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Welcome to Frontiers in Optics 2007

Welcome to San Jose, California and the Bay area—home to more than 200 companies focusing on optics and photonics and one of the premier centers of optics and photonics research in the United States! We are pleased that you have chosen to join us for the 2007 Frontiers in Optics (FiO) conference, the 91st Annual Meeting of the Optical Society of America.

This year's program encompasses the breadth of optical science and engineering and provides an atmosphere that fosters the exchange of information between those working on fundamental research and those looking for solutions to engineering problems. On behalf of the FiO Division Chairs, we would like to thank our colleagues from the Division of Laser Science of the American Physical Society for assisting in cultivating joint topics and sessions that will greatly enhance the experience of the attendees at FiO 2007. We have a full program this year, with more than 600 invited and contributed oral and poster presentations. Our poster sessions this year are enhanced to foster networking; two extensive sessions will be run during the meeting, with the first scheduled during the opening conference reception on Sunday, September 16.

In addition to the dynamic technical program that includes presentations by luminaries addressing the most innovative developments in their respective fields, there are many exciting special symposia and events scheduled for the meeting this year:

- **The Joint FiO/LS Awards Ceremony and Plenary Session** from 8:30 a.m. to 12:00 p.m. on Monday, September 17 will feature two world-renowned plenary speakers: Eli Yablonovitch from the Univ. of California at Berkeley and Nobel Laureate John Hall from JILA, the Univ. of Colorado and NIST.
- FiO is pleased to feature **several special symposia:** the Joint FiO/SPRC Symposium, Optics for Energy; Joint FiO/LS Symposium: Optics and the Second "Magic Decade" of Quantum Mechanics; Organic Thin Films for Photonic Applications; International Symposium on Optical Materials; (Guarded) Rational Exuberance: Renaissance after the Telecom Boom? and Best of Topicals. See Page 13 for details about the symposia.
- If you're an OSA member, be sure to join us at the **OSA Member Reception and JOSA 90th Anniversary Celebration** on Tuesday, September 18 from 6:30 p.m. to 8:00 p.m.
- Late-breaking advances in optics will be presented on Wednesday, September 19, in the **FiO postdeadline paper sessions,** running from 6:00 p.m. to 7:30 p.m.
- FiO is pleased to announce the debut of **Best Student Paper Awards.** Two awards will be selected from each of the seven technical divisions of OSA. Selections will be made based on the quality of the submitted technical summary and presentation. Winners will be announced at the end of the conference and in the next issue of *Optics & Photonics News.*
- **Science Educators' Day** will be held on Thursday, September 20, from 5:30 p.m. to 9:00 p.m. This is a highly engaging and informative session directed toward science educators at the elementary through secondary school levels, with topics of interest also to those at the college level.

We welcome you to FiO 2007 and encourage you to take full advantage of the benefits of this year's social and networking opportunities, technical sessions, corporate programming, poster sessions and an exhibition showcasing more than 70 participating companies!

Connie J. Chang-Hasnain
Conference Co-Chair
Univ. of California at Berkeley, USA

Gregory J. Quarles
Conference Co-Chair
VLOC, USA

Welcome to Laser Science XXIII

The leadership of the Division of Laser Science (DLS) of the American Physical Society (APS) is pleased to welcome you to our 23rd annual meeting, LS XXIII, in San Jose, California, September 16–20, 2007. We would like to thank our colleagues, Steven Girvin, Daniel Heinzen, Mark Kasevich, John Kitching, Guido Mueller, Linda Peteanu, Ronald Walsworth, Shailendhar Saraf and Thomas Weinacht for their help in organizing a broad range of topics in physics, biology and chemistry. This year's program includes many of the areas of forefront laser science that are customarily found at the annual DLS meeting, plus new topics associated with lasers in relativity, astronomical and space-physics applications. We have collaborated with our colleagues in the Optical Society of America to provide thorough coverage of mutually interesting topics in a number of joint sessions, and to coordinate schedules to encourage your intellectual wanderings between DLS and OSA sessions. In addition to an outstanding technical program, there are many exciting special symposia and events scheduled for the meeting this year. Special attention is appropriate for the **Symposium on Undergraduate Research** on Monday afternoon showcasing the work of some of our youngest scientists. We also wish to draw your attention to the symposium on Wednesday morning, **Joint FiO/LS Symposium: Optics and the Second "Magic Decade" of Quantum Mechanics,** which will provide an interesting historical perspective and was organized by Joseph Eberly.

