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

**About Femtosecond Laser Microfabrication (LM)**

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  - Surface processing
  - Waveguide writing
  - Laser welding, sintering
  - 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. Gertsvolf¹,², D. Grojo¹, M. Spanner¹, P. P. Rajeev¹, P. B. Corkum¹,², D. M. Rayner¹; ¹Natl. Res. Council Canada, USA, ²Univ. 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
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.
<table>
<thead>
<tr>
<th>Event</th>
<th>Location</th>
<th>Sunday October 11</th>
<th>Monday October 12</th>
<th>Tuesday October 13</th>
<th>Wednesday October 14</th>
<th>Thursday October 15</th>
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<tbody>
<tr>
<td>Registration</td>
<td>Fairmont Hotel, Market Street Foyer</td>
<td>7:00 a.m. – 6:00 p.m.</td>
<td>7:00 a.m. – 6:00 p.m.</td>
<td>7:00 a.m. – 5:30 p.m.</td>
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<td>E-Center</td>
<td>Fairmont Hotel, Market Street Foyer</td>
<td>7:00 a.m. – 6:00 p.m.</td>
<td>7:00 a.m. – 6:00 p.m.</td>
<td>7:00 a.m. – 5:30 p.m.</td>
<td>7:30 a.m. – 5:00 p.m.</td>
<td>7:30 a.m. – 5:00 p.m.</td>
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<tr>
<td>Press Room</td>
<td>Fairmont Hotel, Redwood Room</td>
<td>12:00 p.m. – 4:00 p.m.</td>
<td>8:00 a.m. – 5:00 p.m.</td>
<td>8:00 a.m. – 5:00 p.m.</td>
<td>8:00 a.m. – 5:00 p.m.</td>
<td>8:00 a.m. – 12:00 p.m.</td>
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<tr>
<td>1st International OSA Student Chapter Solar Mini-Car Competition</td>
<td>Fairmont Hotel, Imperial Ballroom</td>
<td>4:00 p.m. – 7:00 p.m.</td>
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<tr>
<td>FiO/LS Welcome Reception</td>
<td>Sainte Claire Hotel, Ballroom</td>
<td>6:00 p.m. – 7:30 p.m.</td>
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<tr>
<td>Joint FiO/LS Plenary Session/Award Presentations</td>
<td>Fairmont Hotel, Regency Ballroom</td>
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<td>8:00 a.m. – 12:00 p.m.</td>
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<td>Export Regulation Fundamentals for the Optics and Photonics Industry</td>
<td>Sainte Claire Hotel, Sainte Claire Room</td>
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<td>9:00 a.m. – 12:00 p.m.</td>
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<td>(Registration Required)</td>
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<tr>
<td>Exhibit</td>
<td>Fairmont Hotel, Imperial Ballroom</td>
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<td>10:00 a.m. – 4:00 p.m.</td>
<td>10:00 a.m. – 4:00 p.m.</td>
<td>10:00 a.m. – 10:30 a.m.</td>
<td>10:00 a.m. – 3:30 p.m. – 4:00 p.m.</td>
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<td>Exhibit Hall Coffee Breaks</td>
<td>Fairmont Hotel, Imperial Ballroom</td>
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<td>10:00 a.m. – 10:30 a.m.</td>
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<tr>
<td>Exhibit-Only Time</td>
<td>Fairmont Hotel, Imperial Ballroom</td>
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<td>12:00 p.m. – 1:30 p.m.</td>
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<td>Refreshment Break</td>
<td>Fairmont Hotel, Imperial Ballroom</td>
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<td>3:30 p.m. – 4:00 p.m.</td>
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<td>OSA Member Reception</td>
<td>Sainte Claire Hotel, Ballroom</td>
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<td>7:00 p.m. – 8:30 p.m.</td>
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<tr>
<td>Joint FiO/LS Poster Session</td>
<td>Fairmont Hotel, Imperial Ballroom</td>
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<td>12:00 p.m. – 1:30 p.m.</td>
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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)
- Femtosecond Laser Microfabrication (LM)
- Computational Optical Sensing and Imaging (COSI)
- 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.

**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.

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.*
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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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 ultrashort 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.

**Satsuma:** Compact fiber laser, delivering ultrashort pulse duration as low as 250 fs, high repetition rate (1 MHz or more) and high energy (up to 10 μJ).
CREOL, The College of Optics and Photonics

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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

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Scientific journals and books on Optics, Lasers and Photonics: Elsevier offers journals and books on Optics, Lasers and Photonics: hardcopy and sciencedirect.com. New online author service: CiteAlert. Dedicated alerting services for companies in this field.

FEMTOLASERS, Inc.

Table 11
1 Mifflin Place | 119 Mt. Auburn Street, Suite 400 | Cambridge, MA 02138
Phone: 978.456.9920 | Fax: 978.456.9922
Email: info@femtolasers.com | URL: www.femtolasers.com

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.

FEMTPOWER™ V: an ultrafast 2-stage Ti:Sapphire multi-millijoule amplifier system including the FEMTOSOURCE™ rainbow™ DFG oscillator for lowest noise Carrier Envelope Phase (CEP) stabilization of the entire system.

Fianium Ltd.

Booth 109
858 West Park Street | Eugene, OR 97401
Phone: 541.343.6767 | Fax: 541.343.1838
Email: sales@fianium.com | URL: www.fianium.com

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

Table 2
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United Kingdom
Phone: +44 1460 256457 | Fax: +44 1460 256441
Email: sales@goochandhousego.com
URL: www.goochandhousego.com

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
Email: contact@imagine-optic.com
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.

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IOP Publishing
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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).

LaserFest
Booth 113
c/o The Optical Society
2010 Massachusetts Ave., NW | Washington, DC  20036
Phone: 202.416.1412
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, MgF2, CaF2, ZnSe and other advanced materials. Single and multi-layer coatings can be added to viewports to optimize transmission performance.

MPF’s Laser-Optics Viewports: MPF’s Laser-Optics viewports have lenses and AR-coating features specific to use with high powered lasers - 193 ArF-Excimer, 248 KrF-Excimer, 780 Diode, and 1064 Yag.

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
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Optikos Corporation is the world’s largest manufacturer of equipment for the measurement of optical image quality and a leading provider of optical product development services. As the world leader in the field of MTF testing, Optikos offers complete solutions for both component and system-level tests on imaging systems operating from the ultraviolet to the far infrared. Optikos’s product line includes testing suites for measuring the performance of optical and electro-optical imaging systems.

**Optimax Systems, Inc.**  
**Table 5**  
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**Phone:** 585.265.1066 | **Fax:** 585.265.1033  
**Email:** sales@optimaxsi.com | **URL:** www.optimaxsi.com  
Optimax is dedicated to small volume, high quality, and quick delivery of precision optical components. Specializing in aspheres, cylinders, plano-optics and spheres, manufactured to customer-supplied specifications. With more than 100 opticians, we enjoy a good challenge, call us!  
**Aspheres:** Optimax makes precision aspheres from optical glasses and crystals. Stop by our table and we’ll show you some examples.

**The Optical Society (OSA)**  
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OSA Foundation
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2010 Massachusetts Ave., NW | Washington, DC 20036
Phone: 202.416.1421 | Fax: 202.416.6130
Email: foundation@osa.org | URL: www.osa-foundation.org
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.

OSA Interactive Science Publishing
Booth 203
2010 Massachusetts Ave., NW | Washington, DC 20036
Phone: 202.223.8130 | Fax: 202.223.1096
Email: info@osa.org | URL: www.opticsinfobase.org
The Optical Society (OSA) announces a new paradigm for the publication of scientific images – Interactive Scientific Publishing (ISP). With support from the NIH’s National Library of Medicine, ISP allows authors of peer-reviewed journal articles to publish large 2D and 3D datasets with original source data that can be viewed and analyzed interactively by readers. ISP provides the software for authors to organize and publish source data while offering readers the viewing and analysis tools. Interact with 2D and 3D image data. Engage more thoroughly with research results. View ISP images and data for free!

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Booth 302
2 South Street, Berkshire Common | Pittsfield, MA 01201
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Email: photonics@laurin.com | URL: www.photonics.com
Photonics Media - The Pulse of the Industry - is Laurin Publishing Company’s international suite of media with more than 50 years as the industry’s leading publications. In print with Photonics Spectra and Biophotonics International magazines, EuroPhotonics and Photonics Showcase supplements, the Photonics Directory and online at Photonics.com.

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.

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### Society of Vacuum Coaters

**Table 1**

<table>
<thead>
<tr>
<th>171 Pinon Hill Place</th>
<th>Albuquerque, NM 87122</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phone:</strong> 505.856.7188</td>
<td><strong>Fax:</strong> 505.856.6716</td>
</tr>
<tr>
<td><strong>Email:</strong> svcinfo@s svc.org</td>
<td><strong>URL:</strong> <a href="http://www.svc.org">www.svc.org</a></td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Ginzton Laboratory – AP 207</th>
<th>Stanford University</th>
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<tr>
<td>Stanford, CA 94305-4088</td>
<td></td>
</tr>
<tr>
<td><strong>Phone:</strong> 650.723.5627</td>
<td><strong>Fax:</strong> 650.725.1822</td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:photonics@stanford.edu">photonics@stanford.edu</a></td>
<td></td>
</tr>
<tr>
<td><strong>URL:</strong> <a href="http://photons.stanford.edu">http://photons.stanford.edu</a></td>
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</table>

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

**Table 3**

<table>
<thead>
<tr>
<th>6300 Powers Ferry R, Ste. 600-345</th>
<th>Atlanta, GA 30339-2919</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phone:</strong> 404.547.9267</td>
<td><strong>Fax:</strong> +1 866.855.4518</td>
</tr>
<tr>
<td><strong>URL:</strong> <a href="http://www.swamoptics.com">www.swamoptics.com</a></td>
<td></td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:linda.trebino@swamoptics.com">linda.trebino@swamoptics.com</a></td>
<td></td>
</tr>
</tbody>
</table>

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.

**BOA Pulse Compressor:** BOA Compressor automatically aligned arrangement avoids all problematic distortions of two and four prism designs (including angular dispersion, spatial chirp, and pulse front tilt).

