Novotný[1], David Procházka[1], Karel Novotný[2], Lucie Krajcarová[2], Michaela Galiová[2], Markéta Holá[2]; [1]Inst. of Physical Engineering, Faculty of Mechanical Engineering, Brno Univ. of Technology, Czech Republic, [2]Dept. of Chemistry, Faculty of Science, Masaryk Univ., Czech Republic.* The capability of laser-induced breakdown spectroscopy for elemental mapping of plant tissues is discussed in wider context. Comparison with another laser-ablation based method (LA-ICP-MS) and with synchrotron hard-X-ray radiation micro-radiography and micro-CT techniques is provided.

JTuC13
Computational Imaging in Machine Vision System for Automated Optical Inspection, *Nak-Hoon Ko[1], Yoon-Suk Lee[1], Sang-Chul Jung[1], Dae-Chan Kim[1], Tae-Il Choi[2], Beom-Hoan O[1], Se-Geun Park[1], El-Hang Lee[1], Seung Gol Lee[1]; [1]Inha Univ., Republic of Korea, [2]Samsung Electro-Mechanics Co., Ltd., Republic of Korea.* This paper describes a virtual vision inspector which can numerically calculate an image to be acquired in a machine vision system for automatic optical inspection. This program will be useful for optimizing machine vision system.

JTuC14
Two-Photon Near-Infrared Cancer Imaging, *Nikolay S. Makarov, Jean Starkey, Mikhail Drobizhev, Aleksander Rebane; Montana State Univ., USA.* We present a way of optical detection of malignant cancer cell colonies by using multi-wavelength two-photon excited fluorescence from environmentally sensitive Styryl-9M dye, allowing distinguishing between samples containing no cells, normal cells and cancer cells.

LM Posters

JTuC15
Material Modifications with Ultrafast Bessel Beams, *Veronique Zambon, Nathalie McCarthy, Michel Piché; Ctr. d'Optique, Photonique et Laser (COPL) and Dept. de Physique, de Génie Physique et d'Optique, Univ. Laval, Canada.* Ultrafast Bessel beams produced by axicon focusing have a long collimation length that is advantageous for laser micromachining. We have used these beams to fabricate optical waveguides and micro-fluidic channels in transparent glass.

JTuC16
Scan Speed Dependence of Quill Writing with Ultrashort Laser Pulses in Fused Silica, *Matthieu Lancry, Weijia Yang, Bertrand Poumellec, Bernard Bourguignon; Univ. of Paris Sud, France.* We demonstrate that the quill writing phenomenon in ultrafast laser modification of fused silica is dependent on the scan speed. The phenomenon appears when the pulse overlapping is higher than 95%.

JTuC17
Femtosecond Laser Fabrication and Optical Studies of Microstructures in PMMA and PDMS, *Kallepalli L. N. Deepak[1], Venugopal Rao Soma[2], Narayana Rao Desai[1]; [1]School of Physics, Univ. of Hyderabad, India, [2]Advance Ctr. of Res. in High Energy Materials (ACRHEM), Univ. of Hyderabad, India.* Several microstructures, including gratings and holes, were fabricated in PMMA and PDMS using 100 fs pulses. Our results on the physical/optical studies such as fluorescence, Raman, diffraction efficiency etc. will be presented.

JTuC18
Dynamics of Femtosecond Laser Nanostructuring of Metals, *Taek Yong Hwang, A. Y. Vorobyev, Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA.* We perform a systematic study on femtosecond laser-induced nanostructures on noble metals. Our study reveals the ultrafast dynamics of nanostructural formation on metals following femtosecond laser irradiation.

JTuC19
Q-Switched Operation of Yb-Fiber Laser Based on the Waveguide YAG:Cr^{4+} Saturable Absorber, *Andrey Okhrimchuk[1], Alexander Shestakov[2], Vladimir Mezentsev[1], Vladislav Dvoyrin[3], Evgeny Sholokhov[4], Ian Bennion[1]; [1]Aston Univ., UK, [2]ELS Co., Russian Federation, [3]Fiber Optics Res. Ctr., Russian Acad. of Sciences, Russian Federation, [4]General Physics Inst., Russian Acad. of Sciences, Russian Federation.* The waveguide saturable absorber is inscribed by femtosecond pulses in YAG:Cr^{4+} crystal. Q-switch operation of a fiber laser with such saturable absorber is demonstrated for the first time.

JTuC20
Femtosecond Laser Ablation on Dental Resins and Biomaterials - Analysis of Ablated Profile near an Interface Using Local Effective Intensity, *Gustavo Nicolodelli, M. M. Costa, V. S. Bagnato; Physical Inst. of São Carlos, Univ. of São Paulo, Brazil.* The purpose of this study was to evaluate the progression of ablation, near an interface separating two distinct media. We have used a method that correlates ablation with intensity, obtained from surface ablation data.

For FiO/LS presentations on Tuesday, see pages 56-75.

Fairfield

NOTES

Belvedere

AOIM

8:00 a.m.–9:45 a.m.
AWA • Semiconductor Materials
Martin M. Fejer; Stanford Univ., USA, Presider

AWA1 • 8:00 a.m. Invited
Growth of Orientation-Patterned Semiconductors for Nonlinear Optical Frequency Conversion, *Candace Lynch[1], Vladimir Tassev[1], George Bryant[1], Cal Yapp[2], David Bliss[1]; [1]AFRL, USA, [2]Solid State Scientific Corp., USA.* Millimeter-thick crystals of orientation-patterned GaAs have been grown using low pressure Hydride Vapor Phase Epitaxy for use in the generation of mid-IR and THz radiation.

AWA2 • 8:30 a.m.
All-Epitaxial Growth of Low-Loss, Large-Aperture Orientation-Patterned Gallium Arsenide (OPGaAs), *Peter G. Schunemann, Lee Mohnkern, Alice Vera, Daniel C. Creeden, Thomas M. Pollak; BAE Systems Inc., USA.* Improved reactor design and optimized process parameters have enabled all-epitaxial growth of large diameter (3-inch), large aperture (>1.5mm thick), and low-loss (<0.005cm^{-1}) quasi-phasematched GaAs for powerful and efficient fiber-laser-pumped mid-IR OPOs.

AWA3 • 8:45 a.m.
Efficient Mid-Infrared Optical Parametric Oscillator Based on $CdSiP_2$, *Peter G. Schunemann[1], Leonard A. Pomeranz[1], Kevin T. Zawilski[1,2], Jean Wei[2], Leonel Gonzalez[2], Shekhar Guha[2], T. M. Pollak[1]; [1]BAE Systems Inc., USA, [2]US AFRL/RXPJ, USA.* We report the first optical parametric oscillator based on the new mid-infrared nonlinear optical crystal $CdSiP_2$. Pumping with a 2W, 1.99-micron Tm:YALO laser produced 340 mW average power output (signal + idler) at 27% slope.

AWA4 • 9:00 a.m.
Photoluminescence of Magnetic Ion Doped Nanostructured Indium Tin Oxide Films, *Prasanta K. Biswas, Susmita Kundu, Sunirmal Jana, Nilanjana Das, Dipten Bhattacharya; Central Glass and Ceramic Res. Inst., India.* Sol-gel based undoped and Cr(III)-, Mn(II)-doped quantum sized (2.5-15nm) indium tin oxide films were prepared. Photoluminescence intensity at ~395 nm for free exciton gradually decreases with increase in nanoclustered size for all films except Mn(II)-doped.

Club Regent

JOINT

8:00 a.m.–10:00 a.m.
JWA • Joint AO/COSI/SRS Session
Rafael Piestun; Univ. of Colorado at Boulder, USA, Presider; Julian C. Christou; Gemini Observatory, USA, Presider

JWA1 • 8:00 a.m. Invited
Innovative Adaptive Optics and Applications, *Christopher Dainty; Natl. Univ. of Ireland, Galway, Ireland.* We explore the possible connections between adaptive optics and computational imaging.

JWA2 • 8:30 a.m. Invited
Adaptive Regression Kernels for Image/Video Restoration and Recognition, *Peyman Milanfar; Univ. of California at Santa Cruz, USA.* I present a nonparametric framework for locally-adaptive signal processing and analysis. Without making strong assumptions about noise/signal models, the framework is applicable to many problems including denoising, upscaling, and object detection in images and video.

JWA3 • 9:00 a.m. Invited
Light Field Photography and Microscopy, *Marc Levoy; Stanford Univ., USA.* Light fields represent radiance as a function of position and direction in space. I describe three systems for recording and generating light fields: A camera array, a handheld plenoptic camera, and a light field microscope.

Cupertino

NOTES

For FiO/LS presentations on Wednesday, see pages 76-99.

Fairfield	Belvedere	Club Regent	Cupertino
	AOIM	JOINT	

Thank you for attending FiO/LS/Fall Congress. Look for your post-conference survey via email and let us know your thoughts on the program.

AWA • Semiconductor Materials—Continued

AWA5 • 9:15 a.m.
Optoelectronic Properties of Germanium Islands Formed on Silicon Using Stranski-Krastanov Growth by MBE, *Latha Nataraj, Nathan Sustersic, Matthew Coppinger, Felipe Gerlein, James Kolodzey, Sylvain G. Cloutier; Univ. of Delaware, USA.* We report on the optoelectronic properties of bulk Germanium islands formed on silicon by Molecular Beam Epitaxy. More specifically, we will discuss the role of strains and doping in favoring efficient light-emission at telecommunication wavelengths.

AWA6 • 9:30 a.m.
Substantial Enhancement in the Optical Band Gap of ZnO Films Using Ca Dopant, *Kamakhya Prakash Misra, Atul Srivastava, R. K. Shukla, Anchal Srivastava; Univ. of Lucknow, India.* 12.72% enhancement in the band gap of ZnO thin films has been obtained using Ca dopant for the first time. The films, deposited by sol-gel method, are nanocrystalline and highly transparent in the visible region.

JWA • Joint AO/COSI/SRS Session—Continued

JWA4 • 9:30 a.m. Invited
Adaptive Complex Field Control with an Array of Phase-Locked Fiber Collimators, *Mikhail Vorontsov, Thomas Weyrauch, A. Beresnev, Gary W. Carhart, Ling Liu, Konley Aschenbach; Inst. for Systems Res., Univ. of Maryland at College Park, USA.* We discuss development of a coherent fiber-array system composed of fiber collimators with built-in capabilities for adaptive control of the outgoing beam complex field characteristics including wavefront phase piston, tip and tilt and amplitude.