One of the plenary talks on Monday morning will be given by our own John L. Hall (a.k.a. Jan), whose pioneering work in precision laser measurements have been an inspiration to generations of laser scientists. The technical sessions for LS XXIII are organized around six broad themes: Lasers in Precision Measurements; Precision Control of Light and Matter; Optical and Mechanical Couplings of Laser Light (joint with FiO); Lasers in Chemistry; Lasers in Biology (joint with FiO); and Lasers in Condensed Matter. Within each theme are topical sessions that examine a wide variety of laser science, from lunar ranging to biological imaging, from the shortest pulses to the longest interferometers, from cold atoms and molecules to cold mirrors, from microscopy of single molecules to polymer surfaces.

Our DLS business meeting will be held Tuesday from 6:30 p.m. to 7:00 p.m. in the Glen Ellen Room at the Fairmont Hotel. The DLS banquet will be Tuesday evening, following the business meeting, at the Gordon Biersch Brewery from 7:30 p.m. to 10:00 p.m. We welcome you to LS XXIII and encourage you to take full advantage of this year's technical and poster sessions, joint symposia and plenary lectures as well as an exhibit hall showcasing leading suppliers to the laser science community. Enjoy!

Frederick J. Raab
Program Co-Chair
LIGO Hanford Observatory, USA

Charles A. Schmuttenmaer
Program Co-Chair
Yale Univ., USA

Welcome to the 2007 Topical Meeting on Organic Materials and Devices for Displays and Energy Conversion

The aim of Organic Materials and Devices for Displays and Energy Conversion (OMD) is to bring together researchers from academia, industry and government laboratories from national and international settings in order to share their latest developments in this exciting area.

This year's OMD program includes a total of two plenary presentations, 18 invited presentations and 15 oral contributed presentations. The two plenary presentations are scheduled as follows: Progress in Light-Emitting and Photovoltaic Organic and Hybrid Materials and Devices, Ghassan Jabbour, Arizona State Univ., USA, during technical session OMA on Monday, September 17, 1:30 p.m.–2:15 p.m.; and The Use of Heavy Metal Complexes in Organic LEDs and Solar Cells, Mark Thompson, Univ. of Southern California, USA, during technical session OTuC on Tuesday, September 18, 2:00 p.m.–2:45 p.m.

All OMD attendees may attend the Frontiers in Optics conference, including the Organic Thin Films for Photonic Applications Symposium, and the Laser Science XXIII conference.

We welcome you to San Jose, California and look forward to your participation.

Jian Li
General Chair
Arizona State Univ., USA

Chun-Sing Lee
General Chair
City Univ. of Hong Kong, Hong Kong

Conference Committees

Frontiers in Optics 2007

Frontiers in Optics Conference Chairs

Connie J. Chang-Hasnain, *Univ. of California at Berkeley, USA*

Gregory J. Quarles, *VLOC, USA*

OSA Technical Divisions

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Anurag Gupta, *Optical Res. Associates, USA*, Chair

Optical Fabrication and Testing

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Thin Films

Zakya Kafafi, *Naval Res. Lab, USA*, Chair

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X-Ray Optics

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Azer Yalin, *Colorado State Univ., USA*, Chair

Short Wavelength and High Field Physics

Chunlei Guo, *Univ. of Rochester, USA*, Chair

Koichi Yamakawa, *Japan Atomic Energy Agency, Japan*, Vice-Chair

Photonic Metamaterials: From Random to Periodic

Hui Cao, *Northwestern Univ., USA*, Chair

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Diffuse Imaging and Optics

Joseph P. Culver, *Washington Univ. in St. Louis, USA*, Vice-Chair

Microscopy and OCT

Chris Schaffer, *Cornell Univ., USA*, Chair

Adam Wax, *Duke Univ., USA*, Vice-Chair

Therapeutic Laser Applications

Seonkyung Lee, *Physical Sciences Inc., USA*, Chair

Division 3 Associate

Conor Evans, *Harvard Univ., USA*

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Laser Science XXIII

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Charles A. Schmuttenmaer, *Yale Univ., USA*