### Taylor & Francis

**Booth 214**

<table>
<thead>
<tr>
<th>4 Park Square</th>
<th>Milton Park</th>
<th>Nr Abingdon</th>
<th>Oxfordshire OX14 4RN</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phone:</strong> +44 (0) 207 017 6000</td>
<td><strong>Fax:</strong> +44 (0) 207 017 6714</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:rebecca.hougham@tandf.co.uk">rebecca.hougham@tandf.co.uk</a></td>
<td><strong>URL:</strong> <a href="http://www.tandf.co.uk/journals">www.tandf.co.uk/journals</a></td>
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Building on two centuries’ experience, Taylor & Francis has grown rapidly over the last two decades to become a leading international academic publisher. With offices in the UK, North America, Singapore and Australia, the Taylor & Francis Group publishes more than 1,000 journals and around 1,800 new books each year, with a books backlist of over 20,000 titles. We are providers of quality information and knowledge for our customers who include researchers, students, academics and professionals.

**Journal of Modern Optics:** Modern Optics publishes original contributions to optical knowledge from educational, government and industrial groups world-wide. The whole field of classical and quantum optics is covered.

### Thorlabs

**Booth 107**

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<thead>
<tr>
<th>435 Rt. 206</th>
<th>Newton, NJ 07860</th>
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<tbody>
<tr>
<td><strong>Phone:</strong> 973.300.3000</td>
<td><strong>Fax:</strong> 973.300.3600</td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:sales@thorlabs.com">sales@thorlabs.com</a></td>
<td><strong>URL:</strong> <a href="http://www.thorlabs.com">www.thorlabs.com</a></td>
</tr>
</tbody>
</table>

Thorlabs has been an active member of the Photonics community for over 20 years. We strive to be the ultimate resource for the photonics community. Thorlabs designs, develops, and manufactures building blocks for the photonics industry including equipment for opto-mechanics, motion control, nano-positioning, alignment, optical components, laser diodes, tunable lasers and vibration isolation systems. In addition to core photonics building blocks, we now provide system level solutions including complete OCT and imaging systems.

**Adaptive Optics Kit:** Thorlabs offers two complete Adaptive Optics Kits; they include a 140 actuator MEMS Deformable Mirror, Shack-Hartmann Sensor, System Software, and Mechanical and Optical Components.
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Optical Engineering. Industries and national laboratories can interact with The Institute’s faculty and students through The Institute’s Industrial Associates Program, which meets on campus twice annually. Also of interest to industry is the Optics Summer School Program. See www.optics.rochester.edu for more details.

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Lambda Research Corporation
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Laser Focus World/PennWell Corporation
Laser Quantum Ltd.
Laserent, Inc.
Light Age, Inc.
The Light Brigade, Inc.
LightCounselling
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Menlo Systems GmbH
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Nanobiosym
New Focus a Newport Brand
Newport Corporation
NKT Photonics A/S
nLight Corp.
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NP Photonics
NSG America
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OptiPro Systems
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OptoSigma Corporation
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PD-LD, Inc.
Pentax Corporation
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Photonic Products Group, Inc. (PPGI)
Photonics Industries International, Inc.
Photronics Innovations, Inc.
Photronics Media
Photop Technologies, Inc.
PI (Physik Instrumente) L.P., Piezo Nano Positioning
Picometríx, LLC
piezoelectric jena GmbH
Polyimide Technologies, Inc.
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Precision Photonics Corporation
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The College of Optics and Photonics
University of Dayton
University of Rochester, Institute of Optics
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Volpi USA
Vortran Laser Technology
VPDispex
Vytalab Corporation
Zemetrics, Inc.
Ziva Corporation
Zemega Terahertz Corporation
Zygo Corporation

FIND OUT WHY MORE THAN 200 COMPANIES HAVE BECOME OSA CORPORATE MEMBERS
## Agenda of Sessions — Sunday, October 11

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 a.m.–3:00 p.m.</td>
<td><strong>OSA Student Chapter Leadership Meeting</strong>, Plaza Ballroom, Crowne Plaza Hotel</td>
</tr>
<tr>
<td>7:00 a.m.–6:00 p.m.</td>
<td>Registration, Market Street Foyer, Fairmont Hotel</td>
</tr>
<tr>
<td>9:00 a.m.–12:30 p.m.</td>
<td><strong>Short Courses</strong>, Locations will be provided at registration</td>
</tr>
<tr>
<td></td>
<td><strong>SC235: Nanophotonics: Materials, Fabrication and Characterization</strong>, Joseph W. Haus, Andrew Sarangan, Qiwen Zhan; Univ. of Dayton, USA</td>
</tr>
<tr>
<td></td>
<td><strong>SC324: Plasmonics</strong>, Stefan Maier; Experimental Solid State Group, Dept. of Physics, Imperial College London, UK</td>
</tr>
<tr>
<td></td>
<td><strong>SC326: Patent Fundamentals</strong>, Mohammed N. Islam; Optics and Photonics and Solid State Electronics Lab, Dept. of Electrical Engineering and Computer Science, Univ. of Michigan, USA</td>
</tr>
<tr>
<td>12:30 p.m.–1:30 p.m.</td>
<td>Lunch Break (on your own)</td>
</tr>
<tr>
<td>1:30 p.m.–5:00 p.m.</td>
<td><strong>Short Courses</strong>, Locations will be provided at registration</td>
</tr>
<tr>
<td></td>
<td><strong>SC274: Polarization Engineering</strong>, Russell Chipman; Univ. of Arizona, USA</td>
</tr>
<tr>
<td></td>
<td><strong>SC322: Silicon Nanophotonics</strong>, Jelena Vučković; Edward L. Ginzton Lab, Stanford Univ., USA</td>
</tr>
<tr>
<td></td>
<td><strong>SC340: Tissue Optics and Optical Coherence Tomography</strong>, Kirill Larin¹, Valery V. Tuchin²; ¹Univ. of Houston, USA, ²Saratov State Univ., Russian Federation</td>
</tr>
<tr>
<td>4:00 p.m.–6:00 p.m.</td>
<td><strong>What's Hot in Optics Today?</strong> Regency Ballroom, Fairmont Hotel</td>
</tr>
<tr>
<td>4:00 p.m.–7:00 p.m.</td>
<td><strong>1st International OSA Student Chapter Solar Mini-Car Preliminary Races</strong>, Imperial Ballroom, Fairmont Hotel</td>
</tr>
<tr>
<td>6:00 p.m.–7:30 p.m.</td>
<td><strong>FiO/LS Welcome Reception</strong>, Ballroom, Sainte Claire Hotel</td>
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</table>

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

**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*

<table>
<thead>
<tr>
<th>FME: Tissue Imaging and Spectroscopy</th>
<th>FMF: Spatial Nonlinearities: Solitons and Beams</th>
<th>LSMB: Advances in Chiroptical Spectroscopy I</th>
<th>LSMC: Micro- and Nanofluidics I <em>(ends at 3:15 p.m.)</em></th>
<th>LSMD: Ultrafast X-Ray Science I</th>
<th>LSME: Laser Science Symposium on Undergraduate Research I <em>(2:00 p.m.–4:00 p.m.)</em></th>
</tr>
</thead>
</table>

**Coffee Break,** *Regency and Imperial Ballroom Foyer, Fairmont Hotel*

<table>
<thead>
<tr>
<th>FMK: Microscopy and OCT I</th>
<th>FML: Silicon Photonics I</th>
<th>LSMF: Advances in Chiroptical Spectroscopy II <em>(ends at 5:30 p.m.)</em></th>
<th>LSGM: Micro- and Nanofluidics II <em>(ends at 6:15 p.m.)</em></th>
<th>LSMH: Ultrafast X-Ray Science II <em>(ends at 5:45 p.m.)</em></th>
<th>LSMI: Laser Science Symposium on Undergraduate Research II <em>(4:30 p.m.–6:30 p.m.)</em></th>
</tr>
</thead>
</table>

**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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<td></td>
</tr>
<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>FTuA: 3-D Entertainment in the Marketplace (ends at 9:30 a.m.)</td>
<td>FTuB: Plasmonic Emitters and Resonators</td>
<td>JTuA: Gravitational Wave Interferometers II (Joint FiO/LS) (ends at 10:15 a.m.)</td>
<td>FTuC: Optical Communication</td>
<td>FTuD: Novel Fiber Devices I</td>
<td>JTuB: Entanglement Generation and Measurement II (Joint FiO/LS)</td>
</tr>
<tr>
<td>8:00 a.m.–9:30 a.m.</td>
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<td>OSA Young Professionals Networking Event with Corporate Members, Courtyard Atrium, Sainte Claire Hotel</td>
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<td>9:00 a.m.–12:00 p.m.</td>
<td>Student Programming: Painless Publishing, Science Policy and OSA Traveling Lecturer, Regency Ballroom II, Fairmont Hotel</td>
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<td>10:00 a.m.–10:30 a.m.</td>
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<td>Coffee Break, Imperial Ballroom, Fairmont Hotel</td>
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<td>10:00 a.m.–4:00 p.m.</td>
<td>Exhibit Hall Open, Imperial Ballroom, Fairmont Hotel</td>
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<td>10:30 a.m.–12:00 p.m.</td>
<td>FTuF: 3-D Capturing, Visualization and Displays</td>
<td>FTuG: Wavefront Design for Information Transport and Sensing I (ends at 11:45 a.m.)</td>
<td>FTuH: Diffractive and Holographic Optics I</td>
<td>FTuL: All-Optical Signal Processing I</td>
<td>FTuJ: Anderson Localization II</td>
<td>FTuK: High Peak Power Laser Technology II</td>
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<td>12:00 p.m.–1:30 p.m.</td>
<td>Exhibit Only Time, Imperial Ballroom, Fairmont Hotel</td>
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<td>12:00 p.m.–2:00 p.m.</td>
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<td>1st International OSA Student Chapter Solar Mini-Car Final Races, Imperial Ballroom, Fairmont Hotel</td>
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<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>OSA Fellow Member Lunch, Silicon Valley Capital Club, 50 W. San Fernando, Suite 1700, San Jose, California 95113, Phone: 408.971.9300</td>
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<td>12:00 p.m.–1:30 p.m.</td>
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<td>1:30 p.m.–3:30 p.m.</td>
<td>FTuM: Emerging 3-D Display Technologies and Research Frontiers I (ends at 3:00 p.m.)</td>
<td>FTuN: Negative Index Materials and Cloaking</td>
<td>FTuO: Diffractive and Holographic Optics II</td>
<td>FTuP: Optical Access</td>
<td>FTuQ: Light in the Eye</td>
<td>FTuR: Rogue Waves and Related Phenomena</td>
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<td>3:30 p.m.–4:00 p.m.</td>
<td>Coffee Break/Exhibits, Imperial Ballroom, Fairmont Hotel</td>
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<td>3:30 p.m.–5:30 p.m.</td>
<td>Meet the Editors of the APS Journals, Bamboo Lounge, Fairmont Hotel</td>
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<td>4:00 p.m.–5:30 p.m.</td>
<td>FTuT: Emerging 3-D Display Technologies and Research Frontiers II</td>
<td>FTuU: Wavefront Design for Information Transport and Sensing II</td>
<td>FTuV: Metamaterials in Emerging Technologies</td>
<td>FTuW: All-Optical Signal Processing II</td>
<td>FTuX: Novel Optics of Periodic Structures</td>
<td>FTuY: Optical Biosensing (ends at 5:45 p.m.)</td>
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<tr>
<td>4:30 p.m.–5:30 p.m.</td>
<td>Minorities and Women in OSA (MWOSA) Tea, Sainte Claire Room, Sainte Claire Hotel</td>
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<td>6:00 p.m.–7:00 p.m.</td>
<td>OSA Annual Business Meeting, Piedmont Room, Fairmont Hotel</td>
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<td>6:00 p.m.–7:00 p.m.</td>
<td>DLS Annual Business Meeting, California Room, Fairmont Hotel</td>
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<td>6:00 p.m.–7:30 p.m.</td>
<td>JTuC: Joint AO/COSI/LM/SRS Welcome Reception and Poster Session, Regency Ballroom, Fairmont Hotel</td>
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<td>7:00 p.m.–8:30 p.m.</td>
<td>OSA Member Reception, Ballroom, Sainte Claire Hotel</td>
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<td>7:00 p.m.–10:00 p.m.</td>
<td>Laser Science Banquet, Gordon Biersch, 33 East San Fernando Street, San Jose, California, Phone: 408.294.6785</td>
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<td>FTuU: Wavefront Resonators</td>
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<td>FTuN: Negative Index Transport and Sensing I</td>
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<td>2:00 p.m.</td>
<td>FTuG: Wavefront Localization II</td>
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**Agenda of Sessions**
### Agenda of Sessions — Wednesday, October 14