9:00 a.m.–12:00 p.m. Export Regulation Fundamentals for the Optics and Photonics Industry, *Sainte Claire Room, Sainte Claire Hotel*

10:00 a.m.–10:30 a.m. Coffee Break, *Imperial Ballroom, Fairmont Hotel*

10:00 a.m.–4:00 p.m. Exhibit Hall Open, *Imperial Ballroom, Fairmont Hotel*

NOTES

For FiO/LS presentations on Wednesday, see pages 76-99.

Fairfield

AO

10:30 a.m.–11:50 a.m.
AOWA • High Contrast Imaging and Point Spread Function Calibration II
Donald Gavel; Univ. of California at Santa Cruz, USA, Presider

AOWA1 • 10:30 a.m.
Broadband Correction for High Contrast Imaging Using Two Deformable Mirrors in Series, *Tyler D. Groff[1], N. Jeremy Kasdin[1], Laurent Pueyo[2]; [1]Princeton Univ., USA, [2]JPL, USA.* Presented here is a wavefront control algorithm that achieves symmetric high contrast regions using electric field estimation from the science camera. This same algorithm is then extended to broadband suppression.

AOWA2 • 10:50 a.m.
Effects of Aberrations and Specimen Structure in Confocal and Two-Photon Microscopy, *Richard D. Simmonds, Tony Wilson, Martin J. Booth; Dept. of Engineering Science, Univ. of Oxford, UK.* Aberrations affect the image contrast of different specimen structures in microscopes. We have modeled and observed the intensity variation for different structures and the reduction in contrast of small objects within a large background signal.

AOWA3 • 11:10 a.m.
The Electric Field Conjugation: A Unified Formalism for Wavefront Correction Algorithms, *Amir Give'on; JPL, USA.* This paper introduces a unified formulism to describe many of the high contrast correction methods, namely, phase conjugation, classical speckle nulling and energy minimization. This unified formalism led to the Electric Field Conjugation (EFC) algorithm.

Belvedere

AOIM

10:30 a.m.–11:45 a.m.
AWB • Laser-Material Interactions
Peter Moulton; Q-Peak Inc., USA, Presider

AWB1 • 10:30 a.m. Invited
Optical Hyperdoping; Using Lasers to Tailor the Optoelectronic Properties of Semiconductors, *Mark Winkler, Meng-Ju Sher, Yu-Ting Lin, Eric Mazur; Harvard Univ., USA.* Irradiating silicon and other semiconductors with intense femtosecond pulses in the presence of certain gases dramatically alters fundamental properties of the semiconductor and offers a new avenue for the development of optoelectronic devices.

AWB2 • 11:00 a.m.
Asymmetric Writing with Scanning Direction of Femtosecond Laser in Silica Glass, *Bertrand Poumellec, Matthieu Lancry, Jean Claude Poulin; Univ. of Paris Sud, France.* Surface topography in femtosecond irradiated samples that part of the shearing of the laser tracks change its sign with the change in scanning direction (pen effect or asymmetric writing), part not.

AWB3 • 11:15 a.m.
Femtosecond Laser Induced Micro-Structured Silver Containing Glass as an Engineered Nonlinear Optical Material, *Jiyeon Choi[1,2,3], Matthieu Bellec[2], Kevin Bourhis[3], Arnaud Royon[2], Lionel Canioni[2], Thierry Cardinal[3], Evelyne Fargin[3], Vincent Rodriguez[4], Marc Dussauze[4], Aurelien Delestre[3], Martin Richardson[1]; [1] Townes Laser Inst., College of Optics and Photonics, Univ. of Central Florida, USA, [2]CPMOH, Univ. Bordeaux, France, [3]ICMCB, CNRS UPR9048, Univ. Bordeaux, France, [4]ISM, Univ. Bordeaux, France.* The creation mechanism of femtosecond laser produced silver microstructures in silver containing zinc phosphate glass is described. Laser induced depletion in a microstructure enables second harmonic generation exhibiting 2.44 times increased second-order susceptibility than quartz.

Club Regent

COSI

10:30 a.m.–12:00 p.m.
CWA • Polarization Sensing and Imaging
Kenny Kubala; FiveFocal, USA, Presider

CWA1 • 10:30 a.m.
Full Stokes Polarimetry in near Field, *Janghwan Bae, David P. Haefner, Sergey Sukhov, Aristide Dogariu; CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA.* An optimization technique is demonstrated to correct for inherent errors in near-field polarimetry. Stokes analysis of electromagnetic fields in reflection geometry can be optimized based on the local degree of polarization.

CWA2 • 10:45 a.m.
Joint Estimation of Stokes Images and Aberrations from Phase-Diverse Polarimetric Measurements, *John R. Valenzuela, Jeffrey A. Fessler; Univ. of Michigan, USA.* A penalized likelihood algorithm for joint estimation of Stokes images and aberrations for a four channel polarimeter utilizing phase diversity is derived. System optimization is investigated using a Cramer-Rao bound. Simulation results are presented.

CWA3 • 11:00 a.m.
Polarization Estimation through Computational Sensing, *Wei Wang, Timothy J. Schulz; Dept. of Electrical and Computer Engineering, Michigan Technological Univ., USA.* A computational approach for estimating the degree of polarization from the speckle fluctuations of total intensity data is proposed. Maximum likelihood estimators are studied, and their performances are compared to algebraic estimators and Cramer-Rao bounds.

CWA4 • 11:15 a.m.
Snapshot Spectro-Polarimetry Using Disordered Materials, *Thomas Kohlgraf-Owens, Aristide Dogariu; CREOL,College of Optics and Photonics, Univ. of Central Florida, USA.* An optical field is characterized by both its spectral and polarization content. Both properties may be simultaneously estimated by analyzing intensity measurements after the interaction of the field with a disordered material.

Cupertino

JOINT AO/FiO

10:30 a.m.–12:00 p.m.
JWB • Advances in Adaptive Optics Imaging of the Living Retina I
Stephen A. Burns; Indiana Univ., USA, Presider

JWB1 • 10:30 a.m.
Off-Axis Estimation of Ocular Aberrations via Scanning Shack-Hartmann Wavefront-Sensor, *Xin Wei, Larry N. Thibos; School of Optometry, Indiana Univ., USA.* We developed a Scanning Hartmann Shack wavefront sensor by coupling the Shack Hartmann aberrometer with a scanning system. This instrument measures off-axis aberration of the human eye accurately and precisely in an efficient manner.

JWB2 • 10:45 a.m.
Optimal Correction of Subject Prescription on an Adaptive Scanning System for Retinal Imaging, *David Merino, Austin Roorda; School of Optometry, Univ. of California at Berkeley, USA.* The effect on image quality of subject's prescription on an AOSLO is assessed. Models considering different configurations available in literature have been studied. Factors to consider when implementing these configurations on real systems are addressed.

JWB3 • 11:00 a.m. Invited
Adaptive Optics Psychophysics, *Heidi Hofer; Univ. of Houston, USA.* Adaptive optics allows imaging of individual photoreceptors *in vivo* and viewing of arbitrary stimuli nearly free of optical blur. Combining these abilities has created new opportunities to study the retinal and neural limits on vision.

For FiO/LS presentations on Wednesday, see pages 76-99.

Fairfield — AO

AOWA • High Contrast Imaging and Point Spread Function Calibration II—Continued

AOWA4 • 11:30 a.m.
Paramaterization of the Adaptive Optics Point Spread Function, *Julian C. Christou[1], Jack D. Drummond[2]; [1]Gemini Observatory, USA, [2]AFRL, USA.* We demonstrate how an AO PSF can be parametrized by a model comprising Airy and Lorentzian components. We compare the PSF's measured FWHM with that estimated from the Airy component of the model fit.

Belvedere — AOIM

AWB • Laser-Material Interactions—Continued

AWB4 • 11:30 a.m.
Doping Dependence of the Femtosecond Laser Damage Thresholds in Silica Glasses, *Matthieu Lancry[1], Weijia Yang[1], Bertrand Poumellec[1], Peter Kazansky[2]; [1]Univ. of Paris Sud, France, [2]Optoelectronics Res. Ctr., Univ. of Southampton, UK.* We observed that the first threshold (i.e. permanent isotropic index change) is not significantly dependent on the doping whereas it is the contrary for the second threshold (i.e. permanent linear birefringence).

Club Regent — COSI

CWA • Polarization Sensing and Imaging—Continued

CWA5 • 11:30 a.m.
Expanded Field of View Using Polarization Multiplexing, *Kyle M. Douglass[1], Thomas Kohlgraf-Owens[1], Jeremy Ellis[1], Cristian Toma[1], Abhijit Mahalanobis[2], Aristide Dogariu[1]; [1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Lockheed Martin Corp., USA.* We introduce and demonstrate experimentally a method for expanding the field of view of an imaging system by multiplexing polarimetrically encoded images and decoding them with a limited a number of measurements.

CWA6 • 11:45 a.m.
Reconstructing Anisotropic Polarizabilities from a Single Polarimetric Measurement, *David P. Haefner, Sergey Sukhov, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We show how several probability distributions can be restored from the distribution of one single observable. The method is directly applicable to polarimetric measurements with limited control over the experimental conditions.

Cupertino — JOINT AO/FiO

JWB • Advances in Adaptive Optics Imaging of the Living Retina I—Continued

JWB4 • 11:30 a.m.
Experimental Test of Simulated Retinal Images Using Adaptive Optics, *Pablo De Gracia, Carlos Dorronsoro, Lucie Sawides, Enrique Gambra, Susana Marcos; Inst. de Óptica, Spain.* Ocular degradation is frequently assessed convolving images with the ocular point-spread-function, estimated from the wave-aberration. Comparisons of visual acuity measured using aberrated targets (viewed through adaptive-optics corrected aberrations) and under natural aberrations reveal consistent discrepancies.

JWB5 • 11:45 a.m.
High Resolution Wavefront Sensing and Mirror Control for Vision Science by Quantitative Phase Imaging, *Alaster J. Meehan, Phillip Bedggood, Brendan Allman, Keith A. Nugent, Andrew B. Metha; Univ. of Melbourne, Australia.* Quantitative Phase Imaging displays attractive features for ocular wavefront aberrometry. An adaptive-optics mirror control algorithm for ophthalmoscopy is demonstrated that takes advantage of its superior lateral resolution and similar accuracy compared to Hartmann-Shack systems.