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John Kitching, *NIST, USA*
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Guido Mueller, *Univ. of Florida, USA*
Linda Peteanu, *Carnegie Mellon Univ., USA*
Shailendhar Saraf, *Rochester Inst. of Technology, USA*
Ronald Walsworth, *Harvard-Smithsonian Ctr. for Astrophysics, USA*
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Zakya Kafafi, *Naval Res. Lab, USA*
Charles Y.-C. Lee, *AFOSR, USA*
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Alan Sellinger, *Nanyang Technological Univ., Singapore*
Mark Thompson, *Univ. of Southern California, USA*
Jay Wiesenfeld, *Alcatel-Lucent, USA*, SEC Representative
Chung Chih Wu, *Natl. Taiwan Univ., Taiwan*

2007 Joint FiO/LS Awards Ceremony and Plenary Session

Join your colleagues on Monday morning, September 17 in the Regency Ballroom to recognize recent OSA and APS/DLS award and honor recipients. The session, which will begin at 8:30 a.m., includes the Schawlow Prize Lecture as well as two plenary presentations.

The order of events:

- **Welcome**
- **APS/DLS Award and Honor Presentations**
- **Schawlow Prize Lecture: A New Method for Generation of Ultra-Intensive and Ultra-Short Laser Pulses,** *Szymon Suckewer, Princeton Univ., USA*
- **OSA Award and Honor Presentations**

Coffee Break

- **Nanophotonics: From Photonic Crystals to Plasmonics,** *Eli Yablonovitch, Univ. of California at Berkeley, USA*
- **The Optical Frequency Comb: A Remarkable Tool with Many Uses,** *John L. Hall, JILA, Univ. of Colorado and NIST, USA*
- **Closing Remarks**

Plenary Presentations

Nanophotonics: From Photonic Crystals to Plasmonics, Eli Yablonovitch, *Univ. of California at Berkeley, USA*

Engineering design is sometimes inspired by nature. The natural world is filled with crystals, periodic structures that interact with electron waves. Drawing on this analogy, photonic crystals are artificial, multidimensional, periodic structures that are intended for electromagnetic waves, instead. Such nanophotonic structures are now being designed and patterned into Silicon-on-Insulator (SOI) to provide for commercial nanophotonic integration, as a component part of conventional CMOS circuits. Further optical frequency miniaturization will take us toward nanoplasmonics, metallic-wired electrical circuits, running at optical frequencies.

Eli Yablonovitch graduated with the Ph.D. degree in Applied Physics from Harvard University in 1972. He worked for two years at Bell Telephone Laboratories and then became a professor of applied physics at Harvard. In 1979 he joined Exxon to do research on photovoltaic solar energy. Then in 1984, he joined Bell Communications Research, where he was a Distinguished Member of Staff, and also Director of Solid-State Physics Research. In 1992 he joined the University of California at Los Angeles, where he was The Northrop Grumman Opto-Electronics Chair, Professor of Electrical Engineering. Now he is a Professor in the Electrical Engineering and Computer Sciences Dept., University of California at Berkeley.

His work has covered a broad variety of topics: nonlinear optics, laser-plasma interaction, infrared laser chemistry, photovoltaic energy conversion, strained-quantum-well lasers and chemical modification of semiconductor surfaces. Currently his main interests are in optoelectronics, high-speed optical communications, high-efficiency light-emitting diodes and nanocavity lasers, photonic crystals at optical and microwave frequencies, quantum computing and quantum communication.

He is a Fellow of the Institute of Electrical and Electronic Engineers, the Optical Society of America and the American Physical Society. Professor Yablonovitch is a Life Member of Eta Kappa Nu and a Member of the National Academy of Engineering and the National Academy of Sciences. He has been awarded the Adolf Lomb Medal, the W. Streifer Scientific Achievement Award, the R.W. Wood Prize and the Julius Springer Prize.

Yablonovitch was a Founder of the W/PECS series of Photonic Crystal International Workshops that began in 1999. (PECS VIII will be held in Australia in 2009.)