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

- Frontiers in Optics
- Laser Science
- Joint
- Fall OSA Optics & Photonics Congress
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<th>Atherton</th>
<th>Sacramento</th>
<th>Piedmont</th>
<th>Hillsborough</th>
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<td><strong>FWN: Silicon Photonics II</strong></td>
<td><strong>LSWD: Single-Molecule Biophysics II</strong></td>
<td><strong>LSWE: Second-Order Nonlinear Optics II</strong></td>
<td><strong>LSWF: Multidimensional Spectroscopy II</strong></td>
<td><strong>AWO: High Contrast Imaging and Point Spread Function Calibration II</strong> (ends at 11:45 a.m.)</td>
<td><strong>AWB: Laser-Material Interactions</strong></td>
<td><strong>CWA: Polarization Sensing and Imaging</strong></td>
<td><strong>JWB: Advances in Adaptive Optics Imaging of the Living Retina I</strong> (Joint AO/FiO)</td>
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<td><strong>FWT: Plasmonic Sensors</strong> (ends at 3:15 p.m.)</td>
<td><strong>LSWG: Ultrafast Spectroscopy I</strong></td>
<td><strong>LSWH: Second-Order Nonlinear Optics III</strong> (ends at 3:15 p.m.)</td>
<td><strong>LSWI: Multidimensional Spectroscopy III</strong> (ends at 3:00 p.m.)</td>
<td><strong>AWOB: Control Algorithms and Architecture</strong></td>
<td><strong>AWC: Oxide Crystals</strong> (ends at 3:15 p.m.)</td>
<td><strong>CWB: Multi Aperture Imaging</strong></td>
<td><strong>SWA: Phase Retrieval Methods</strong> (ends at 3:15 p.m.)</td>
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<td><strong>FWZ: Silicon Photonics III</strong></td>
<td><strong>LSWJ: Ultrafast Spectroscopy II</strong> (ends at 6:15 p.m.)</td>
<td><strong>LSWK: Second-Order Nonlinear Optics IV</strong> (ends at 3:45 p.m.)</td>
<td><strong>JWF: Advances in Adaptive Optics Imaging of the Living Retina II</strong> (Joint AO/FiO)</td>
<td><strong>AWD: Optical Ceramics</strong></td>
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### Agenda of Sessions — Thursday, October 15

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<th>Time</th>
<th>Empire</th>
<th>Crystal</th>
<th>Gold</th>
<th>Valley</th>
<th>California</th>
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<tr>
<td>7:30 a.m.–5:00 p.m.</td>
<td>registration, Market Street Foyer, Fairmont Hotel</td>
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<tr>
<td>8:00 a.m.–10:00 a.m.</td>
<td>LSThA: X-Ray Imaging I</td>
<td>FThA: Nanofocusing Optics I</td>
<td>FThB: Diffractive and Holographic Optics III</td>
<td>FThC: Micro-Cavity Devices I</td>
<td>FThD: High-Power Fiber Lasers I</td>
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<tr>
<td>10:00 a.m.–10:30 a.m.</td>
<td>Coffee Break, Regency and Imperial Ballroom Foyer, Fairmont Hotel</td>
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<tr>
<td>10:30 a.m.–12:00 p.m.</td>
<td>LSThC: X-Ray Photon Correlation Spectroscopy</td>
<td>FThG: Nanofocusing Optics II</td>
<td>FThH: Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment I (ends at 11:45 a.m.)</td>
<td>FThI: Novel Nonlinear Optical Phenomena</td>
<td>FThJ: High-Power Fiber Lasers II</td>
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<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>Lunch Break (on your own)</td>
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<td>1:30 p.m.–3:30 p.m.</td>
<td>LSThE: X-Ray Imaging II (ends at 2:45 p.m.)</td>
<td>FThM: Nanoscale Methods and Instruments I</td>
<td>FThN: Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment II</td>
<td>FThO: Micro-Cavity Devices II</td>
<td>FThP: Optics in Interventional Medicine</td>
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<td>3:30 p.m.–4:00 p.m.</td>
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<td>4:00 p.m.–6:00 p.m.</td>
<td>FThS: Optical Nonlinear Properties of Materials (ends at 5:15 p.m.)</td>
<td>FThT: Nanoscale Methods and Instruments II (ends at 5:45 p.m.)</td>
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<tr>
<td>5:30 p.m.–8:00 p.m.</td>
<td>Science Educators’ Day, McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021</td>
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**Key to Shading**
- Frontiers in Optics
- Laser Science
- Joint
- Fall OSA Optics & Photonics Congress
<table>
<thead>
<tr>
<th>Session Time</th>
<th>Session Title</th>
<th>Location</th>
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<th>Speaker(s)</th>
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<tr>
<td>7:30 a.m.–5:00 p.m.</td>
<td>Registration</td>
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<td>8:00 a.m.–10:00 a.m.</td>
<td>LSThA: X-Ray Imaging I</td>
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<td>FThB: Diffractive and Holographic Optics III</td>
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<td>FThC: Micro-Cavity Devices I</td>
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<td>FThD: High-Power Fiber Lasers I</td>
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<td>FThE: Integrated Optics</td>
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<td>LSThB: Single-Molecule Biophysics III</td>
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<td>FThF: Polarization and Birefringence in Optical Design I</td>
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<td>AOTHa: Adaptive Optics Systems II</td>
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<td>10:00 a.m.–10:30 a.m.</td>
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<td>FThH: Aspheric and Freeform Optical Surfaces: Design, Characterization and Alignment I</td>
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<td>FThI: Novel Nonlinear Optical Phenomena</td>
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<td>FThJ: High-Power Fiber Lasers II</td>
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<td>FThK: Optoelectronics</td>
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<td>LSThD: Single-Molecule Biophysics IV</td>
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<td>FThL: Polarization and Birefringence in Optical Design II</td>
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<td>AOTHb: System Simulation and Modeling II</td>
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<td>ATHb: Applications of Nanophotonics</td>
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<td>CThb: Pupil Encoding Methods</td>
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<td>FThQ: Molecular Imaging in the Eye</td>
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<td>LSThF: Single-Molecule Biophysics V</td>
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<td>FThR: Computational Imaging and Photography I</td>
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<td>AOTHc: Wavefront Sensing II</td>
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<td>ATHc: Glass Synthesis and Properties</td>
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<td>CThc: Imaging through Complex Media and Spectroscopy</td>
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<td>FThV: Microscopy and OCT II</td>
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<td>FThW: Plasmonic Waveguides and Devices</td>
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<td>FThX: Computational Imaging and Photography II</td>
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<td>FThY: Wavefront Correction Technology</td>
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<td>AOTHd: Optical Fibers</td>
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<td>CThd: COSI Panel Discussion</td>
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**Science Educators’ Day**, McCaw Hall, Frances C. Arrillaga Alumni Center, Stanford Univ., 326 Galvez Street, Stanford, California 94305, Phone: 650.723.2021
sensor is improved from 0.16 to 0.67.

1 Steward Observatory, Univ. of Arizona, USA, 2Max-Planck-Institut für Extraterrestrische Physik, Germany; Observatorio Astrofísico de Arqueá, 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.

AOTuA • 8:30 a.m.
High-Resolution Lidar Observations of Mesospheric Sodium and Implications for Adaptive Optics, Paul Hickson, Thomas Pyrmon; 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.

AOTuA • 8:50 a.m.
ARGOS: The LBT's Laser-Guided Adaptive Optics System, Michael Harti, Sebastian Rabien, Simon Esposito, Lorenzo Busoni; ‘Steward Observatory, Univ. of Arizona, USA, 2Max-Planck-Institut für Extraterrestrische Physik, Germany. ‘Observatorio Astrofísico de Arqueá, 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.