12:00 p.m.–1:30 p.m. Lunch Break *(on your own)*

12:00 p.m.–1:30 p.m. JWC • Joint FiO/LS Poster Session, *Imperial Ballroom, Fairmont Hotel*

NOTES

For FiO/LS presentations on Wednesday, see pages 76-99.

Fairfield

AO

1:30 p.m.–3:30 p.m.
AOWB • Control Algorithms and Architecture
Richard Dekany; Caltech, USA, Presider

AOWB1 • 1:30 p.m. Invited
Control Design and Turbulent Phase Models in Adaptive Optics: A State-Space Interpretation, *Caroline Kulcsár[1], Henri-François Raynaud[1], Jean-Marc Conan[2], Carlos Correia[2], Cyril Petit[2]; [1]Univ. of Paris, France, [2]ONERA, France.* A unified LQG framework is used for analyzing explicit/implicit turbulence models for AO control. Behavior and modeling assumptions of several control laws are discussed, together with associated turbulent phase space reconstruction.

AOWB2 • 2:00 p.m. Invited
Predictive Fourier Wavefront Control: Theory and Observational Results, *Lisa Poyneer[1], Marcos van Dam[2], Jean-Pierre Véran[3]; [1]Lawrence Livermore Natl. Lab, USA, [2]W. M. Keck Observatory, USA, [3]Herzberg Inst. of Astrophysics, Canada.* Astronomical observations at Keck and Gemini validate the fundamental frozen-flow model of Predictive Fourier Control, a computationally efficient and adaptive Kalman filtering technique for predictive wavefront control in adaptive optics.

Belvedere

AOIM

1:30 p.m.–3:15 p.m.
AWC • Oxide Crystals
Peter G. Schunemann; BAE Systems, USA, Presider

AWC1 • 1:30 p.m. Invited
Hydrothermal Solubility and Crystal Growth of $KBe_2BO_3F_2$ (KBBF), *Joseph W. Kolis, Colin D. McMillen; Clemson Univ., USA.* KBBF was found to have a positive solubility dependence on temperature under hydrothermal conditions explored. The hydrothermal growth of KBBF single crystals up to 15 x 10 x 4 mm^3 in size is demonstrated.

AWC2 • 2:00 p.m.
Light Absorption and Pyroelectrically Induced Optical Damage in Nominally Undoped and Magnesium-Doped Lithium Niobate Crystals, *Judith R. Schwesyg[1,2], Martin M. Fejer[1], Matthias Falk[3], Carsten Langrock[1], Roger K. Route[1], Chris R. Phillips[1], Maria Claudia C. Kajiyama[3], Dieter H. Jundt[3], Karsten Buse[2]; [1]E. L. Ginzton Lab, Stanford Univ., USA, [2]Inst. of Physics, Univ. of Bonn, Germany, [3]Crystal Technology, Inc., USA.* This contribution deals with light absorption and temperature change induced optical damage due to the pyroelectric effect in undoped and magnesium-doped lithium niobate crystals. This effect is different from the photorefractive optical damage.

AWC3 • 2:15 p.m.
Vapor-Transport Equilibrated Lightly MgO-Doped Lithium Niobate for Nonlinear Optics, *Rostislav V. Roussev, Roger Route, Karel Urbanek, Robert L. Byer, Martin M. Fejer; Stanford Univ., USA.* We discuss several properties of lightly-MgO-doped near-stoichiometric lithium niobate in comparison with other ferroelectric nonlinear materials. Recent results on green light generation and potential advantages over 5 mol-% MgO-doped congruent lithium niobate are described.

Club Regent

COSI

1:30 p.m.–3:15 p.m.
CWB • Multi Aperture Systems
Ravindra Anant Athale; MITRE Corp., USA, Presider

CWB1 • 1:30 p.m. Invited
A Computational Compound Imaging System Based on Irregular Array Optics, *Jun Tanida, Keiichiro Kagawa, Keita Fujii, Ryoichi Horisaki; Osaka Univ., Japan.* A computational imaging system using compound-eye optics with irregularity can improve imaging performance especially for long distance objects. The system characteristics are analyzed and an efficient algorithm is implemented using a graphic processing unit.

CWB2 • 2:00 p.m. Invited
Multiscale Optical Systems, *David Brady; Duke Univ., USA.* Cameras capturing gigapixel or even terapixel images are enabled by lens systems combining single aperture objectives with arrays of smaller scale processing optics.

Cupertino

SRS

1:30 p.m.–3:15 p.m.
SWA • Phase Retrieval Methods
Charles L. Matson; AFRL, USA, Presider

SWA1 • 1:30 p.m. Invited
Intensity Diffraction Tomography, *Greg Gbur; Univ. of North Carolina at Charlotte, USA.* Over the past few years, a new technique known as intensity diffraction tomography has been developed which allows phase-less reconstruction of weakly scattering objects. We review the technique and discuss recent and future developments.

SWA2 • 2:00 p.m.
Phase Retrieval with a Translating Lyot Stop Coronagraph Mask in the JWST, *Thomas P. Zielinski, James R. Fienup; Institute of Optics, University of Rochester, USA.* A phase retrieval algorithm based on transverse translation diversity is investigated as a method for retrieving the phase of the field as seen through the JWST NIRCam coronagraph using only existing hardware.

SWA3 • 2:15 p.m.
Paper Withdrawn

Thank you for attending FiO/LS/Fall Congress. Look for your post-conference survey via email and let us know your thoughts on the program.

For FiO/LS presentations on Wednesday, see pages 76-99.

Fairfield — AO

AOWB • Control Algorithms and Architecture—Continued

AOWB3 • 2:30 p.m.
A Robust, Strehl Optimal Tomographic Wavefront Control Architecture for Multi-Conjugate and Multi-Object Laser Guide Star Adaptive Optics, *Luc Gilles, Brent L. Ellerbroek; Thirty Meter Telescope, Caltech, USA.* We report on a novel robust, Strehl optimal tomographic wavefront control architecture for multi-conjugate and multi-object laser guide star adaptive optics systems.

AOWB4 • 2:50 p.m.
Minimum Variance Control for the Woofer-Tweeter Concept, *Carlos Correia[1,2], Henri-François Raynaud[2], Caroline Kulcsár[2], Jean-Marc Conan[1]; [1]ONERA, France, [2]L2TI, Univ. Paris XIII, France.* Optimal minimum-variance control of the double stage woofer-tweeter concept in adaptive optical systems is addressed using a LQG approach. Results are shown for an infinitely-fast tweeter coupled to a slower woofer.

AOWB5 • 3:10 p.m.
Bulk Wind Estimator Performance for AO Systems, *Luke C. Johnson, Donald T. Gavel, Donald M. Wiberg; Ctr. for Adaptive Optics, Univ. of California at Santa Cruz, USA.* We use the Cramer-Rao lower bound to find that the error in a bulk wind estimator is dependent on both the signal-to-noise ratio at the wavefront sensor and the spatial frequency content of the wavefront.

Belvedere — AOIM

AWC • Oxide Crystals—Continued

AWC4 • 2:30 p.m. Invited
Periodically Poled Crystals for Mass-Market Applications, *Dieter Jundt; Crystal Technology, Inc., USA.* Optical properties of MgO:LN crystals grown from various melts were characterized. The gained knowledge allows production of wafers with reproducible quality and makes the material well suited for use in portable laser displays.

AWC5 • 3:00 p.m.
Epitaxial Nd:Sapphire Films - Candidate Solid State Laser Material for 1096nm Emission, *Raveen Kumaran[1], Scott E. Webster[1], Shawn Penson[1], Wei Li[1], Thomas Tiedje[2]; [1]Univ. of British Columbia, Canada, [2]Dept. of Electrical and Computer Engineering, Univ. of Victoria, Canada.* Nd:Sapphire films grown by molecular beam epitaxy produce sharp emission lines due to identical-site doping not observed in bulk sapphire crystals. The 1096 nm line is a lasing candidate with an Nd:YVO_4-like emission cross section.

Club Regent — COSI

CWB • Multi Aperture Systems—Continued

CWB3 • 2:30 p.m.
Parallel Optics for Improving System Matrix Condition, *Iftach Klapp, David Mendlovic; Tel Aviv Univ., Israel.* In many cases space variant (SV) image restoration is limited by the optical system matrix condition. We show how to improve this figure by the means of parallel optics for SV and space invariant cases.

CWB4 • 2:45 p.m.
Aberration Correction in Multiscale Lenses, *Nathan Hagen, David J. Brady; Duke Univ., USA.* Multiscale lens design splits the field into subregions and attempts to correct the local wavefront error in each subfield rather than the global error. We review design principles and aberration theory underlying the approach.

CWB5 • 3:00 p.m.
Experimentally Validated High-Resolution Imaging with Adaptive Multi-Aperture Folded Architecture, *Vikrant R. Bhakta, Manjunath Somayaji, Scott C. Douglas, Marc P. Christensen; Southern Methodist Univ., USA.* We present experimental results of imaging and digital super-resolution in a multi-aperture miniature folded imaging architecture called *Panoptes*. We prove the feasibility of integrating folded imagers within a steerable multi-aperture framework while maintaining thin profiles.

Cupertino — SRS

SWA • Phase Retrieval Methods—Continued

SWA4 • 2:30 p.m.
A New Phase-Correlation Based Gradient Registration Approach for Phase-Retrieval with DIC and DPC, *Shalin B. Mehta, Colin J. R. Sheppard; Optical Bioimaging Lab, Div. of Bioengineering, Natl. Univ. of Singapore, Singapore.* Phase-correlation robustly detects translations and rotations between images. We extend it for registration of images acquired using varied settings of differential interference contrast (DIC) and differential phase contrast (DPC) for phase-retrieval.

SWA5 • 2:45 p.m.
Paper Withdrawn

SWA6 • 3:00 p.m.
Using Phase Retrieval to Obtain the Complete Spatio-Temporal Intensity and Phase of Ultrashort Pulses, *Pamela R. Bowlan, Rick Trebino; School of Physics, Georgia Tech, USA.* Using a Gerchberg-Saxton-like phase retrieval algorithm, we recover the spatial phase from spatio-temporal measurements of focusing ultrashort pulses made using an unstable interferometer.