The Optical Frequency Comb: A Remarkable Tool with Many Uses, John L. Hall, *JILA, Univ. of Colorado and NIST, USA*

The optical frequency comb concept and technology exploded in 1999–2000 by the synthesis of advances in independent fields of laser stabilization, ultrafast lasers and nonlinear optical fibers. The comb was developed first as a method for optical frequency measurement and has enabled a new cottage industry developing to check in the 16th digit for time-variation of physical "constants." The comb methods also empower enhanced time-domain control, with broad applications in spectros-

copy, metrology and the extension of nonlinear optics to the XUV range and beyond. Combs should be a major help in frequency-based length metrology, whereby the incredible resolution is accessible *along with* intrinsic resolution of the integer fringe question: Two great applications will be next-generation interferometric planet-finder space missions and cold-start dimensional metrology for tasks like layout of airplanes and accurate photolithography of large wafers.

John L. Hall is Senior Fellow Emeritus of the National Institute of Standards and Technology (NIST) and an Adjoint Fellow of JILA (formerly the Joint Institute for Laboratory Astrophysics), a joint institute of NIST and the University of Colorado-Boulder. Known as a preeminent laser experimentalist, Dr. Hall has contributed significantly to the development of the laser from a laboratory curiosity to one of the fundamental tools of modern science. He is known also for his training and mentoring of new generations of inspired physicists, several now being star researchers themselves.

Hall's work has concentrated on improving the precision and accuracy with which lasers can produce a specific frequency and the stability with which they can hold that frequency. He has helped to develop a broad range of laser applications, including precision spectroscopy for physical and chemical analysis, new tests of fundamental physical "laws," measurement and redefinition of the speed of light, and other time and length metrology advances, such as the optical frequency comb.

Climaxing more than 20 awards from his employer and major professional societies, Dr. Hall was awarded the 2005 Nobel Prize in Physics, sharing this honor with Theodor W. Hänsch of the Max-Planck-Institute and Roy J. Glauber of Harvard University. The Nobel Prize was awarded for their contributions to the development of laser-based precision spectroscopy, including the optical frequency comb technique. The optical frequency comb can measure the frequency of another laser with extraordinarily high precision.

Arthur L. Schawlow Prize and Lecture

The Schawlow Prize recognizes outstanding contributions to basic research that uses lasers to advance our knowledge of the fundamental physical properties of materials and their interaction with light. The Division of Laser Science of the American Physical Society will award the 2007 Arthur L. Schawlow Prize in Laser Science to Szymon Suckewer for pioneering contributions to the generation of ultrashort wavelength and femtosecond lasers and X-ray microscopy.

Schawlow Prize Lecture: A New Method for Generation of Ultra-Intensive and Ultra-Short Laser Pulses, Szymon Suckewer, *Princeton Univ., USA*

We have demonstrated unprecedented large pulse intensity amplification in excess of 10,000 in plasma of just 2mm in length by means of Stimulated Raman Backscattering (SRBS) amplification and compression. The intensity of the amplified pulses exceeded the pumping intensity by almost 2 orders of magnitude. Moreover, this amplification was accompanied by very effective pulse compression, from 500 fsec down to 90 fsec, in a single pass. Amplification was further increased by another factor of ~2 and the pulse was compressed down to ~50 fsec in a double-pass experiment. The crucial result of the double-pass experiment was a very significant improvement in the efficiency of the system, with a 6.4 % average energy transfer from the pump to the ultra-short pulses. This result was more than a factor of 6 improvements in comparison to the best of our previous results [W.Cheng, Y.Avitzour, Y.Ping, S.Suckewer, et.al, Phys. Rev. Lett.94, 045003 (2005)], which makes this RBS amplifier/compressor close to a practical device. We plan to use such RBS amplifier/compressor as a pump for development of the X-ray laser at 3.4 nm in H-like CVI ions in transition to ground state. Co-authors: J.Ren, W.Cheng and S.Li.