LMTuA • 8:00 a.m.
Interferometric Measurements of Parallel Femtosecond-Laser-Induced Phenomena, Yoshio Hayasaki, Mitsuhiro Isaka, Akihito Takaoka, Utsumoniyama Univ., Japan. Time-resolve pump-probe interference microscopy 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.

LMTuA • 8:45 a.m.
Controlling Ultrafast Laser-Induced Refractive Index Changes in Optical Glasses via Adaptive Spatial-Temporal Beam Engineering, Razvan Stoian; Univ. Jean Monnet, France. Spatial-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.

CTuA • 8:30 a.m.
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.

CTuA • 9:00 a.m.
Millimeter-Wave Imaging Using k-Space Compression, Christy Fernandez-Culli, David Brady, David A. Wikner, Joseph N. Mait; 1Duke Univ., USA, 2US Army Research Laboratory, 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.

STuA • 8:30 a.m.
On Improved Temporal Resolution for Magnetic Resonance Angiography, Phil Bones, Bing Wu, Bahareh Vajad, 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).

STuA • 9:00 a.m.
Sparse Reconstruction of Complex Signals in Compressed Sensing Terahertz Imaging, Zhiming Xu, Wai Lam Chan, Daniel M. Mittleman; Univer. of Hong Kong, Hong Kong, 2Dept. 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.

STuA • 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.

Strehl ratio of 0.27–0.33. Simulations of system performance predict an H-band CANARY design is described here for the initial experimental demonstrator for the proposed EAGLE E-ELT instrument. The University of Catolica de Chile, Chile. CANARY is the on-sky LGS MOAO.
**Wavefront Sensing I**

**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.**

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 Landrieu, 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 Wavefront Sensing with a Laser Guide Star for an ELT, Brice Le Roux; Astronomy Observatory of Marseilles 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.

**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.**

Three-Dimensional Structuring of Materials by Femtosecond Laser Pulses, Sauliuis Juknevicius, Hirukai Misawo, 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, Marco Polo, Antonio A. R. Neves, Roberto Cingolani, Davide Pagnanolo; Natl. Nanotechnology Lab, CNR-INFM, Italy, ’Inst. Superiore di Formazione Interdisciplinare ISSIFI, 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.**

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

**10:30 a.m.–12:00 p.m.**

**CTuB** • Light Field Representations

Ramesh Raskar; MIT, USA, Presider

**CTuB1 • 10:30 a.m.**

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 time-space 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. Tisterv, Michael A. Fiddy, Dartmouth College, USA, ’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, Andrew Lumadex; Adobe, USA, ’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 camera’s spatial resolution.

**CTuB4 • 11:30 a.m.**

Resolution in Plenoptic Cameras, Todor G. Georgiev, Andrew Lumadex; Adobe, USA, ’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 camera’s spatial resolution.

**10:30 a.m.–12:00 p.m.**

**STuB** • Inverse Scattering

Andrew Lambert; Univ. of New South Wales, Australia, Presider

**STuB1 • 10:30 a.m.**

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. Lu, Rick P. Millican; 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.**

Resolution Enhancement from Electron Microscope Images of Heterogeneous Particles, Peter Doerschuk, Yi Zhang; 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.
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<td>12:00 p.m.–1:30 p.m.</td>
<td>Exhibit Only Time, Imperial Ballroom, Fairmont Hotel</td>
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<td>12:00 p.m.–2:00 p.m.</td>
<td>1st International OSA Student Chapter Solar Mini-Car Final Races, Imperial Ballroom, Fairmont Hotel</td>
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<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>OSA Fellow Member Lunch, Silicon Valley Capital Club, 50 W. San Fernando, Suite 1700, San Jose, California 95113, Phone: 408.971.9300</td>
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<td>12:00 p.m.–1:30 p.m.</td>
<td>Lunch Break (on your own)</td>
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**NOTES**

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**STuB5 • 11:45 a.m.**

**New Computational Methodology for the Recovery of Facial Images Retained in Human Memory**, Christopher J. Solomon, Stuart J. Gibson, Matthew I. S. Maylin; Univ. of Kent, UK, 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.

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**LMTuB • 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, Jon J. Witcher, Denise M. Krol; Univ. of California at Davis, USA, 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.

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**AOTuB4 • 11:40 a.m.**

**Off-Axis Beacon Sharpening**, Erez N. Ribak, Ruth Mackey; Technion-Israel Inst. of Technology, Israel, 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.

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**CTuB • 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.

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**LMTuB • 11:45 a.m.**

**Three-Dimensional Micromachining with Femtosecond Lasers—Continued**

For FiO/LS presentations on Tuesday, see pages 56-75.
Fall OSA Optics & Photonics Congress

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 Gladysz1, Julian Christou2; 1European Southern Observatory, Germany, 2Gemini 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.
Szymon Gladysz1, Julian Christou 2; 1European Southern Observatory, Germany, 2Gemini 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.

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.
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, Jing Siebenmorgen, Thomas Calmano, Klaus Petermann, Günter Flueker; 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, S. Franke-Arnold, 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 electrophoretic and optical detection of a 1-nM oligonucleotide plug.

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. Padgett1, B. Jack1, J. Leach1, J. Romero 1, S. Franke-Arnold 1, M. Ritsch-Marte 2, S. M. Barnett 3; 1Univ. of Glasgow, UK, 2Innsbruck Medical Univ., Austria, 3Univ. 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.

CTuC3 • 2:15 p.m. Invited
Information Theoretic Based Image Quality Evaluation.
David R. Gerwe1, Carlos E. Luna1, Brandoch Calfee2; 1Boeing Directed Energy, USA, 2Boeing Laser Technical Services, 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.

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

STuC1 • 1:30 p.m. Invited
Atmospheric Imaging.
Jörg Siebenmorgen, Thomas Calmano, Samuel J. Romero 1, S. Franke-Arnold 1, M. Ritsch-Marte 2, S. M. Barnett 3; 1Univ. of Glasgow, UK, 2Innsbruck Medical Univ., Austria, 3Univ. 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.

CTuC2 • 2:00 p.m.
Holographic Ghost Imaging.
M. J. Padgett1, B. Jack1, J. Leach1, J. Romero 1, S. Franke-Arnold 1, M. Ritsch-Marte 2, S. M. Barnett 3; 1Univ. of Glasgow, UK, 2Innsbruck Medical Univ., Austria, 3Univ. 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.

STuC2 • 2:00 p.m.
Statistical Turbulence Approach to the Covariance Matrices in the Shiftmap Prediction Using Kalman Filter.
Jörg Siebenmorgen, 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. Image quality 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.
Gladysz2, Chris Dainty 1; 1Natl. Univ. of Ireland, Galway, Ireland, PSF based on a statistical analysis of the AO WFS data provided by methods to reconstruct the Gemini Planet Imager long-exposure

We investigate the performance and limitations of two different Inst. of Astrophysics, Canada, 3Lawrence Livermore Natl. Lab, USA.

2European Organisation for Astronomical Res. in the Southern Wavelength Diversity adaptive optics images. Our approach combines PSF estimation from 1University of Montreal, Canada, 2Herzberg in Fused Silica, Jonathan Witther, Luke Fletcher, Willber 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.

LMTuC • 2:45 p.m. Annoyance Behavior of Femtosecond Laser-Written Waveguides in Fused Silica, Jonathan Witther, Luke Fletcher, Willber 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.

LMTuC • 3:00 p.m. Femtosecond Laser Writing of Phase-Shifted Bragg Grating Waveguides in Fused Silica, Luis A. Fernandez1, Jason R. Greiner1, Peter R. Herman1, J. Stewart Atchison1, Paulo V. S. Marques1; 1Univ. of Toronto, Canada, 2INESC Porto, Dept. de Fisica, 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 r and other phase-shifts.

LMTuC • 3:15 p.m. Curvilinear Low-Loss Waveguides in Borosilicate Glass Fabricated by Femtosecond Chirp-Pulse Oscillator, Mykhaylo Dubov1, T. Allsop1, S. R. Natarajan1, V. E. Mazanov1, J. Bennion1; 1University of Ottawa, Canada, 2Boeing LTS, USA. We describe a generalization of aperture mask-Speckle Imaging with a Partitioned Aperture, Brandoch Calef, Boeing LTS, 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.

CtuC • 3:00 p.m. Signal-to-Noise-Ratio Limit to the Depth-of-Field Extension for Task-Specific Imaging Systems using 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.

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

Fall OSA Optics & Photonics Congress

For FI/O presentations on Tuesday, see pages 56–75.

4th OSA Autumn Topical Meeting • Tuesday, October 13

Fairfield

AO

Belvedere

LM

Club Regent

COSI

Cupertino

SRS

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

AOTuC • 2:30 p.m. Long Exposure PSF Reconstruction for GPI, Jérôme Maire1, Jean-Pierre Vérin2, Lisa A. Peyner3; 1Univ. Montreal, Canada, 2Herzberg Inst. of Astrophysics, Canada, 3Lawrence 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.

AOTuC • 2:50 p.m. Enhanced Faint Companion Photometry and Astrometry Using Wavelength Diversity, Daniel Burke1, Nicholas Devaney1, Szymon Gladysz1, Chris Dainty1; 1Natl. Univ. of Ireland, Galway, Ireland, 2European 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.
AOTuD • 4:00 p.m.
Extreme Adaptive Optics Simulations for the European ELT, Viva 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.

AOTuD1 • 4:40 p.m.
VLT Adaptive Optics Facility Simulations, Miska LeLouis, Pierre-Yves Maday, Jerome Pauquie, Stefan Steudeke; European Organisation for Astronomical Research in 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.

CTuD1 • 4:30 p.m.
Optimization of Double-Helix Point Spread Function for Photon-Limited 3-D Imaging Systems, Gvimii Sharma, Sri Rama Prasanna Panani, Rafael Piestun; Univ. of Colorado at Boulder, USA. 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.

CTuD2 • 4:30 p.m.
Broadband Three-Dimensional Imaging Using a Double-Helix Point Spread Function, Sean Quinn, 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.

CTuD3 • 4:45 p.m.
Experimental Reconstruction of Wigner Distribution, Tatiana Alieva1, Alejandro Cámara1, José A. Rodrigo2, María L. Calvo1; 1Univ. 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.