3:30 p.m.–4:00 p.m. Coffee Break/Exhibits, *Imperial Ballroom, Fairmont Hotel*

For FiO/LS presentations on Wednesday, see pages 76-99.

JOINT AO/FiO

4:00 p.m.–5:30 p.m.
JWF • Advances in Adaptive Optics Imaging of the Living Retina II
Jungtae Rha; Medical College of Wisconsin, USA, Presider

JWF1 • 4:00 p.m. Invited
Adaptive Optics Instrumentation, *Stephen A. Burns[1], Zhangyi Zhong[1], Weiyao Zou[1], Cong Deng[1], Daniel Ferguson[2], Xiaofeng Qi[1]; [1]Indiana Univ., USA, [2]Physical Sciences Inc., USA.* Adaptive optics imaging of the retina presents unusual design challenges. AO instruments allowing steering of the beam across the retina, large amounts of defocus, and variable pupil sizes will be discussed.

JWF2 • 4:30 p.m.
A New Ferrofluid Mirror for Vision Science Applications, *Denis Brousseau[1], Ermanno F. Borra[1], Anna M. Ritcey[1], Melanie C. Campbell[2,3], Simon Thibault[1], Julie Drapeau[1], Azadeh Naderian[1]; [1]Univ. Laval, Canada, [2]Univ. of Waterloo, Canada, [3]Guelph Waterloo Physics Inst., Canada.* We present a novel ferrofluid mirror design which will result in an inexpensive adaptive optics element with large stroke for use in ophthalmic imaging.

JWF3 • 4:45 p.m. Invited
Adaptive Optics-OCT Imaging of the Retina, *Donald T. Miller; Indiana Univ., USA.* Ultrahigh resolution OCT with adaptive optics provides unprecedented 3-D resolution of the cellular retina *in vivo*. Here we investigate the utility of this instrument for imaging individual retinal nerve fiber bundles, retinal capillaries, and photoreceptors.

JWF4 • 5:15 p.m.
First-Order Design of Off-Axis Reflective Ophthalmic Adaptive Optics Systems Using Afocal Telescopes, *Alfredo Dubra[1], Armando Gómez-Vieyra[2], Daniel Malacara-Hernández[2], David R. Williams[1]; [1]Univ. of Rochester, USA, [2]Ctr. de Investigaciones en Optica AC, Mexico.* Expressions for minimal astigmatism in image and pupil planes in off-axis reflective afocal telescopes formed by pairs of spherical mirrors are presented and evaluated for small angles of incidence.

AOIM

4:00 p.m.–5:30 p.m.
AWD • Optical Ceramics
Candace L. Lynch; AFRL, USA, Presider

AWD1 • 4:00 p.m. Invited
Ceramic and Glass Ceramic Phosphors for Solid State Lighting, *Setsuhisa Tanabe; Kyoto Univ., Japan.* Transparent ceramic and glass ceramic phosphors containing Ce^{3+}-doped $(Y,Gd)_3Al_5O_{12}$ were prepared and luminescent characteristics pumped with blue LED were investigated. Transparent ceramic samples without Gd showed the best luminous efficacy as a white light source.

AWD2 • 4:30 p.m. Invited
Current Status of Optical Ceramics, *Akio Ikesue; World Lab Co., Ltd., Japan.* We demonstrated not only high-efficiency laser generation from polycrystalline Nd:YAG ceramics, but also succeeded in fabrication of high-functional ceramic lasers such as composite, fiber, micro-sphere, and single crystal by sintering method etc.

AWD3 • 5:00 p.m. Invited
Control of Defects in Laser and Scintillator Ceramics, *Romain Gaume; Stanford Univ., USA.* When properly designed, optical-ceramics can yield high performance lasers and scintillators. Controlling the defects in these materials is essential to these applications. Systematic composition studies in YAG-ceramics, investigated by novel optical characterization techniques, will be presented.

6:30 p.m.–8:00 p.m.
AIOM Welcome Reception,
Regency Ballroom I, Fairmont Hotel

NOTES

For FiO/LS presentations on Wednesday, see pages 76-99.

Fairfield

AO

8:00 a.m.–9:40 a.m.
AOThA • Adaptive Optics Systems II
Donald T. Miller; Indiana Univ., USA, Presider

AOThA1 • 8:00 a.m.
Remove Optical Vortices Using Continuous Phase Modulation, *Mingzhou Chen, Chris Dainty; Applied Optics, School of Physics, Natl. Univ. of Ireland, Galway, Ireland.* We introduce a method to remove optical vortices from strong scintillated laser beams by vortex dipole annihilation with a continuous phase modulation. Numerical simulations and an experimental setup are also presented.

AOThA2 • 8:20 a.m.
Experimental Validation of LTAO and MCAO Configurations with Optimal Control, *Anne Costille[1], Cyril Petit[1], Jean-Marc Conan[1], Caroline Kulcsár[2], Henri-Francois Raynaud[2], Thierry Fusco[1]; [1]ONERA, France, [2]LETI, Univ. Paris XIII, France.* We present an experimental validation of LTAO and MCAO concepts in closed-loop in laboratory. We compare the performance of LQG based optimal control and classic integrator based control in closed-loop for these configurations.

AOThA3 • 8:40 a.m.
Performance Assessment of the Gemini South near Infrared Coronagraphic Imager (NICI) Adaptive Optics System, *Christ Ftaclas, Mark Chun, Zahed Wahhaj; Inst. for Astronomy, Univ. of Hawaii, USA.* We describe the NICI adaptive correction system and characterize its spatial and temporal correction spectra by combining multi-wavelength on-sky images, phase inversion on test source images and system capture data.

AOThA4 • 9:00 a.m.
Building an Open Loop Interaction Matrix for VOLT, *David R. Andersen, Michael Fischer, Jean-Pierre Véran; Herzberg Inst. of Astrophysics, Natl. Res. Council Canada, Canada.* We explore a method for building an interaction matrix for VOLT (the Victoria Open Loop Testbed) that bypasses problems associated with optically aligning an open loop wave-front sensor to the deformable mirror.

AOThA5 • 9:20 a.m.
Thermal Compensation in the LIGO Gravitational-Wave Interferometers, *Phil Willems; LIGO Project, Caltech, USA.* Gravitational-wave (GW) interferometers, such as LIGO, are susceptible to thermal aberrations that impair their performance. We describe thermal compensation in the LIGO GW interferometers, as well as future plans toward a fully adaptive system.

Belvedere

AIOM

8:00 a.m.–9:30 a.m.
AThA • Nanostructured Materials
Shaya Y. Fainman; Univ. of California at San Diego, USA, Presider

AThA1 • 8:00 a.m. Invited
Optical Metamaterials, *Xiang Zhang; Univ. of California at Berkeley, USA.* Abstract not available.

AThA2 • 8:30 a.m.
Preparation of Metallo-Dielectric Diffractive and Plasmonic Structures via Self-Assembly, *Filip Novotný, Jan Proška, Ivan Richter, Pavel Fiala; Czech Technical Univ. in Prague, Czech Republic.* Self-assembly is a prospective and cost-effective way how to obtain three-dimensional metallo-dielectric diffractive and plasmonic structures. We show utilization of self-assembly principle in preparation of highly ordered sub wavelength structures.

AThA3 • 8:45 a.m.
Colloidal Metallic Nanoparticles in Ionic Liquids: New Systems for Nonlinear Optical Applications, *Cassio E. A. Santos[1], Marcio A. R. Alencar[1], Luciane F. Oliveira[2], Carla W. Scheeren[2], Jairton Dupont[2], Jandir M. Hickmann[1]; [1]Univ. Federal de Alagoas, Brazil, [2]Univ. Federal do Rio Grande do Sul, Brazil.* Large nonlinear optical responses were observed of Ag and Au colloidal nanoparticles dispersed in ionic liquids. These hybrid organic-metallic materials are promising candidates to the development of nonlinear optical applications.

AThA4 • 9:00 a.m.
Photoluminescence Modification in Self-Assembled Fluorescent 3-D Photonic Crystals, *Harish N. Swaha Krishnamoorthy[1], Jung Hun Song[2], Ilona Kretzschmar[2], Vinod M. Menon[1]; [1]Dept. of Physics, Queens College of CUNY, USA, [2]Dept. of Chemical Engineering, City College of CUNY, USA.* Using time resolved luminescence measurements, we report 10% increase in spontaneous emission lifetime from a self-assembled 3-D photonic crystal fabricated using fluorescent polystyrene spheres with refractive index contrast of ~0.57.

AThA5 • 9:15 a.m.
Far Field and near Field Properties of Triangular Metal Nanoparticle and Nanopatterns of 3-Fold Rotational Symmetry, *Kin Hung Fung, Pratik Chaturvedi, Anil Kumar, Keng H. Hsu, Nicholas X. Fang; Univ. of Illinois at Urbana-Champaign, USA.* We study the relation between near-field enhancement and far-field extinction spectra of three-fold rotationally symmetric nanopatterns consisting of metal nano-triangles. Our symmetry analysis benefits the understanding of the plasmon resonance phenomena in these nanopatterns.

Club Regent

COSI

8:00 a.m.–10:00 a.m.
CThA • New Imaging Concepts
Joseph N. Mait; ARL, USA, Presider

CThA1 • 8:00 a.m. Invited
Imaging Systems with Extreme Form Factors, *James R. Leger, J. Burch; Univ. of Minnesota, USA.* We discuss theoretical and practical aspects of far-field imaging systems that are completely contained on a plane or a line. Computational imaging can potentially enhance the resolution, optical throughput, and color correction of these systems.

CThA2 • 8:30 a.m. Invited
Nonlinear Imaging, *Alexandre S. Goy, Demitri Psaltis; Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland.* We address the general problem of imaging through Kerr focusing media when filamentation occurs. Amplification of weak phase patterns is possible through such media. This may find application in surface characterization or evanescent waves detection.

CThA3 • 9:00 a.m.
Transport of Intensity Imaging with Higher Order Derivatives, *Laura Waller, Lei Tian, George Barbastathis; MIT, USA.* We introduce and test a method for improving the accuracy of phase retrieval based on transport of intensity (TIE), by using intensity measurements at multiple planes to estimate and remove artifacts from higher-order axial derivatives.