Szymon Suckewer is Professor of Mechanical and Aerospace Engineering at Princeton Univ. He received his M.S. degree from Moscow Univ. in 1962, Ph.D. in 1966 and D.Sc. in 1971 from Warsaw Univ., all in physics. He emigrated to the U.S. in 1975 and joined Princeton Univ.'s Plasma Physics Laboratory. His initial work at PPPL was on spectroscopic diagnostics of high temperature plasma and in parallel effort on developing his idea about recombination X-ray laser in magnetically confined plasma, which he and his group successfully demonstrated in 1984. This laser was used for X-ray microscopy in 1987-1991.

In 1985 Suckewer recognized the necessity of using ultrashort pumping pulses of high intensity for the development of much shorter wavelengths X-ray lasers. He expanded his group to proceed with the development of an ultrashort pulse KrF laser, which was completed in 1987 and generated intensity of 2×10^{18} W/cm^2. This device was used to generate lasing action at 13.5 nm in Li III ions in transition to ground state in 1996.

In 1987 he joined the MAE Dept. of the School of Engineering and Applied Sciences as a professor. He is a Fellow of the APS and the OSA. Presently Prof. Suckewer and his group are developing a powerful femtosecond laser based on Raman amplification and compression in plasma.

APS/DLS Awards

APS/DLS Fellowships

Arthur L. Schawlow Prize
Recipient: Szymon Suckewer, *Princeton Univ., USA*

OSA Awards and Honors

OSA Fellowships

Esther Beller Hoffman Medal
Recipient: M.J. Soileau, *Univ. of Central Florida, USA*

Distinguished Service Award
Recipient: Stephen D. Fantone, *Optikos Corp., USA*

Nick Holonyak, Jr. Award
Recipient: Connie J. Chang-Hasnain, *Univ. of California at Berkeley, USA*

Edwin H. Land Medal
Recipient: Charles R. Munnerlyn, *VISX, retired, USA*

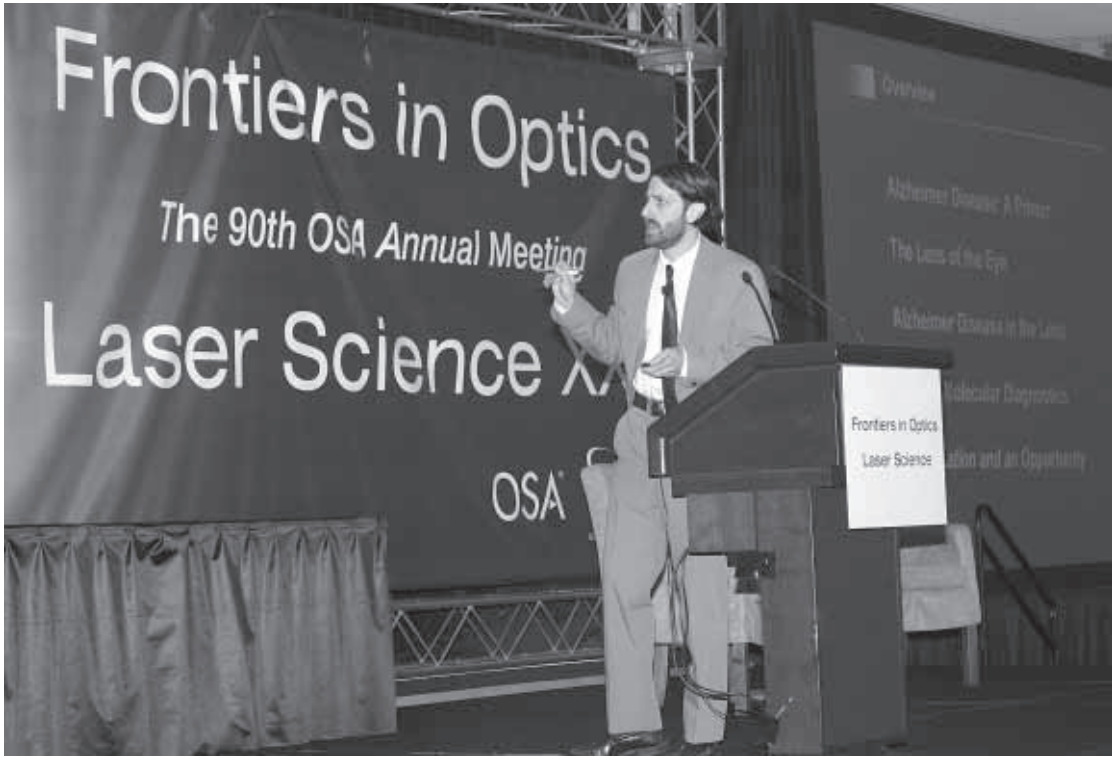
Leadership Award—New Focus/Bookham Prize
Recipient: Arpad A. Bergh, *OIDA, retired, USA*