CTuD1 • 4:00 p.m.
Three-Dimensional Supersolution Using Single-Molecule Photoswitches and a Double-Helix PSF, W. E. Moerner1, Michael Thompson, Matthew Lew1, Majid Badieirostami, Samuel J. Lord1, Nicholas R. Conley1, Hisanobu D. Lee1, Sri Rama Prasanna Pavan1, Rafael Piestun1; Stanford Univ., USA, 1 Univer. 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.
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.

STuCD • 4:00 p.m.
Optimizations of double-helix point spread function for photolimited 3-D imaging systems, Gvimii Sharma, Sri Rama Prasanna Panani, Rafael Piestun; Univ. of Colorado at Boulder, USA. 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.

STuC3 • 4:45 p.m.
Experimental Reconstruction of Wigner Distribution, Tatiana Alieva1, Alejandro Cámara1, José A. Rodrigo2, María L. Calvo1; 1Univ. 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.

TMuT3 • 4:00 p.m.
Limited 3-D Imaging Systems, Tatiana Alieva1, José A. Rodrigo2; 1Univ. 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.

CTuD3 • 4:45 p.m.
Experimental Reconstruction of Wigner Distribution, Tatiana Alieva1, Alejandro Cámara1, José A. Rodrigo2, María L. Calvo1; 1Univ. 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.

For FIO/LS presentations on Tuesday, see pages 56-75.
AOTuD • 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.

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

CTuD • 3-D Imaging and PSF Design—Continued

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

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.

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.
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.

JTuC7 Computational Confocal Scanning Tomography, Keith J. Dillon, Yashihua Fauman. Univ. of California at San Diego, USA. We demonstrate a technique to perform computed tomographic reconstruction of a refractive and reflective 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-Chie 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 Hologram from Two-Dimensional Photos, Nicholas Hageman, Xiaomin Jin. ITRI, Industrial Technology Res. Inst., Taiwan. We demonstrated a three-dimensional (3-D) hologram by 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 Wei, Mohammad Ahrabine, Wei Cui, Min Xie, Swapan K. Gayen. ‘City College of New York, CUNY, USA, ‘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 intralipidal-10% suspension in water.

JTuC11 EMCCD Based Photon Imaging in Ultra Low Light Level, Wei Ji, Qian Chen, Guohua Gu, Jianfeng Huang. Nanjing Univ. of Science and Technology, China. An EMCCD based photon imaging strategy for ultra low light level scene was present. 3-D thresholding 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, Josef Kaiser1, Rudimar Maluna1, Jan Novotny1, David Prochazka1, Karel Novotny1, Lucie Krajcarova1, Michalda Gallova1, Marketa Hol1, Inst. of Physical Engineering, Faculty of Mechanical Engineering, Brno Univ. of Technology, Czech Republic, ‘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 and micro-CT techniques is provided.

JTuC13 Computational Imaging in Machine Vision System for Automated Optical Inspection, Nak-Hoon Ke1, Toon-Suk Lee1, Sang-Chul Jung1, Dae-Chan Kim1, ‘Yi-Bi Choi1, ‘Beom-Hoon O1, ‘Se-Gun Park1, El-Hang Lee1, Seung-Gol Lee1; Inha Univ., Republic of Korea, ‘Samsung Electro-Mechanics Co., Ltd., Republic of Korea. This paper describes a virtual laser beam scanner 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. Makarov1, Jean Starkey2, Mikhail Drobitsch3, Aleksander Rebours, 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 590-556 dye, allowing distinguishing between samples containing no cells, normal cells and cancer cells.

JTuC15 Material Modifications with Ultrafast Beams, Veronique Zambron, Nathalie McCarthy, Michel Pichet. ‘Ctr. d’Optique, Photons et Laser (COPFL) and Dept. de Physique, de Génie Physique et d’Optique, Univ. Laval, Canada. Ultrafast 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 Femtosecond Laser Fabrication and Optical Studies of Microstructures in PMMA and PDMS, Kallepalli L. N. Deepak1, Venugopal Rao Somar1, Narayana Rao Desai1; ‘School of Physics, Univ. of Hyderabad, India, ‘Advance Ctr. of Res. in High Energy Materials (ACRHIM), 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.

JTuC17 Dynamics of Femtosecond Laser Nanostructuring of Metals, Taek Yong Haung1, A. Y. Voroblev2, Chunlei Gu1; 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.

JTuC18 Q Switched Operation of Yb-Fiber Laser Based on the Waveguide YAG:Cr⁺³ Saturable Absorber, Andrey Okhrimchak1, Alexander Shetakov1, Vladimir Mecentsev2, Valentin Droshin2, Eugene Shokhov3; 1Aston Univ., UK, 2ELS Co., Russian Federation, ‘Fiber Optics Res. Ctr., Russian Acad. of Sciences, Russia Federation, ‘General Physics Inst., Russian Acad. of Sciences, Russia Federation. The waveguide saturable absorber is inscribed by femtosecond pulses in YAG:Cr⁺³ crystal. Q switch operation of a fiber laser with such saturable absorber is demonstrated for the first time.

JTuC19 Femtosecond Laser Ablation on Dental Resins and Biomaterials - Analysis of Ablated Profile near an Interface Using Local Effective Intensity, Gustavo Nicolodi, M. M. Costa, V. S. Baptista; 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.
### Fairfield Belvedere Club Regent Cupertino

#### AWA1 • 8:00 a.m. Invited

**Growth of Orientation- Patterned Semiconductors for Nonlinear Optical Frequency Conversion**

Candace Lynch1, Vladimir Tassger1, George Bryan1, Cal Yapp1, David Bliss1; AFRL, USA, Solid State Scientific Corp., USA. Millimeter-thick crystals of orientation-patterned GaAs have been grown using low pressure Hydride Vapour 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. Schunemann1, Lee Mohlenkorn1, Alice Vera1, Daniel C. Creedon1, Thomas M. Pollak1, 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-phaseshifted 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**

Peter G. Schunemann1, Leonard A. Pomeranz1, Kevin T. Zawilski1,2, Jean Wei1,2, Leonel Gonzalez2, Shekhar Guha2, T. M. Pollak1; BAE Systems Inc., USA, US AFRL/RXJP, USA. We report the first optical parametric oscillator based on the new mid-infrared nonlinear optical crystal CdSiP. Pumping with a 2W, 1.99-micron Ti: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. Biswas1, Sasmita Kandu1, Samir Mandal1, Nilanjana Das, Dipen Bhattacharyya, 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.

#### Notes

For FiO/LS presentations on Wednesday, see pages 76-99.
AWA5 • 9:15 a.m.
Optoelectronic Properties of Germanium Islands Formed on Silicon Using Stranski-Krastanov Growth by MBE, Latha Nataraj, Nathan Susteric, Matthew Copping, 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 strain 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 Murra, 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.

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

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.
New Chapter Title

Fall OSA Optics & Photonics Congress

Fairfield

10:30 a.m.–11:50 a.m.

AOWA1 • High Contrast Imaging and Point Spread Function Calibration II
Donald Gavel, Univ. of California at Santa Cruz, USA, Presider

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 formalism to describe many of the high contrast correction methods, namely, phase conjugation, classical speckle correction methods, namely, phase conjugation, classical speckle

Belvedere

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 Shee, 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.

Club Regent

10:30 a.m.–12:00 p.m.

CWA • Polarization Sensing and Imaging
Kenny Kabala; FiveFocal, USA, Presider

CWA1 • 10:30 a.m.

Full Stokes Polariometry in near Field
Janghwan Bae, David P. Haufner, Sergey Stokin, Aristide Dogariu; CRCEL 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 Polariometric 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 Kohlegraf-Owens, Aristide Dogariu; CRCEL,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

10:30 a.m.–12:00 p.m.

JWB • Advances in Adaptive Optics Imaging of the Living Retina
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. Tobie; School of Optometry, Indiana Univ., USA. We developed a Scanning Hartmann wavefront sensor by coupling the Shack Hartmann aberrometer with a scanning system. This instrument measures off-axis aberrations 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 Bozdur; School of Optometry, Univ. of California at Berkeley, USA. The effect on image quality of a 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.
**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. Christou¹, Jack D. Drummond²; ¹Gemini Observatory, USA, ²AFRL, 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.

**AWB • Laser-Material Interactions—Continued**

**AWB4 • 11:30 a.m.**
Doping Dependence of the Femtosecond Laser Damage Thresholds in Silica Glasses, Matthieu Lancry¹, Weiwei Yang², Bertrand Poumellec¹, Peter Kazansky³; ¹Univ. of Paris Sud, France, ²Optoelectronics 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).

**CWA • Polarization Sensing and Imaging—Continued**

**CWA5 • 11:30 a.m.**
Expanded Field of View Using Polarization Multiplexing, Kyle M. Douglass¹, Thomas Kohlgraf-Owens², Jeremy Ellis³, Cristian Toma⁴, Abhijit Mahalanobis⁵, Aristide Dogariu⁶; ¹CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, ²Lockheed 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 number of measurements.

**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 Gamba, 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.
A unified LQG framework is used for predictive wavefront control. A computational imaging system based on 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.

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

Periodically Poled Crystals for Mass-Market Applications. Dieter Klapp, David Mendlovic; Tel Aviv Univ., Israel.

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.


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.

Epitaxial Nd:Sapphire Films - Candidate Solid State Laser Material for 1096nm Emission. Raveen Kumaran, Scott E. Webster, Shawn Persson; Univ. of British Columbia, Canada. "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:YVO4-like emission cross section.

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.

Bulk Wind Estimator Performance for AO Systems. Luke C. Johnsson, 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.

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.
A New Ferrofluid Mirror for Vision Science Applications

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. Burns¹, Zhongyi Zhong¹, Weiwei Zhou¹, Cong Dong¹, Daniel Ferguson¹, Xiaofeng Qi¹; ¹Indiana Univ., USA, ²Physical 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 Brousseau¹, Ermanno F. Borra¹, Anna M. Ritcey⁲, Melanie C. Campbell⁳; ¹Ann Arbor, USA, ²Univ. of Waterloo, Canada, ³Guelph 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 Afoocal Telescopes. Alfredo Dubra¹, Armando Gómez-Vieyra¹, Daniel Malacara-Hernández¹, David R. Williams¹; ¹Univ. of Rochester, 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.
AIOI Welcome Reception,
Regency Ballroom I, Fairmont Hotel

For FiO/LS presentations on Wednesday, see pages 76-99.
Experimental Validation of LTAO and MCAO Configurations with Optimal Control, Anne Costille1, Cyril Petit1, Jean-Marc Conan1, Caroline Kulcsár2, Henri-Francois Raynaud2, and Stéphane Gendron3. 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.