CThA4 • 9:15 a.m.
Localization Precision of Three-Dimensional Superresolution Fluorescence Imaging Using a Double-Helix Point Spread Function, *Matthew Lew, Michael A. Thompson, Majid Badieirostami, W. E. Moerner; Stanford Univ., USA.* We localize a diffraction-limited fluorescent bead to 10-20 nm in three dimensions using a double-helix point spread function and use this method to track a fluorescently tagged protein in three dimensions within a live cell.

CThA5 • 9:30 a.m.
Coding and Signal Inference in Compressive Holography, *Kerkil Choi, Ryoichi Horisaki, Daniel L. Marks, David J. Brady; Duke Univ., USA.* Compressive sensing enables highly accurate signal reconstruction from fewer measurements than the number of samples in a signal to be estimated. This paper describes a theoretical framework for 3-D tomographic reconstruction from 2-D holographic measurements.

CThA6 • 9:45 a.m.
Experimental Demonstrations of Compressive Holography, *Sehoon Lim[1], Ryoichi Horisaki[2], Kerkil Choi[1], Daniel L. Marks[1], David J. Brady[1]; [1]Duke Univ., USA, [2]Osaka Univ., Japan.* We demonstrate 3-D object reconstruction from a single 2-D data plane using compressive holography in Gabor and Leith-Upatneiks geometries.

10:00 a.m.–10:30 a.m. Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

For FiO/LS presentations on Thursday, see pages 100-115.

Fairfield

AO

10:30 a.m.–11:30 a.m.
AOThB • System Simulation and Modeling II
Miska LeLouarn; European Southern Observatory, France, Presider

AOThB1 • 10:30 a.m.
An Auto-Regressive Model to Create Seeing Time Series, *Glen Herriot[1,2], Brent L. Ellerbroek[2], David A. Andersen[1], Matthias Schoeck[2], Tony Travouillon[2]; [1]Herzberg Inst. of Astrophysics, Natl. Res. Council Canada, Canada, [2]Thirty Meter Telescope, Caltech, USA.* We present an auto-regressive model of atmospheric seeing versus time, based on three years' data from TMT candidate site Cerro Armazonas. The model reproduces time histories of r_0 including a floor, stable stretches, and excursions.

AOThB2 • 10:50 a.m.
Improving the Accuracy of the Ultra Fast Kolmogorov Phase Screen Generator, *Vinay B. Sriram[1], David Kearney[2], Ross Frick[2], Oskar Mencer[1]; [1]Imperial College London, UK, [2]Univ. of South Australia, Australia.* In this paper we characterize the ultra fast phase screen generator's accuracy for high turbulence levels. We then present modifications which preserve the performance and improve the accuracy of the algorithm at high turbulence levels.

AOThB3 • 11:10 a.m.
Hybrid Adaptive Optics Systems with Discrete-Time Atmospheric Turbulence Models, *Douglas P. Looze; Univ. of Massachusetts at Amherst, USA.* A discrete-time model of an AO system that incorporates the intra-frame effects of the DM but uses a discrete-time model of the atmospheric effects is presented.

Thank you for attending FiO/LS/Fall Congress. Look for your post-conference survey via email and let us know your thoughts on the program.

Belvedere

AIOM

10:30 a.m.–12:00 p.m.
AThB • Applications of Nanophotonics
Presider to Be Announced

AThB1 • 10:30 a.m. Invited
Nanophotonics for Information Systems, *Yeshaiahu Fainman, Kazuhiro Ikeda, Dawn Tan; Univ. of California at San Diego, USA.* We explore lithography to pattern metals-dielectrics-semiconductors on various scales opening new capabilities in optics, where functionality and properties are enabled by the structure- composition and not just by the intrinsic properties of a bulk material.

AThB2 • 11:00 a.m.
All-Optical Magnetometer Based on Magnetite Core-Polymer Shell Nanocomposite Material, *Alejandra Lopez-Santiago, Palash Gangopadhyay, Jayan Thomas, Robert A. Norwood, Nasser Peyghambarian; Univ. of Arizona, USA.* An all-optical magnetometer has been constructed based on magnetite core polymer shell nanocomposite material. A noise equivalent magnetic field sensitivity of 5 nT/$\sqrt{\text{Hz}}$ was observed using a 1 μT 500 Hz control magnetic field.

AThB3 • 11:15 a.m.
Selected Applications of Atomic Layer Deposition Dielectric Nanolaminates as Functional Optical Coatings, *Adriana Szeghalmi[1], Michael Helgert[2], Robert Brunner[2], Mario Bretschneider[3], Stephan Senz[1], Ulrich Gösele[1], Mato Knez[1]; [1]Max Planck Inst. of Microstructure Physics, Germany, [2]Carl Zeiss AG, Germany, [3]IFG Inst. for Scientific Instruments GmbH, Germany.* The paper discusses optical applications of atomic layer deposition. X-ray mirrors, antireflective coatings and band-pass filters were made for the visible spectral region. Coatings applied to two-dimensional shallow gratings produced tunable guided mode resonance filters.

AThB4 • 11:30 a.m.
Degenerate Two-Beam Interaction by Hologram Grating in Nano-Colloid, *Sergej Mikhnov[1], Rudol'ph Litvinov[1], Eugene Ageev[1], Sergei Shestov[2], Leonid Zagrebin[2]; [1]Tomsk State Univ. of Control Systems and Radioelectronics, Russian Federation, [2]Ctr. of Cell-Information Medicine, Ltd., Russian Federation.* Degenerate two-beam interaction on the light wavelength in colloid with spherical nano-particles is considered. The contributions of gradient light force and light scattering in local and non-local components of the dynamic grating are carried out.

AThB5 • 11:45 a.m.
Time Domain Numerical Observation of Superluminal Pulse in Photonic Band-Gap Structures, *Tingyi Gu, Chun Jiang; Shanghai Jiaotong Univ., China.* In this paper, we systemically study the time domain properties of superluminal light in 1-D and 2-D band-gap photonic crystals, including band diagram, transmission, group velocity, energy velocity and dwell time.

Club Regent

COSI

10:30 a.m.–12:15 p.m.
CThB • Pupil Encoding Methods
Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA

CThB1 • 10:30 a.m. Invited
Rewriting the Rules of Imaging Design in the New Era of Electro-Optics, *David G. Stork; Ricoh Innovations, USA.* Centuries-old rules of optics design and informal rules-of-thumb are becoming obsolete in the new era when digital image processing is included into the data path.

CThB2 • 11:00 a.m.
Pupil Phase Encoding for Mitigation of Laser-Induced Saturation in Imaging Sensors, *Joseph van der Gracht[1], Lei Zhang[2], Todd Torgersen[3], Paul Pauca[3]; [1]HoloSpex, Inc., USA, [2]Agiltron, Inc., USA, [3]Wake Forest Univ., USA.* Wave-front coding can mitigate the harmful effects of unwanted laser illumination. The pupil phase element spreads out the focused beam and avoids detector saturation. We consider different classes of phase masks for this application.

CThB3 • 11:15 a.m.
Extending Depth-of-Field: Spherical Coding Versus Asymmetric Wavefront Coding, *Dirk Robinson, David G. Stork; Ricoh Innovations, USA.* We compare the image quality between asymmetric wavefront codings and the simple-to-manufacture spherical aberration over an extended focal range. We verify and explain the superior performance of the spherical aberration via simulation results.

CThB4 • 11:30 a.m.
Experimental Validation of Extended Depth-of-Field Imaging via Spherical Coding, *Michael D. Robinson[1], Vikrant Bhakta[2]; [1]Ricoh Innovations, USA, [2]Souther Methodist Univ., USA.* We designed and built a spherical coded triplet imaging system and experimentally verified its extended depth-of-field imaging capabilities.

CThB5 • 11:45 a.m.
Computational Differential Interference Contrast (DIC) Microscopy for Quantitative Imaging, *Chrysanthe Preza[1], Joseph A. O'Sullivan[2]; [1]Univ. of Memphis, USA, [2]Washington Univ. in St. Louis, USA.* We demonstrate that application of a regularized alternating minimization algorithm to DIC microscopy images results in quantitative imaging of the specimen's phase and amplitude information. The alternating minimization algorithm's robustness to noise is investigated.

CThB6 • 12:00 p.m.
Off-Axis Sensor Modulation Transfer Function Measurement Using Band-Limited Laser Speckle, *Xi Chen, Doug Fettig, Bob Gravelle, Donna Cao, Gennadiy Agranov; Aptina Imaging, USA.* We present a new methodology for measurement of off-axis sensor modulation transfer function using band-limited laser speckle and two-dimensional generalized sampling theorem. The effect of chief ray angle on sensor modulation transfer function is studied.

12:00 p.m.–1:30 p.m. Lunch Break *(on your own)*

For FiO/LS presentations on Thursday, see pages 100-115.

Fairfield

AO

1:30 p.m.–3:10 p.m.
AOThC • Wavefront Sensing II
Mikhail Vorontsov; Inst. for Systems Res., USA, Presider

AOThC1 • 1:30 p.m.
A Linear Model for Shack-Hartmann Sensors, *Brent L. Ellerbroek; Thirty Meter Telescope Project, Caltech, USA.* We describe a linear model for Shack-Hartmann sensors. For small wave-front aberrations, the model accounts for the effects of physical optics, extended sources, pixel sampling, and the pixel weights used to compute the gradients.

AOThC2 • 1:50 p.m.
New Modal Wavefront Sensing Employing Binary Basis Functions, *Feiling Wang[1], Christopher Spivey[1], Guixiong Zhong[2], Yuchuan Chen[2], Jing Zhao[2]; [1]Alethus LLC, USA, [2]Agiltron Inc., USA.* Recently, a modal wavefront sensing method, with the use of binary basis functions, was proposed. In this paper we examine some of the optical arrangements for its applications and present experimental results obtained.

AOThC3 • 2:10 p.m.
Direct Wavefront Sensing in Adaptive Microscopy, *Saad A. Rahman, Alexander Jesacher, Tony Wilson, Martin J. Booth; Dept. of Engineering Science, Univ. of Oxford, UK.* Aberrations in high resolution microscopes can be corrected using adaptive optics. We investigate theoretically and experimentally wavefront sensing using backscattered light and show its benefits and limitations for application in adaptive confocal and multiphoton microscopes.

AOThC4 • 2:30 p.m.
Scene Based Wavefront Sensing for Figure Control of Airborne and Space Optics, *Allan Wirth, Andrew Jankevics, Frank Landers; Xinetics / Northrop Grumman, USA.* Correlation wavefront sensing is applied to the problem of figure and alignment maintenance of imaging systems on airborne and space platforms. The design of the system and results of laboratory testing are presented.