Adolph Lomb Medal
Recipient: Shanhui Fan, *Stanford Univ., USA*

C.E.K. Mees Medal
Recipient: J. Gary Eden, *Univ. of Illinois at Urbana-Champaign, USA*

David Richardson Medal
Recipient: James L. Fergason, *Fergason Patent Properties, USA*

R. W. Wood Prize
Recipient: Bahram Jalali, *Univ. of California at Los Angeles, USA*



Lee E. Goldstein giving one of the plenary presentations at FiO/LS 2006

Special Events

Fall Vision Meeting

Sunday, September 16–Wednesday, September 19
Doubletree Marina, Berkeley, California

The OSA Fall Vision Meeting is a small, high-quality scientific meeting focused on all aspects of vision research. Talks are organized so that there is plenty of time for discussion. Additional meeting details can be found at *http://www.osavisionmeeting.org/2007_new/*.

Optics Overviews: What's Hot in Optics Today?

Sunday, September 16, 4:00 p.m.–6:00 p.m.
Fairmont Hotel, Regency Ballroom

Find out what scientific and technical advances are being made over the entire field of optics. The OSA Technical Division Chairs will present trends in their respective technical areas. The overviews highlight recent developments in optics and are designed to be informative and accessible even to the non-technical attendee.

- **What's Hot in Optical Design and Instrumentation,** Scott A. Lerner, *Hewlett-Packard, USA*
- **What's Hot in Optical Sciences,** Barry C. Walker, *Univ. of Delaware, USA*
- **What's Hot in Optics in Biology and Medicine,** Gregory Faris, *SRI Intl., USA*
- **What's Hot in Optics in Information Science,** Eric Johnson, *Univ. of North Carolina at Charlotte, USA*
- **What's Hot in Photonics,** Jay Wiesenfeld, *Bell Labs, Alcatel-Lucent, USA*
- **What's Hot in Quantum Electronics,** Colin McKinstrie, *Alcatel-Lucent, USA*
- **What's Hot in Vision and Color,** Alex Wade, *Smith-Kettlewell Eye Res. Inst., USA*

Participants' presentations will also be placed on the OSA website (*http://www.osa.org)* for viewing by the general public. Go to the technical groups areas of the membership section of OSA's website to view the technical overviews from this conference as well as those presented during the OSA Leadership Conference in February 2007.

Welcome Reception and Joint FiO/LS Poster Session I

Sunday, September 16, 6:00 p.m.–7:30 p.m.
Sainte Claire Hotel, Ballroom

Kick off the FiO 2007/LS XXIII meeting by attending the welcome reception and opening poster session! Meet with your colleagues, kick off the technical program with close to 50 poster presentations, network with your peers and make new acquaintances. Light hors d'oeuvres will be served.

FiO/LS Poster Presentations

Sunday, September 16, 6:00 p.m.–7:30 p.m.
Sainte Claire Hotel, Ballroom
Wednesday, September 19, 12:00 p.m.–1:30 p.m.
Fairmont Hotel, Regency Ballroom

This year there are 95 FiO and nine LS posters scheduled for presentation. Poster presentations offer an effective way to communicate new research findings and provide an opportunity for lively and detailed discussion between presenters and interested viewers.

OSA Division and Technical Group Meetings

Network with peers, meet group leaders and get involved in planning future group activities by attending division meetings during FiO. The following divisions have planned group meetings at FiO:

Sunday, September 16, 3:00 p.m.–3:30 p.m.

Vision and Color, *Doubletree Marina, Berkeley*

Sunday, September 16, 7:30 p.m.–8:30 p.m.