Thermal Compensation in the LIGO Gravitational-Wave Interferometers, Donald T. Miller; Indiana Univ., USA, Presider.

Thermal compensation in the LIGO 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.

Photoluminescence Modification in Self-Assembled Fluorescent 3-D Photonic Crystals, Harish N. Swaha Krishnamoorthy1, Jung Hun Song2, Ilona Kretzschmar2, Vinod M. Menon1, and Kin Hung Fung. Using time resolved luminescence measurements, we report an 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.

Experimental Demonstration of Compressive Holography Using a Double-Helix Point Spread Function, Matthew Lew, Michael A. Thompson, Majid Badieirostami, W. E. Moerner; Stanford Univ., 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.

Optical Metamaterials, Xiang Zhang; Univ. of California at Berkeley, 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.

We study the relation of 3-Fold Rotational Symmetry to Far Field and near Field Properties of Triangular Metal Nanoparticle and Nanopatterns, Hsu, Nicholas X. Fang; Univ. of Illinois at Urbana-Champaign, USA. We study the relation of 3-fold rotational symmetry to far field and near field properties of triangular metal nanoparticles and nanopatterns of 3-fold rotational symmetry.

Using a Double-Helix Point Spread Function, Localization Precision of Three-Dimensional Superresolution Fluorescence Imaging, Badieirostami, W. E. Moerner; Stanford Univ., USA. We localize a diffraction-limited fluorescently tagged protein in three dimensions within a live cell using a double-helix point spread function and this method to track a fluorescently tagged protein in three dimensions within a live cell.

Preparation of Metallo-Dielectric Diffractive and Plasmonic Structures via Self-Assembly, Filip Novotny, Jan Prášil, Ivan Richter, Pavel Pilař; Czech Technical Univ. in Prague, Czech Republic. We show utilization of self-assembly principle in preparation of highly ordered sub wavelength structures. 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.
Ellerbroek, David A. Andersen 1, Matthias Schoeck 2, Tony Travouillon 2; 1Herzberg Inst. of Astrophysics, Natl. Res. Council Canada, Canada, 2Thirty 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_e including a floor, stable stretches, and excursions.

AOThB1 • 10:30 a.m.
An Auto-Regressive Model to Create Seeing Time Series, Glen Herriot 1, Brent L. Ellerbrook 1, David A. Andersen 1, Matthias Schoeck 2, Tony Travouillon 2; 1Herzberg Inst. of Astrophysics, Natl. Res. Council Canada, Canada, 2Thirty 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_e including a floor, stable stretches, and excursions.

AOThB2 • 10:50 a.m.
Improving the Accuracy of the Ultra Fast Kolmogorov Phase Screen Generator, Vigna R. Strand 1, David Kearney 2, Ross Frick 2, Oskar Mencer 1; 1Imperial College London, UK, 2Univ. 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, Douglass P. Low 1, 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.

AThB1 • 10:30 a.m.
Hybrid Adaptive Optics Systems with Discrete-Time Atmospheric Turbulence Models, Douglass P. Low 1, 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.

AThB2 • 11:00 a.m.
All-Optical Magnetometer Based on Magnetite Core-Polymer Shell Nanocomposite Material, Alejandro Lopez-Santiago 1, Palash Gangopadhyay 2, Jayan Thomas 2, Robert A. Norwood 2, Nasser Peyghambarian 3, David G. Stork 3; 1Univ. of California at San Diego, USA, 2Univ. of Arizona, USA, 3Univ. of California at San Diego, 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/√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 Sreghalmi 1, Michael Helger 2, Robert Brunner 2, Mario Bretschneider 2, Stephan Seel 2, Ulrich Gisler 2, Mario Kneffe 2; 1Max Planck Inst. of Microstructure Physics, Germany, 2Carl Zeiss AG, Germany, 3IFG 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, Sergey Michikin 1, Radu Iftinov 1, Eugene Agner 1, Sergei Shustov 1, Ricoh Innovations, USA, 2Southern Methodist Univ., USA, 3IFG Inst. for Scientific Instruments GmbH, Germany. In this paper, we systematically 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.

AThB5 • 11:45 a.m.
Time Domain Numerical Observation of Superluminal Pulse in Photonic Band-Gap Structures, Tingyi Gu 1, Chuang Jiang 1, Shanghai Jiaotong Univ., China. In this paper, we systematically 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.

AThB6 • 12:00 p.m.
Off-Axis Sensor Modulation Transfer Function Measurement Using Band-Limited Laser Speckle, Xi Chen 1, Doug Feting 2, Rob Gravette 2, Donna Cau 1, Gemalduy Agron 1, Apina 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.

CThB1 • 10:30 a.m.
Pupil Encoding Methods, Aristide Dogorlia 1, CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.

CThB2 • 11:00 a.m.
Pupil Phase Encoding for Mitigation of Laser-Induced Saturation in Imaging Sensors, Joseph van der Graacht 1, Lei Zhang 2, Todd Torgerson 3, Paul Pauc 4; 1HoloSpcx, Inc., USA, 2Agiltron, Inc., USA, 3Wake Forest Univ., USA, 4Ricoh 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.

CThB3 • 11:15 a.m.
Extending Depth-of-Field: Spherical Coding Versus Asymmetric Wavefront Coding, Dirk Robinson 1, David G. Stork 2, Ricoh Innovations, USA. We design and built a spherical coded triplet imaging system and experimentally verified its extended depth-of-field imaging capabilities.

CThB4 • 11:30 a.m.
Experimental Validation of Extended Depth-of-Field Imaging via Spherical Coding, Michael D. Robinson 1, Vikrant Bhakti 1, 2Ricoh Innovations, USA, 3IFG Inst. for Scientific Instruments GmbH, Germany. 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; 1Univ. of Memphis, USA, 2Washington 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 enhances the noise and provides better noise-reduction.

CThB6 • 12:00 p.m.
Optical Coatings for Information Systems, John Berntner 1, 2, Brent L. Ellerbrook 2, 3, and Adriana Szeghalmi 1; 1Max Planck Inst. of Microstructure Physics, Germany, 2Carl Zeiss AG, Germany, 3IFG Inst. for Scientific Instruments GmbH, Germany. Coatings applied to two-dimensional shallow gratings produced tunable guided mode resonance filters.
and present experimental results obtained.

Recently, a modal wavefront sensing method, with the use of binary basis functions...

We describe a linear model for Shack-Hartmann sensors. For small...

Fairfield

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. Ellernbrook; 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 Wang⁴, Christopher Spivey¹, Guixiong Zhong², Yuchuan Chen², Jing Zhao²; ¹Alethus LLC, USA, ²Agiltron 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 Jankievicz, 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

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.
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, Yitor M. Schneider; Corning, Inc., USA. A new technique based on the laser vitrification of cordierite ceramic powders is used to fabricate microlens 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 Kinowski¹, Oudile Robin-Cristoni¹, Yan T. Tran¹, Katarzyna Wanczyko-Baum², Sylvia Turrell³, Bruno Casper²; ¹Lasers and Optical Materials, Univ. of Oxford, ²Laser & Plasma Research Laboratory, ³Microscopy Services France, France. We present 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 spectrscopic assessment are reported.

AThC4 • 2:30 p.m.
Progress on the Fabrication of On-Chip, Integrated Chalcogenide Glass (ChG)-Based Sensors, Laercio Pott¹, Nathan Carlile¹, Bogdan Zadyrko¹, Igor Luzinov¹, Kathleen Richardson¹, Juan Ht³, Anu Agarwall³, Lionel Kimerling³, Troy Anderson³; ¹Clemson Univ., USA, ²AUS, USA, ³CREOL, 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

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

CThC1 • 1:30 p.m.
Sub-Surface Interferometric near-Field Topography, Dana C. Kohlgraf-Owens, David Haeffner, 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. Kanaev¹, John R. Ackerman¹, Erin F. Fleet², Dean A. Scribner³; ¹Global Strategies Group N A Inc., USA, ²NRL, USA, ³Northrop 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 Aubailly¹, Mikhail A. Vorontsov², Gary W. Carhart³, Michael T. Valley⁴; ¹Univ. of Maryland, USA, ²ARI, USA, ³Sandia 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, Vincianne 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.
### Data Compression for Nearly-Periodic Data

Amos Talmi\(^1\), Erez N. Ribak\(^2\), \(^3\) Timi Technologies Ltd., Israel, \(^1\) Technion-Israel Inst. of Technology, Israel, \(^1\) 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.

### 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.

### 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
MEMS Wavefront Correctors

What’s the Use of Silica Microstructured Fibers?

Chalcogenide Glass Fibers and Their Applications

Optical Properties of Chalcogenide-Filled Silica-Air PCF

Bi-Doped Fibers for NIR Lasers and Amplifiers: Opportunities and Challenges

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.

Chalcogenide Glass Fibers and Their Applications

Invited

AOThD3 • Wavefront Correction Technology

What’s the Use of Silica Microstructured Fibers?

AOThD2 • 4:00 p.m.

AOThD4 • 5:10 p.m.

Fast, Robust Parameter Estimation and Open-Loop Control of Point-Actuated, Continuous-Facesheet Deformable Mirrors

Invited

AOThD1 • 4:00 p.m.

MEMS Wavefront Correctors

Invited

AOThD2 • 4:20 p.m.

Optically Addressed MEMS Coupled Photodetector Spatial Light Modulator

Invited

AOThD3 • 4:50 p.m.

Piezo Array Deformable Mirrors and New Associated Technologies: Spherical Shape and Tip/Tilt Mount

Invited

AOThD4 • 5:10 p.m.

Piero Array Deformable Mirrors and New Associated Technologies: Spherical Shape and Tip/Tilt Mount

Invited

AThD1 • Optical Fibers

AThD2 • 4:30 p.m.

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.

Optical Properties of Chalcogenide-Filled Silica-Air PCF, Markus A. Schmidt1, Nicolai Granzow1, Lothar Wondraczek2, Philip St. J. Russell1; 1Max Planck Inst. for the Science of Light, Germany, 2Dept. of Materials Science and Engineering, Univ. of Erlangen-Nuremberg, Germany. Sub-micron strands of Ge3As52S45 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.