Belvedere

AIOM

1:30 p.m.–3:15 p.m.
AThC • Glass Synthesis and Properties
Jonathan Knight; Univ. of Bath, UK, Presider

AThC1 • 1:30 p.m. Invited
Glass-Imprinting for Optical Device Fabrication, *Junji Nishii; Hokkaido Univ., Japan.* Development of thermally durable SiC molds enabled us to imprint fine periodic structures onto a oxide glass surface. Antireflection lenses, quarter wave plates operating in visible wavelength region, could be fabricated.

AThC2 • 2:00 p.m.
Microlens Array Laser Sintered on Glass Sheets, *Changyi Lai, Vitor M. Schneider; Corning, Inc., USA.* A new technique based on the laser vitrification of cordierite ceramic powders is used to fabricate microlenses arrays on a glass substrate. Crack free quasi-spherical lenses with good optical and surface quality are demonstrated.

AThC3 • 2:15 p.m.
Low-Loss Tin Silica Glass-Ceramic Waveguides Doped by Rare-Earth Elaborated by Sol-Gel Route, *Christophe Kinowski[1], Odile Robbe-Cristini[1], Van T. T. Tran[1], Katarzyna Woznica-Raulin[1], Sylvia Turrell[1], Bruno Capoen[2], Mohamed Bouazaoui[2], Franck Beclin[3], Maurizio Ferrari[4], Shivakiran N. B. Bhaktha[4,5]; [1]LASIR, France, [2]PhLAM, France, [3]LSPES, France, [4]CSMFO Lab, Italy, [5]Dept. di Fisica, Univ. di Trento, Italy.* We present recent results obtained in developing glass-ceramic waveguide based on the sol-gel techniques and activated by rare earth ions. The fabrication protocols as well as the spectroscopic assessment are reported.

AThC4 • 2:30 p.m. Invited
Progress on the Fabrication of On-Chip, Integrated Chalcogenide Glass (ChG)-Based Sensors, *Laeticia Petit[1], Nathan Carlie[1], Bogdan Zdyrko[1], Igor Luzinov[1], Kathleen Richardson[1], Juejun Hu[2], Anu Agarwal[2], Lionel Kimerling[2], Troy Anderson[3], Martin Richardson[3]; [1]Clemson Univ., USA, [2]MIT, USA, [3]CREOL, Univ. of Central Florida, USA.* Optical sensor technologies for chemical detection have advanced over the past decade. We report progress on the material design, fabrication and performance of high-Q chalcogenide glass resonators utilizing cavity-enhancement for high sensitivity MIR chemical sensing.

Club Regent

COSI

1:30 p.m.–3:00 p.m.
CThC • Imaging through Complex Media and Spectroscopy
Joe Van der Gracht; Holospex, Inc., USA, Presider

CThC1 • 1:30 p.m.
Sub-Surface Interferometric near-Field Tomography, *Dana C. Kohlgraf-Owens, David Haefner, Sergey Sukhov, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We describe a straightforward method to recover the sub-surface topography of coated samples with sub-diffraction limited resolution. Experimental verification is accomplished using a near-field scanning optical microscope (NSOM) operated in dual mode.

CThC2 • 1:45 p.m.
Imaging through the Air-Water Interface, *Andrey V. Kanaev[1], John R. Ackerman[1], Erin F. Fleet[2], Dean A. Scribner[3]; [1]Global Strategies Group N A Inc., USA, [2]NRL, USA, [3]Northrop Grumman Mission Systems, USA.* Imaging through turbulent air-water interface presents an arduous task and recently has attracted considerable attention. We studied a solution based on atmospheric distortion correction technique and proposed to augment the approach with polarimetric imaging.

CThC3 • 2:00 p.m.
Video Enhancement through Automated Lucky-Region Fusion from a Stream of Atmospherically-Distorted Images, *Mathieu Aubailly[1], Mikhail A. Vorontsov[2], Gary W. Carhart[2], Michael T. Valley[3]; [1]Univ. of Maryland, USA, [2]ARL, USA, [3]Sandia Natl. Labs, USA.* An automated video enhancement technique based on "lucky-region" fusion is presented. The fusion parameter is automatically adjusted to imaging conditions based on analysis of source images. The technique is demonstrated experimentally on atmospherically-distorted image sets.

CThC4 • 2:15 p.m.
Computational Depth-Variant Imaging for Quantitative Fluorescence Microscopy, *Vimeetha Myneni, Chrysanthe Preza; Univ. of Memphis, USA.* We show a performance analysis of a Depth-Variant Expectation Maximization algorithm previously developed for fluorescence microscopy concluding that a small number of point spread functions can be used for an accurate estimation result.

CThC5 • 2:30 p.m.
Adaptive Feature-Specific Spectroscopy, *Dineshbabu V. Dinakarababu, Michael E. Gehm; Univ. of Arizona, USA.* We introduce the Adaptive Feature-Specific Spectrometer (AFSS), a chemical-detection methodology that uses an adaptively reconfigured set of signal projections to drastically shorten time-to-identification in low-SNR situations.

For FiO/LS presentations on Thursday, see pages 100-115.

Fairfield

AO

AOThC • Wavefront Sensing II—Continued

AOThC5 • 2:50 p.m.
Data Compression for Nearly-Periodic Data, *Amos Talmi[1], Erez N. Ribak[2,3]; [1]Timi Technologies Ltd., Israel, [2]Technion-Israel Inst. of Technology, Israel, [3]Applied Optics, School of Physics, Natl. Univ. of Ireland, Galway, Ireland.* Shape from shade and Hartmann sensing require plenty of pixels for measurement, but many fewer can be analyzed, saving space and time. We found a method to compress large-format camera outputs with minimal accuracy loss.

Belvedere

AIOM

AThC • Glass Synthesis and Properties—Continued

AThC5 • 3:00 p.m.
Ultrafast Dephasing Time Measurements in a Niobic-Silicate Nanocomposite Using Incoherent Light, *Euclides C. L. Almeida[1], Leonardo de S. Menezes[1], Cid B. de Araújo[1], Andrey A. Lipovskii[2]; [1]Univ. Federal de Pernambuco, Brazil, [2]St. Petersburg State Technical Univ., Russian Federation.* We report on the measurement of a short optical dephasing time (~ 20 fs) in a glass-ceramic containing sodium niobate nanocrystals using degenerate four-wave mixing with incoherent light. The dephasing mechanisms are discussed.

Club Regent

COSI

CThC • Imaging through Complex Media and Spectroscopy—Continued

CThC6 • 2:45 p.m.
Compressive Sensing Echelle Spectrometer, *Lina Xu, Ting Sun, Kevin Kelly; Rice Univ., USA.* A compressive sensing echelle spectrometer has been built. By employing compression, we reconstructed the two dimensional echelle spectrums using the single photodetector with far fewer measurements when compared to raster scanning.

3:30 p.m.–4:00 p.m. Coffee Break, *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

NOTES

For FiO/LS presentations on Thursday, see pages 100-115.

Fairfield

AO

4:00 p.m.–5:30 p.m.
AOThD • Wavefront Correction Technology
Malcolm Northcott; Aoptix Technologies, USA, Presider

AOThD1 • 4:00 p.m. Invited
MEMS Wavefront Correctors, *Thomas Bifano[1-2]; [1]Boston Univ., USA, [2]Boston Micromachines Corp., USA.* Deformable mirrors made using MEMS processes have become commodity products. Newer capabilities include nanometer-scale predictive open-loop control and scaling to >4000 actuators, while maintaining exceptionally low size, weight, and power.

AOThD2 • 4:20 p.m.
Optically Addressed MEMS Coupled Photodetector Spatial Light Modulator, *Bahareh Haji-Saeed[1], Jed Khoury[1], Kenneth Vaccaro[1], John Kierstead[2], Charles Woods[1], Andrew Davis[2]; [1]Sensors Directorate, AFRL, USA, [2]Solid State Scientific Corp., USA.* We are in the process of developing an all optically driven deformable mirror device through integration of an array of photodetectors with an array of MEMS deformable mirrors.

AOThD3 • 4:50 p.m.
Piezo Array Deformable Mirrors and New Associated Technologies: Spherical Shape and Tip/Tilt Mount, *Jean-Christophe Sinquin, Jean-Marie Lurçon, Pierre Morin; CILAS, France.* We recall the principles, performances and main technical advantages of CILAS Piezo Array Deformable Mirrors. Then we present two new associated technologies: the possible spherical shape of these mirrors and specific tip/tilt mount.

AOThD4 • 5:10 p.m.
Fast, Robust Parameter Estimation and Open-Loop Control of Point-Actuated, Continuous-Facesheet Deformable Mirrors, *Curtis R. Vogel[1], Glenn Tyler[2], Rodolphe Conan[3], Celia Blain[3]; [1]Montana State Univ., USA, [2]Optical Sciences Co., USA, [3]Univ. of Victoria, Canada.* We introduce robust order N algorithms to estimate model parameters and control DMs in open loop based on the Vogel-Yang model for deformable mirrors appearing in JOSA-A, 23, pp. 1074-1081, 2006.

Belvedere

AIOM

4:00 p.m.–6:00 p.m.
AThD • Optical Fibers
Kathleen Richardson; Clemson Univ., USA, Presider

AThD1 • 4:00 p.m. Invited
What's the Use of Silica Microstructured Fibers? *Jonathan Knight; Univ. of Bath, UK.* Photonic crystal materials offer opportunities to overcome the limitations of naturally-occurring optical materials. Recent developments in photonic crystal fibers formed from silica and air offer several examples.

AThD2 • 4:30 p.m. Invited
Chalcogenide Glass Fibers and Their Applications, *Ishwar Aggarwal; NRL, USA.* IR transmitting chalcogenide glasses and fibers are being developed for numerous military, commercial and biomedical applications in the infrared region. Latest results regarding fabrication of the fibers, fiber properties and their applications will be presented.

AThD3 • 5:00 p.m.
Optical Properties of Chalcogenide-Filled Silica-Air PCF, *Markus A. Schmidt[1], Nicolai Granzow[1], Lothar Wondraczek[2], Philip St. J. Russell[1]; [1]Max Planck Inst. for the Science of Light, Germany, [2]Dept. of Materials Science and Engineering, Univ. of Erlangen-Nuremberg, Germany.* Sub-micron strands of $Ge_3As_{52}S_{45}$ glass are incorporated into hollow channels in silica-air fibers. Band gap guidance is observed in a completely filled PCF. Coupling is observed between conventional fiber core and an adjacent chalcogenide strand.