Optical Sciences, *Fairmont Hotel, Empire Room*

Optics in Information Science, *Fairmont Hotel, Gold Room*

Photonics, *Fairmont Hotel, Valley Room*

Quantum Electronics, *Fairmont Hotel, California Room*

Monday, September 17, 7:30 p.m.–8:30 p.m.

Optical Design and Instrumentation, *Fairmont Hotel, Empire Room*

Guest speaker:
History of Optical Design, *Kevin Thompson, Optical Res. Associates, USA*

These division meetings will encompass the technical groups affiliated with the division. Should you have any suggestions for any of the technical group activities, contact the division chair with your input.

2007 Joint FiO/LS Awards Ceremony and Plenary Session

Monday, September 17, 8:30 a.m.–12:00 p.m.
Fairmont Hotel, Regency Ballroom

The 2007 Joint FiO/LS Awards Ceremony and Plenary Session will feature three world-renowned speakers. See Page 8 for detailed descriptions of the speakers and their presentations.

OSA's Annual Business Meeting

Monday, September 17, 6:30 p.m.–7:30 p.m.
Fairmont Hotel, Belvedere Room

Take the opportunity to meet the OSA Board of Directors and hear fiscal and program reports on the Society firsthand. Questions and input are welcome! The results of the Board of Directors election will also be announced.

Minorities and Women in OSA (MWOSA) Networking Breakfast

Tuesday, September 18, 8:00 a.m.–9:30 a.m.
Fairmont Hotel, Club Regent

All conference attendees are invited to this complimentary luncheon and presentation. This year's guest speaker is Kate Pickle, Science Technology Engineering & Math (STEM) Project Manager for the Girl Scouts of the USA (GSUSA). Ms. Pickle's presentation will include an overview of GSUSA programs that encourage girls to excel in science and math studies, including their collaboration with the OSA Foundation to produce *Lighten Up! Discovering the Science of Light.* The Lighten Up! program is an exciting project that teams the OSA community of volunteers with troops around the country to explore optics through interesting hands-on demonstrations.

OSA Member Reception and JOSA 90th Anniversary

Tuesday, September 18, 6:30 p.m.–8:00 p.m.
Sainte Claire Hotel, Ballroom

The OSA Member Reception held during FiO is a special tradition; it's a time when members gather for great conversation and lots of good cheer! This year's reception includes a special 90th anniversary celebration for the *Journal of the Optical Society of America* (JOSA). All OSA members are encouraged to attend. Delicious refreshments will be served; admittance is free.

Division of Laser Science Annual Business Meeting

Tuesday, September 18, 6:30 p.m.–7:00 p.m.
Fairmont Hotel, Glen Ellen Room

All members and interested parties are invited to attend the Annual Business Meeting of the Division of Laser Science. The DLS officers will report on the activities of the past year and on plans for the future. Questions will be taken from the floor. This is your opportunity to help define the operations of the DLS and LS conference.

Laser Science Banquet

Tuesday, September 18, 7:30 p.m.–10:00 p.m.
Gordon Biersch Brewery
33 E. San Fernando St., Tel.: 408.294.8510

Join your colleagues for the annual LS Banquet. Tickets are required for this event and can be purchased at registration for $50. Tickets must be purchased by 12:00 noon on Monday, September 17.

FiO Postdeadline Papers

Wednesday, September 19, 6:00 p.m.–7:30 p.m.

For more information, including the schedule and locations, see the Postdeadline Papers program in your registration bag.

Science Educators' Day

Thursday, September 20, 5:30 p.m.–9:00 p.m.
Fairmont Hotel, Regency Ballroom

Sponsored by the OSA, the Northern California Local Section of OSA, and OSA Student Chapters at Stanford Univ. and Univ. of California at Berkeley, Educators' Day is designed to provide middle and high school science teachers with optics teaching resources that can be used in their classrooms. This event features hands-on classroom experiment demonstrations led by optics experts. Special thanks to our corporate sponsors for EDAY 2007 (as of August 16): Corning-Tropel and JK Consulting.

Special Symposia

Laser Science Symposium on Undergraduate Research

Monday, September 17, 12:00 p.m.–6:00 p.m.
Fairmont Hotel, Glen Ellen Room (oral sessions); Fairfield Room (posters)
Symposium organizer: Harold Metcalf, SUNY, Stony Brook, USA.