Highly Efficient 1300 nm Emission in Bismuth Doped AlGeP-Silica Fiber, Richard S. Quanbery1, Karen L. Shubocki1, Theodore E. Morse2; 1Worcester Polytechnic Inst., USA, 2Boston 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.

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.

AThD3 • 5:00 p.m.

Optical Properties of Chalcogenide-Filled Silica-Air PCF

Recent results on 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 Niefeld; Univ. of Arizona, USA
Rafael Piestun; Univ. of Colorado, USA
Key to Authors

Abate, Adam R.—FTuA2
Abell, Josh—FMH4
Abi-Salloum, T. Y.—LSTuA2
Abolghasem, Payam—LSWH4
Abramochkin, Eugeny—FWW3
Accardi, Anthony—CThB5
Achermann, Marc—LSGW, LSWJ4
Ackerman, John R.—CTuC2
Accemman, Yiess—LSMH2
Adam, Vojtech—JWC19
Adams, Daniel E.—FWH7
Adato, Ronen—FPW6
Adhikari, Rana—JMB, JTuA1, JWC20
Adibi, Ali—FUb7, FWF6, FWZ2
Adkins, Sean—AOTuB1
Adler, Werner—FTuP2
Agarwal, Anu—AThC4
Agarwal, Girish S.—FMG5, FWI6, JW2D,
LSTu84, LSTuK3
Agee, Eugene—AThB4
Aggarwal, Ishwar—ATuD2
Agranov, Gennady—CThB6
Agrawal, Govind P.—FML4, FWU1
Agrawal, Miguel—FWW3
Ahmed, Iftikhar—FThO4
Agranov, Gennady—JWC10, LSWB4
Ahmad, Rafael—FWH1
Alieva, Tatiana—STu3
Alipour, Payam—FWZ2
Aller-Carpentier, Emmanuel—AOThC2
Allman, Brendan—JW85
Allsup, T. —LMTuC6
Almeida, Euclides C. L.—AThC5
Almeida, M. P.—JWD9
Alonso, Benjamin—JWC10, LSWB4
Alonso, Miguel A.—FWH1, FWQ2, FWW
Alrubaiiee, Mohammad—JTuC10
Alopecer, Joseph B.—FW5
Altug, Hatice—FMA4, FW6P
Ala, Andrew—FMH6
Aman, Markus C.—FTuW2
Ambekar Ramachandra Rao, Raghu—
FMK7
Amityat, Zohar—LSTuG4
Ammons, Mark—AOThA4
An, S.—FW2E
Andegoye, Kari—FMP7
Andersen, David A.—AOThB1
Andersen, David R.—AOThA4
Anderson, E. H.—FUb2
Anderson, Monté D.—JWC21
Anderson, Matt E.—FThB7
Anderson, Ryan—FMJ2
Anderson, Troy—AThC4
Anderson, Trevor—LSThD3
Anguita, Jaime A.—FTuC5
Ansmann, M.—JMA1
Antonio-Lopez, Jose E.—FUbD6
Apatrakul, Paveen—FTu2
Applegate, Brian E.—FThV4
Arabi, Hesam—FWE2
Ara, Alan—LMTuDP
Ara, Jun—FTuF3
Arau, Muzammil—FTuS, JTuA4
Archambault, Jean-Luc—FTuC2
Archer, Rod—FTuA1
Arjmand, Arghavan—FWZ2
Arnold, Stephen—LSMG2
Arnoldus, Henk F.—FMF3
Arrizón, Victor—JWC2
Arroyo Casarrubio, M. L.—JWC59
Artal, Pablo—LSWB4
Artal, Alp—FMA4
Artioukov, I. A.—FTuZ2
Aschenbach, Konley—JW4
Aschieri, P.—FWD1
Ashok, M.—LSTuG6
Askari, Murzad—FWF6
Aslanov, Emil—FWC8
Asman, Charles P.—FTuD2
Aspelmeyer, Markus—LSTuH1
Asprou-Guzik, A. —JWD3
Assoufid, Lahsen—FThG, FTmH2
Athale, Ravindra Anant—CThD, CWB
Atwood, David—FTuZ2, FThA1, FThT
Aubailly, Mathieu—CThC3
Audebert, Patrick—FM2
Aviña-Cervantes, Juan G.—JWC67
Avlasevich, Yuri—FMH2
Ayala, Oscar D.—FTuP6
Azad, Abdul K.—FWO1
Azevedo, Antônio—FWT3
Baba, Yoshinobu—LSTuF4
Badeirostam, Majid—CThA4, CTuD1
Bae, Hy-Kyoung—FMJ6
Bae, In-Ho—JWC11
Bahn, Jonathan—CThC8
Bagheri, Saeed—CTuC5
Bagno, V. S.—FTuC20
Baig, Mirza I.—FTuG7
Bailly, Ryan C.—LSMC1, LSMG
Bajaj, Sita—LSThA3
Baker, Henry—JWC34
Baker, Katherine A.—FThP3
Baker, Lane A.—LSMC2
Baker, Sarah—FWR1
Balakrishnan, Subramanian—JWC31
Balasubramanian, T.—LSTuG6
Baldelli, Steven—LSWH3
Ball, Navneet K.—LSWK5
Balle, S.—LSTu4
Banaee, Mohammad G.—FWT2, FWT5
Banch, Ole—FTuD4
Banks, Martin—FTuA2, FTuM2, FTuF
Barbastathis, George—CThA3, CTuD4,
FME7, FThB1, FTuR3, JWC24
Barbieri, M. —JWD9
Barbosa, L. C.—FWF2
Barclay, Paul E.—FTuU1, FW4, LSTuD3
Barea, Luis A. M.—FTO7
Barnakov, Yu. A.—FTuN5
Barnes, Michael D.—LSMB4, LSMF,
LSTA8, LSTuJ, LSTuL, LSTuQ, LSTuT2,
LSTuY, LSWH7
Barrett, Stephen—CThC2, FTuB4, JW4
Barovansky, Andrew—JWC8
Barreiro, Julio—JWE1
Barros, Gemima—FThS1
Barsi, Christopher—FMc1, FThX4
Bartal, Guy—FTuB2, FTuN2
Barthélémy, Alain—FW15
Barthélémy, Pierre—FM4C
Bartoli, Silvano—FTuY5
Barton, Jennifer K.—FM7
Barty, Anton—LSTA3
Barty, Christopher—FMI1
Barvieu, B.—FWD1
Basden, Alastair G.—AOThU4, AOThA5
Bastias, Martin J.—FQW1
Bastia, Thierry—JWC2
Bassar-Pasternak, Miguel A.—FTuE1
Bätterger, V.—LSTuB1
Baum, Peter—LSW1
Beausoleil, Raymond G.—FThE2, FThU1,
FW4, FW5, LSTuD3
Beckley, Amber M.—FThL2
Becin, Franck—ATHC3
Beggah, Philippe—JWB5
Beck, T. —LSMH1
Bega, Nathan J.—LSWH1
Bekker, Alexander—FWDS
Beliaev, Alexander—FVT1
Bellev, Matthieu—AWB3
Bello-Jiménez, Juan M.—FThD4
Benner, W. H.—LSTh3
Bennink, Ryan S.—JMA4, JMA7
Bennion, Ian—FTuG19, LMTuA6,
LMTuC6
Benson, Oliver—FWE4
Beresnev, A.—JW4
Bergh, Magnus—LSThA3
Berglund, Andrew—LSWD4
Berken, Kathrin—CTuC6
Berkovitch, Nikolai—FMH3
Berland, Keith—LSTb1, LSThF
Berova, Nina—LSMB1
Bertillon, Michel—FMF4
Berndt, Joseph—JWC8
Bewersdorff, Joerg—LSTb2, LSThD
Beyre, M.—LSMH1
Bhakta, Aditya—JWC4
Bhakta, Vikrant R.—CTuB4, CTuC4,
CW5B
Bhakthi, Shivakiran N. —ATHC3
Bhattacharya, Dipen—AWA4
Bhola, Bipin—FTuB4
Bialczak, Radoslaw C.—JMA1
Biamonte, J. D.—JWD3
Bidlot, Jean-Raymond—FTuB1
Bifano, Thomas—AOTuD1, FWA2
Bijlani, Bhavin J.—LSWH4
Biondini, Gino—FTuR3
Bird, Mark—FTuQ4
Biswas, Prasanta K.—AWA4
Biswas, Rothen—FThE5
Biswas, Rukhsana—FW4
Biswas, Rukhsana—FTuD1
Birtwistle, Martin—JWC67
Blain, Celia—AOTuH4
Blair, David A. D.—FTWT1
Blair, John—FTuN4
Blair, Louden—FTu2
Blake, Peter—FThN
Blund, Hawthorn, Joss—FTuD2
Blank, David A. —LSWC4, LSW1
Blinn, Boris R.—FTuB5, FTuB6
Blokh, Konstantin Yu.—FWP3
Blokh, Yuri P.—FWP3
Bliss, David—AWA1
Bloecker, Mark J.—FTuW2, FWC6
Blum, Christian—FW56
Bollier, William R.—JWC81
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 Koehler; 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.–1:00 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, JWCl61, JWCl78, 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.
• FThM ends at 3:30 p.m.
• JWE ends at 5:45 p.m.
• LSOH 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 Katoukita, 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 Lanerc 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 Kulesaur; 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 Livio; 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.
• Kirshor 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 FTH1, Multi-Modal Scanning X-Ray Microscopy.
- Diego Krafj; Colorado State Univ., USA will present LSWD3, Tracking Single Potassium Channels in Live Mammalian Cells.

**Author Updates**


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 Baranowski, Adin Kavate; 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. Milne1, S. Johnson2, V. T. Pham2, A. El Nahhas1, R. van der Veen1, P. Beaud1, Ch. Bressler1, M. Chergui3; 1Lab of Ultrafast Spectroscopy, Ecole Polytechnique Fédérale de Lausanne, Switzerland, 2Swiss Light Source, Paul Scherrer Inst., Switzerland. Steve Johnson will present.

**Presider Updates**

- Kathleen Richardson; Clemson Univ., USA will preside over session AWA.