AThD4 • 5:15 p.m.
Highly Efficient 1300 nm Emission in Bismuth Doped AlGeP-Silica Fiber, *Richard S. Quimby[1], Roman L. Shubochkin[2], Theodore F. Morse[2]; [1]Worcester Polytechnic Inst., USA, [2]Boston Univ., USA.* Bismuth doped AlGeP-silica fibers prepared by aerosol deposition have a 1300 nm emission band extending from 1100-1450 nm when pumped at 808 nm. The radiative efficiency was measured to be near unity.

AThD5 • 5:30 p.m. Invited
Bi-Doped Fibers for NIR Lasers and Amplifiers: Opportunities and Challenges, *Evgeny M. Dianov; Fiber Optics Res. Ctr., Russian Acad. of Sciences, Russian Federation.* Recent results on Bi-doped glasses and optical fibers are reviewed. The absorption and luminescent properties of Bi-doped fibers and the results on creation of Bi-doped fiber lasers for a spectral region of 1140-1550nm are presented.

Club Regent

COSI

4:00 p.m.–5:00 p.m.
CThD: COSI Panel Discussion

End the meeting with an exciting panel discussion. In addition to reviewing some of the highlights of the meeting, this will also provide a forum to review related funding programs such as DARPA MOSAIC and some of the recommendations made by recent initiatives such as the Computational Space Telescope study.

Panel participants include:

Ravindra Anant Athale; *MITRE Corp., USA*
David Brady; *Duke Univ., USA*
Aristide Dogariu; *CREOL, College of Optics and Photonics, Univ. of Central Florida, USA*
Michael A. Fiddy; *Univ. of North Carolina at Charlotte, USA*
Mark Allen Neifeld; *Univ. of Arizona, USA*
Rafael Piestun; *Univ. of Colorado, USA*

5:30 p.m.–8:00 p.m. Science Educators' Day, *McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021*

For FiO/LS presentations on Thursday, see pages 100-115.

FiO/LS/Fall Congress Key to Authors and Presiders

(Bold denotes presider or presenting author. Presentation numbers are listed in alphabetical order.)

FiO/LS/OSA Fall Optics & Photonics Congress Program and Exhibit Guide Addendum

LASER SCIENCE SYMPOSIUM ON UNDERGRADUATE RESEARCH: Please see the 6-page program in your registration bag for more information on this symposium, including the updated schedule. Note that the posters will remain in the Cupertino Room until 6:00 p.m.

Short Course Cancellations

SC326 Patent Fundamentals
SC322 Silicon Nanophotonics
SC340 Tissue Optics and Optical Coherence Tomography

What's Hot in Optics Today?

Presentation updates:

- **Seeing the (Almost) Invisible: Using Novel Nonlinear Optical Effects for Image Contrast in Biology and Medicine**, *Chris Schaffer; Cornell Univ., USA*
- **Design Events—Solar Technology: Design, Fabrication, and Testing**, *R. John Koshel; Photon Engineering LLC and College of Optical Sciences, Univ. of Arizona, USA*
- **What's Hot in Information Acquisition, Processing and Display**, *David Brady; Duke Univ., USA*
- **What's Hot in Photonics and Opto-Electronics**, *Juerg Leuthold; Univ. of Karlsruhe, Germany*
- **More to Retinal Wiring than Meets the Eye**, *Alex Wade; Smith-Kettlewell Eye Res. Inst., USA*

Technical Group Meetings

- On Sunday, from 7:00 p.m.–8:30 p.m. in the Empire Room at the Fairmont Hotel, join the Fabrication, Design, and Instrumentation Division meeting for a special guest presentation on NIF.
- On Tuesday, from 7:00 p.m.–8:00 p.m. in the Empire Room at the Fairmont Hotel, attend the joint meeting of the Optical System Design and Characterization and Polarization Technical Groups.
- On Wednesday, from 4:00 p.m.–5:00 p.m. in the Cupertino Room at the Fairmont Hotel, join the OSA Imaging Sensing and Pattern Recognition Technical Group for an informal discussion of results presented at the COSI and SRS topical meetings and at FiO. Light refreshments will be served.

Student Programming

The presentation by Featured OSA Traveling Lecturer: Irving Bigio scheduled for Tuesday has been cancelled. The "Painless Publishing" session is now from 9:00 a.m.–10:00 a.m. The "Career Focus: Policy in Science" session is now from 10:30 a.m.–12:00 p.m.

Withdrawn Presentations

AO: AOTuC3, AOThB3
FiO: FTuY5, JWC61, JWC78, JWE6, FWC6, FWL6, FThO1
LM: LMTuB2
LS: LSTuA1, LSTuI4, LSWA5, LSWJ1, LSWJ4, LSWK4, LSThD2

Session Updates

- **AWA** ends at 10:00 a.m.
- **AWB** ends at 12:00 p.m.
- **AWC** ends at 3:30 p.m.
- **AWD** ends at 6:00 p.m.
- **AThA** ends at 9:45 a.m.
- **AOThA** ends at 10:00 a.m.
- **AOThB** ends at 11:50 a.m.
- **CWB** ends at 3:30 p.m.
- **CThC** ends at 3:15 p.m.
- **FTuM** ends at 3:30 p.m.
- **JWE** ends at 5:45 p.m.
- **FThO** begins at 1:45 p.m.
- **LSWD** ends at 12:30 p.m.
- **LSWJ** starts at 4:30 p.m.
- **SWA** ends at 3:30 p.m.

Program Additions

LS invited presentation **LSWD5, Local Structural Flexibility of Nucleic Acid Probed by a Wide Field Single Molecule FRET Imaging Technique,** *Tae-Hee Lee; Pennsylvania State Univ., USA* will be presented at 12:00 p.m. **Abstract:** A simple method to probe local structural flexibility of nucleic acid based on a wide field single molecule FRET imaging technique will be presented. Applications to DNA duplexes, ribosome complexes and nucleosomes will also be presented.

FiO invited presentation **FTuF3, Problems in Physically Based Simulations of Real-World Environments,** *Donald P. Greenberg; Program of Computer Graphics, Cornell Univ., USA* will be presented at 11:30 a.m. **Abstract:** For the design of buildings, advertising for the automotive industry, or interior design, physically-based simulations must be accurate representations of real-world environments. This heavily illustrated graphical talk identifies the unsolved research areas necessary to reach this goal and shows several compelling applications.

The talk that was originally FTuF3 is now **FTuM4, 3-D TV Based on Integral Method Using Extremely High-Resolution Video System,** *Masahiro Kawakita, Jun Arai, Fumio Okano; NHK Science & Technical Res. Labs, Japan*, and will be presented at 3:00 p.m.

Presentation Schedule Updates

AWB2, Asymmetric Writing with Scanning Direction of Femtosecond Laser in Silica Glass, is now **AThC4** and will be presented by Matthieu Lancry on Thursday at 2:30 p.m.

AThC4, Progress on the Fabrication of On-Chip, Integrated Chalcogenide Glass (ChG)-Based Sensors, is now **AWB2** and will be presented at 11:00 a.m. on Wednesday.

AWB3, Femtosecond Laser Induced Micro-Structured Silver Containing Glass as an Engineered Nonlinear Optical Material, begins at 11:30 a.m.

AWB4, Doping Dependence of the Femtosecond Laser Damage Thresholds in Silica Glasses, begins at 11:45 a.m.

AThC5, Ultrafast Dephasing Time Measurements in a Niobic-Silicate Nanocomposite Using Incoherent Light, begins at 2:45 p.m.

AThD2, Chalcogenide Glass Fibers and Their Applications, is now **AWD4** and will be presented at 5:30 p.m. on Wednesday.

FThU6, Direct Measurement of High Q-Factors in Individual Salt-Water Microdroplets by Photothermal Tuning Spectroscopy, is now **FThU7** and will be presented at 5:45 p.m.

FThU7, Reversible Photothermal Tuning of Single Salt-Water Microdroplets on a Superhydrophobic Surface, is now **FThU6** and will be presented at 5:30 p.m.

Presenter Changes

- *Julian Christou; Gemini Observatory, USA* will present **AOTuC1, Differential Photometry through PDF Deconvolution** and **AOTuC2, Statistical Signal Enhancement in Adaptive-Optics Observations of Exoplanets**.
- *Caroline Kulcsár; LETI, Univ. Paris XIII, France* will present **AOThA2, Experimental Validation of LTAO and MCAO Configurations with Optimal Control**.
- *David A. Andersen; Herzberg Inst. of Astrophysics, Natl. Res. Council of Canada, Canada* will present **AOThB1, An Auto-Regressive Model to Create Seeing Time Series**.
- *Jeffrey Livas; NASA Goddard Space Flight Ctr., USA* will present **JMB2, LISA: Detecting Gravitational Waves from Space**.
- *Edward Watson; AFRL, USA* will present **FTuF1, Three-Dimensional Sensing, Visualization, and Display by Integral Imaging**.
- *Peter (Jeff) Wisoff; Lawrence Livermore Natl. Lab, USA* will present **FTuK1, Status of the National Ignition Facility**.
- *Kishor T. Kapale; Western Illinois Univ., USA* will present **JWC25, On Simultaneous**

Measurement of Polarization and Orbital Angular Momentum of Light.
• *C. Faber; Univ. of Erlangen-Nuremberg, Germany* will present **FWV1, Deflectometry Challenges Interferometry: 3-D-Metrology from Nanometer to Meter**.
• *Pierre Thibault; Paul Scherrer Inst., Switzerland* will present **FThT1, Multi-Modal Scanning X-Ray Microscopy**.
• *Diego Krapf; Colorado State Univ., USA* will present **LSWD3, Tracking Single Potassium Channels in Live Mammalian Cells**.

Author Updates

Corrected reference 2 for **AOThB3P**: [2] R. Holzlöhner, S. M. Rochester, D. Bonaccini Calia, D. Budker, J. M. Higbie, and W. Hackenberg, "Optimization of cw sodium laser guide star efficiency", to appear in Astronomy and Astrophysics, preprint: arXiv 0908.1527 http://arxiv.org/abs/0908.1527

Updated author information for **JTuC8, Six-Dimensional Joystick Based on Detection of Optical Spot:** *Meng-Che Tsai, Pin-Hao Hu, Yung-Hsing Wang; ITRI, Industrial Technology Res. Inst., Taiwan.* Yung-Hsing Wang will present.

Updated author order for **JWC28, Atmospheric Propagation of Fiber and Solid State Lasers in Maritime Environments:** *Matthew A. Leigh, Timothy O. Murphy, Andrew Baronavski, Adin Kawate; Envisioneering, Inc., USA.* Matthew Leigh will present.

Updated author information for **LSTuC1, Sub-Picosecond Intersystem Crossings and Structural Dynamics: Combined Ultrafast Optical and X-Ray Absorption Studies:** *C. Milne[1], S. Johnson[2], V. T. Pham[1], A. El Nahhas[1], R. van der Veen[1], P. Beaud[2], Ch. Bressler[1], M. Chergui[1]; [1]Lab of Ultrafast Spectroscopy, Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Swiss Light Source, Paul Scherrer Inst., Switzerland.* Steve Johnson will present.

Presider Updates

• *Kathleen Richardson; Clemson Univ., USA* will preside over session **AWA**.
• *Martin M. Fejer; Stanford Univ., USA* will preside over **AThD**.
• *David H. Reitze; Univ. of Florida, USA* will preside over session **FMI**.
• *Neil Terry; Duke Univ., USA* will preside over session **FMK**.
• *Se Baek Oh; MIT, USA* will preside over session **FTuH**.
• *Edward Watson; AFRL, USA* will preside over **FTuM**.
• *Roberta Zambrini; IFISC (UIB-CSIC), Univ. Illes Balears, Spain* will preside over session **FWS**.
• *Benjamin Varcoe; Univ. of Leeds, UK* will preside over session **FThC**.
• *Thomas Schreiber; Fraunhofer Inst. Optik Feinmechanik, Germany* will preside over session **FThD**.
• *Urs Utzinger; Univ. of Arizona, USA* will preside over **FThP**.
• *Andrew Harvey; Heriot-Watt Univ., UK* will preside over session **FThR**.
• *Peter Herman; Univ. of Toronto, Canada* will preside over session **LMTuC**.

POSTDEADLINE PRESENTATIONS: Please see the postdeadline papers book for times and locations of postdeadline paper presentations. AO, AIOM, COSI and SRS postdeadline papers will be presented throughout the week in various oral sessions.

New Exhibitors:

Laser Quantum
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A special thanks to the American Institute of Physics for their sponsorship of Wednesday's FiO Coffee Breaks.

AIP American Institute of Physics

OSA's 93RD ANNUAL MEETING

FRONTIERS IN OPTICS 2009

FALL 2009 OSA OPTICS & PHOTONICS CONGRESS

Adaptive Optics: Methods, Analysis and Applications (AO)
Advances in Optical Materials (AIOM)
Computational Optical Sensing and Imaging (COSI)
Signal Recovery and Synthesis (SRS)

Postdeadline Papers

ISBN 978-1-55752-879-7

FAIRMONT HOTEL
SAN JOSE, CALIFORNIA, USA

TECHNICAL CONFERENCE: **October 11–15, 2009**
EXHIBIT: **October 13–14, 2009**

SPONSOR: OSA

Advances in Optical Materials

Belvedere Room, Fairmont San Jose Hotel
8:00 a.m.–10:00 a.m.
AWA • Semiconductor Materials
Kathleen Richardson; Clemson Univ., USA, Presider

AWA7P • 9:45 a.m.
Molecularly Engineered Semiconductor Cluster Nanocomposites with Large Nonlinear Responses and Low Losses, *Ronald M. Kubacki; Ionic Systems Inc., USA.* Materials can now be molecularly engineered specifically for advanced photonics. Nanocomposites enable passive waveguides with less than 0.5 dB/m loss and active sections with large (i.e. > 1,000) non linear optical responses.

Belvedere Room, Fairmont San Jose Hotel
1:30 p.m.–3:30 p.m.
AWC • Oxide Crystals
Peter G. Schunemann; BAE Systems, USA, Presider

AWC6P • 3:15 p.m.
Tape Cast Composite Ceramic Er:YAG Laser, *Nikolay Ter-Gabrielyan[1], Larry D. Merkle[1], Mark Dubinskii[1], E. R. Kupp[2], Gary L. Messing[2]; [1]US ARL, USA, [2]Penn State Univ., USA.* Laser operation of tape cast composite ceramic Er:YAG rod is demonstrated at 1645 nm with slope efficiency of 56.9% under the resonant pumping. This is believed to be the first reported composite ceramic Er:YAG laser.

Computational Optical Sensing and Imaging

Club Regent Room, Fairmont San Jose Hotel
1:30 p.m.–3:30 p.m.
CWB • Multi Aperture Systems
Ravindra Anant Athale; MITRE Corp., USA, Presider

CWB6P • 3:15 p.m.
Dual-Band Imaging System Based on a Compact Coaxial Folded Optic Architecture, *R. L. Morrison[1], R. A. Stack[1], Gary Euliss[2], R. A. Athale[2], B. F. Necioglu[2], R. W. Horstmeyer[2], Colin Reese[3]; [1]Distant Focus Corp., USA, [2]MITRE Corp., USA, [3]U. S. Army RDECOM CERDEC Night Vision and Electronic Sensors Directorate, USA.* We present an unconventional coaxial architecture for simultaneous acquisition of images in two discrete spectral bands. The approach is realized by taking advantage of a novel annular-folded lens design previously developed under the DARPA/MONTAGE program.

Signal Recovery and Synthesis

Cupertino Room, Fairmont San Jose Hotel
1:30 p.m.–3:30 p.m.
SWA • Phase Retrieval Methods
Charles L. Matson; AFRL, USA, Presider

SWA7P • 3:15 p.m.
High Dynamic Range Image Capture with Plenoptic 2.0 Camera, *Todor G. Georgiev[1], Andrew Lumsdaine[2], Sergio Goma[3]; [1]Adobe Systems, USA, [2]Indiana Univ., USA, [3]Qualcomm, USA.* We demonstrate high dynamic range (HDR) imaging with the Plenoptic 2.0 camera. Multiple exposure capture is achieved with a single shot using microimages created by microlens array that has an interleaved set of different apertures.

Adaptive Optics: Methods, Analysis and Applications

Fairfield Room, Fairmont San Jose Hotel
8:00 a.m.–10:00 a.m.
AOThA • Adaptive Optics Systems II
Donald T. Miller; Indiana Univ., USA, Presider

AOThA6P • 9:40 a.m.
A Calibration Unit for the Rayleigh Laser Guide Stars at the LBT, *Christian Schwab[1], Andreas Quirrenbach[1], Wolfgang Gässler[2], Diethard Peter[2]; [1]Landessternwarte, ZAH, Univ. Heidelberg, Germany, [2]Max Planck Inst. for Astronomy, Germany.* We describe the calibration scheme and optical design of a calibration unit for the off-axis laser guide stars at LBT's ARGOS facility. Artificial stars with the desired wavefront are created using a computer generated hologram.

Fairfield Room, Fairmont San Jose Hotel
10:30 a.m.–11:50 a.m.
AOThB • System Simulation and Modeling II
Miska LeLouarn; European Southern Observatory, France, Presider

AOThB3P • 11:10 a.m.
Optimization of cw and Pulsed Sodium Guide Star Lasers, *Ronald Holzlöhner[1], Simon Rochester[2], Domenico Bonaccini Calia[1], Dmitry Budker[2], James M. Higbie[3], Wolfgang Hackenberg[1]; [1]European Southern Observatory (ESO), Germany, [2]Univ. of California at Berkeley, USA, [3]Bucknell Univ., USA.* We present the results of extensive Bloch equation numerical simulations, both for cw and for various pulsed laser formats and applications.

Advances in Optical Materials

Belvedere Room, Fairmont San Jose Hotel
8:00 a.m.–9:45 a.m.
AThA • Nanostructured Materials
Shaya Y. Fainman; Univ. of California at San Diego, USA, Presider

AThA6P • 9:30 a.m.
100-Fold Enhancement of Fluorescence Imaging by Two-Dimensional-Grating-Coupled Surface Plasmon Resonance, *Kenji Kintaka[1], Xiaoqiang Cui[1], Keiko Tawa[1], Junji Nishii[1,2]; [1]Natl. Inst. of Advanced Industrial Science and Technology, Japan, [2]Hokkaido Univ., Japan.* Silver-coated two-dimensional periodic structures were fabricated for high-efficiency excitation of surface plasmon resonance. The fluorescence image of labeled proteins on the periodic structure was 100 times as bright as that on a flat glass plate.

Belvedere Room, Fairmont San Jose Hotel
1:30 p.m.–3:15 p.m.
AThC • Glass Synthesis and Properties
Jonathan Knight; Univ. of Bath, United Kingdom, Presider

AThC6P • 3:00 p.m.
Characterization of Eu^{2+}-Doped $SrMgAl_2SiO_7$ as a Novel Blue-Emitting Phosphor Synthesized through Sol-Gel Method, *Reza Salimi, Hassan Sameie, Ali A. Sabbagh Alvani, Ali A. Sarabi, Fathollah Moztarzadeh, Mohammadreza Tahriri; Amirkabir Univ. of Technology, Islamic Republic of Iran.* Phase-forming process, thermal behavior of components and luminescence properties of novel blue-emitting phosphor, $SrMgAl_2SiO_7:Eu^{2+}$ were investigated. Narrow emission peak at 421 nm and nanocrystallite (30.6 nm) of final products, were attributed to the sol-gel process.

Computational Optical Sensing and Imaging

Club Regent Room, Fairmont San Jose Hotel
1:30 p.m.– 3:15 p.m.
CThC • Imaging through Complex Media and Spectroscopy
Joe Van der Gracht; Holospex, Inc., USA, Presider

CThC7P • 3:00 p.m.
A Multi-Depth Image Restoration Based on a Quartic Phase Coded Lens, *Ludovic J. Angot, Po-Chang Chen, Chuan-Chung Chang; Industrial Technology Res. Inst., Taiwan.* A phase coded lens design using a quartic form derived from the spherical aberration of traditional optical systems and a method for image restoration of objects located at different distances are provided.

Key to Authors and Presiders

(Bold denotes Presider or Presenting Author)