**Postdeadline Presentations**

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

**New Exhibitors**

**Laser Quantum**
Table 16
Emery Court, Vale Road, Heaton Mersey
Stockport, Cheshire SK4 3GL
United Kingdom
Phone: +44 1612193073
Fax: +44 619755309
www.laserquantum.com
hfarmer@laserquantum.com

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Onyx Optics’ product capabilities include Adhesive-Free Bonded (AFB®) crystal and glass laser components such as laser rods, slabs, disks, and waveguiding structures. We work with materials such as doped and undoped YAG, YLF, YVO₄, sapphire, diamond, and spinel, as well as many others. Our patented composite technology enables higher efficiency, more compact, and higher power solid state laser and photonic devices.

**Booth Move:**
Wiley-Blackwell is now exhibiting in Booths 101 & 103.

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Del Mar Photonics, Inc. product portfolio includes CW single-frequency ring Dye/Ti:Sapphire lasers and spectrometers, ultrafast solid state and fiber oscillators and amplifiers, diode pumped solid state lasers, autocorrelators, pulse pickers, fluorescence, transient spectroscopy and multiphoton microscopy systems, femtosecond and Raman ready AFM & NSOM, terahertz THz set ups, NIR-MWIR-LWIR cameras, and optical and crystal components. Contact: Del Mar Photonics Sales Team, sales@dmphotonics.com.

A special thanks to the American Institute of Physics for their sponsorship of Wednesday’s FiO Coffee Breaks.
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
## 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.

## 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. Morrison¹, R. A. Stack¹, Gary Euliss², R. A. Athale², B. F. Necioglu¹, R. W. Horstmeyer¹, Colin Reese¹; Distant Focus Corp., USA, MITRE Corp., USA, 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. Georgiev¹, Andrew Lumsdaine¹, Sergio Gomez¹; Adobe Systems, USA, Indiana Univ., USA, 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.
AOTH A • Adaptive Optics Systems II
Donald T. Miller; Indiana Univ., USA, Presider

AOTH A6P • 9:40 a.m.
A Calibration Unit for the Rayleigh Laser Guide Stars at the LBT, Christian Schwab1, Andreas Quirrenbach1, Wolfgang Gässler2, Diethard Peter3; 1Landessternwarte, ZAH, Univ. Heidelberg, Germany, 2Max 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.
AOTH B • System Simulation and Modeling II
Miska LeLouarn; European Southern Observatory, France, Presider

AOTH B3P • 11:10 a.m.
Optimization of cw and Pulsed Sodium Guide Star Lasers, Ronald Holzlöhner1, Simon Rochester1, Domenico Bonaccini Calia1, Dmitry Budker1, James M. Highie2, Wolfgang Hackenberg1; 1European Southern Observatory (ESO), Germany, 1Univ. of California at Berkeley, USA, 3Bucknell 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 Kintaka1, Xiaoqiang Cui1, Keiko Tawo1, Junji Nishi2,3; 1Natl. Inst. of Advanced Industrial Science and Technology, Japan, 2Hokkaido 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 brighter than 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 Eu²⁺-Doped SrMgAl₂SiO₇: as a Novel Blue-Emitting Phosphor Synthesized through Sol-Gel Method, Reza Salimi, Hassan Sameie, Ali A. Sabbagh Alvani, Ali A. Sarabi, Fatollah 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, SrMgAl₂SiO₇:Eu²⁺ 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 • 3:30 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.
Adam, Roman — PDPB1
Adamo, Giorgio — PDPB1
Aeschlimann, Martin — PDPB1
Atef, Itai — PDPB1
Almeida, Euclides — PDPB1
Alonso, Miguel A. — PDPB1
Ambar, Oron — PDPB1
Amberg, Philip — PDPB1
Angot, Ludovic J. — CThC7P
Arie, Ady — PDPB1
Assoufid, Lahsen — PDPB1
Athale, R A. — CWB, CWB6P
Bartal, Guy — PDPB1
Beausoleil, Raymond G. — PDPB3
Bonaccini Calia, Domenico — AOThB3P, PDPB1
Bravo-Abad, Jorge — PDPB1
Brener, Igal — PDPB8
Budker, Dmitriy — AOThB3P
Carruthers, Tom — PDPB1
Chang, Chuan-Chung — CThC7P
Chao, Yu-Faye — PDPB1
Chavez-Boggio, Jose M. — PDPB1
Chen, Po-Chang — CThC7P
Chichester, Justin — PDPC7
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Cui, Xiaoxiang — AthA6P
Cunningham, John E. — PDPB5
Curtis, Alden H. — FDPB2
Dai, Lun — PDPB7
De Angelis, Francesco — PDPB1
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Dubinski, Mark — AWC6P
Eggleton, Charles D. — PDPC7
Euliss, Gary — CWB6P
Fairman, Shaya Y. — AThA
Fattal, David — PDPC3
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Fischer, Peer — PDPC2
Fratz, Markus — PDPC2
Furch, Federico J. — PDPA2
Gässler, Wolfgang — AOThA6P
Gayer, Ofer — PDA5
Georgiev, Todor G. — SWA7P
Giel, Dominik M. — PDPC2
Gin, Aaron — PDPB8
Gladden, Chris — PDPB7
Goban, Akhisa — PDPB7
Goma, Sergio — SWA7P
Goodhue, William — PDPB8
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Hackenberg, Wolfgang — AOThB3P, PDPB1
Hewak, Dan W. — PDPB1
Highie, James M. — AOThB3P
Ho, Ron — PDPB5
Holzloehner, Dmitry — AOThB3P
Hoover, Eric — AOThB3P
Horstmeyer, R. W. — CWB6P
Hu, Juejun — PDPC6
Huang, Chung-Che — PDPB1
Ippen, Eric P. — PDPB4
Jacob, Zubin — PDPB6
Jia, Yaoshun — PDPB2
Jimenez, Ralph — PDPC7
Johnson, Anthony — PDPB3
Kapteyn, Henry C. — PDPB1
Kimble, H. Jeff — PDPB7
Kimerling, Lionel C. — PDPC6
Kintaka, Kenji — AThA6P
Knight, Jonathan — AThC
Knight, Kenton — PDPB1
Krishnamoorthy, Ashok V. — PDPB5
Kubacki, Ronald M. — AWA7P
Kuis, Robinson — PDPA3
Kupp, E. R. — AWC6P
Lalanne, Elaine — PDPB3
La-O-Vorakiat, Chan — PDPB1
Leouam, Miska — AOThB
Lexau, Jon — PDPB5
Li, Guoliang — PDPB5
Li, Jingjing — PDPC3
Li, Kuan-Yi — PDPC1
Lin, Shiyun — PDPC6, PDPC8
Liu, Sheng — PDPA3
Lougovski, Pavel — PDPB7
Lumsdale, Andrew — SWA7P
Luo, Ying — PDPB5
Luther, Bradley M. — PDPB2
Ma, Ren-Min — PDPB7
MacDonald, Kevin F. — PDPB1
Marr, David W. M. — PDPC7
Mathias, Stefan — PDPA1
Matson, Charles L. — SWA
Matthews, Jonathan C. F. — PDPA6
Meehan, Shaun P. — PDPB2
Mekis, Attila — PDPB5
Merkle, Larry D. — AWC6P
Messing, Gary L. — AWC6P
Miao, Xiaoyu — PDPB8
Miller, Donald T. — AThA
Mookherjea, Shayan — PDPB3
Moro, Slaven — PDPB3
Morrison, R. L. — CWB6P
Mota, Claudia B. — PDPC5
Moztarzadeh, Fatollahi — AThC6P
Mumane, Margaret M. — PDPA1
Narimanov, Evgenii — PDPB6
Neciglu, B. F. — CWB6P
Nembach, Hans — PDPA1
Nishi, Junji — AThA6P
Nunes, Frederico D. — PDPC5
O'Brien, Jeremy L. — PDPB6
O'Donnell, Kevin A. — PDPB8
Oulton, Rupert F. — PDPB7
Papp, Scott B. — PDPB7
Park, Jung S. — PDPB3
Passmore, Brandon — PDPB8
Peter, Diethard — AOThA6P
Petrucelli, Jonathan C. — PDPB4
Pinkney, Nathaniel — PDPB5
Pinguet, Thierry — PDPB5
Politi, Alberto — PDPB6
Porat, Gil — PDPB5
Quarles, Gregory — PDPC
Quirrenbach, Andreas — AOThA6P
Radic, Stojan — PDPB3
Raj, Kannan — PDPB5
Reagan, Brendan A. — PDPA2
Reese, Colin — CWB6P
Richardson, Kathleen — AWA
Rocca, Jorge J. — PDPA2
Rochester, Simon — AOThB3P
Sabbagh Alvani, Ali A. — AThC6P
Sacchetti, Marco — PDPC5
Salimi, Reza — AThC6P
Samei, Hassan — AThC6P
Samsó, Zsolt L. — PDPB1
Sarabi, Ali A. — AThC6P
Schneider, Claus M. — PDPB1
Schweb, Christian — AOThA6P
Shaner, Eric — PDPB8
Shaw, Justin M. — PDPB1
Shi, Jing — PDPB5
Schunemann, Peter G. — AWC
Siemens, Mark E. — PDPA1
Silberberg, Yaron — PDPA9
Silva, T. J. — PDPA1
Smolyaninov, Igor — PDPB6
Soljačić, Marin — PDPB4
Sorger, Volker J. — PDPB7
Squier, Jeff — PDPB7
Sraj, Ihab — PDPC7
Stack, R A. — CWB6P
Sundheimer, Michael — PDPC5
Tahri, Mohammadreza — AThC6P
Tawa, Keiko — AThA6P
Taylor, Luke R. — PDPA4
Ter-Gabrielyan, Nikolay — AWC6P
Thacker, Hiren — PDPB5
Tsai, Hsiu-Ming — PDPC1
U'Ren, Alfred B. — PDPA8
Van der Gracht, Joe — CThC
van Eck, Steven J. — PDPB7
Vangala, Shivasankar — PDPB8
Xu, Yong — PDPB2
Zentgraf, Thomas — PDPB7
Zhang, Xiang — PDPB7
Zheludev, Nikolay I. — PDPB1
Zheng, Xuezheng — PDPB5
Zlatanovic, Sanja — PDPB3