This special DLS annual symposium is rapidly becoming one of the most successful DLS traditions (this year's is the sixth of a series that began at the Long Beach meeting in 2001). During the past three years the number of undergraduates presenting papers has grown from fewer than 20 to more than 30, and the talks have been of outstanding quality, some absolutely stellar. Last year's posters were outstanding as well, and generated a great deal of lively interest and on-the-spot discussion. This year's symposium will consist of afternoon poster and oral sessions. The event provides an opportunity for some of the student members of our community, who are already among the finest young scientists to be found anywhere, to present their work before an audience of their peers as well as the larger optics community. All are invited and encouraged to attend the sessions.

Sessions SMA, SMD and SMF

See the Symposium on Undergraduate Research program in your registration bag for speaker information.

Joint FiO/Stanford Photonics Research Center (SPRC) Symposium

Monday, September 17, 1:00 p.m.–4:30 p.m.
Fairmont Hotel, Club Regent
Symposium organizer: Thomas M. Baer, Stanford Univ., USA.

Monday afternoon OSA and the Stanford Photonics Research Center are co-sponsoring a series of invited talks from leading scientists detailing a wide array of exciting frontiers in optics. These talks will discuss photonics technology enabling retinal implants to restore sight to the seeing impaired, the challenge of designing optical instruments for measuring defects in integrated circuits incorporating electronic devices with dimensions less than 50 nm, new optical techniques for imaging the complete brains of small animals *in vivo* at the neuron level, the challenges of manufacturing acres of photovoltaic devices for solar energy and the many applications of optical meta materials.

Presentation times to be announced. Abstracts are not available for these presentations.

Session SMB

Commercialization of Printed Thin Film Solar Cells, *James Sheats, Nanosolar, USA*

Retinal Implant Technologies, *Daniel Palanker; Stanford Univ., USA.*

Optical Brain Imaging and Neuronal Mapping in Small Animals, *Mark Schnitzer; Stanford Univ., USA.*

Fundamentals and Applications of Photonic Crystals and Metamaterials, *Shanhui Fan; Stanford Univ., USA.*

IC Inspection Technology: Present Status and Future Challenge, *Mehdi Vaez-Iravani; KLA-Tencor Corp., USA.*

Optics for Energy

Monday, September 17, 1:30 p.m.–5:30 p.m.
Fairmont Hotel, Empire Room
Symposium organizer: Alan Kost, Univ. of Arizona, USA.

This symposium will highlight the increasingly important role of optics for power generation, transmission and storage. The symposium will include invited talks on a wide range of topics to include: nanotechnology and high-efficiency photovoltaic devices, solar concentrators, solar photolysis and production of hydrogen.

Session SMC

1:30 p.m.
From Microwatts to Gigawatts: What's New under the Sun, *Greg P. Smestad; Solar Energy Materials and Solar Cells, USA.*

2:00 p.m.
"Plastic" Electronics and Optoelectronics, *Alan Heeger; Univ. of California at Santa Barbara, USA.*

2:30 p.m.
High Efficiency Solar Cells for Large-Scale Electricity Generation, *Sarah Kurtz; Natl. Renewable Energy Lab, USA.*

3:00 p.m.
Optical Properties of Microalgae for Enhanced Biofuels Production, *Tasios Melis; Univ. of California at Berkeley, USA.*

3:30 p.m.
Coffee Break

Session SME

4:00 p.m.
Recent Developments in Optics for Concentrator Photovoltaic (CPV) Systems, *Patrick Y. Meada; Xerox Palo Alto Res. Ctr., USA.*

4:30 p.m.
Multiple Exciton Generation in Silicon Nanocrystals, *Matthew C. Beard[1], Kelly P. Knutsen[1], Pingrong Yu[1,2], Qing Song[1], Joseph M. Luther[1], Randy J. Ellingson[1], Arthur J. Nozik[1,3]; [1]Natl. Renewable Energy Lab, USA, [2]Innovalight Inc., USA, [3]Univ. of Colorado, USA.*

5:00 p.m.
Optically Powered Video Camera Link, *Gunnar Böttger[1], Michael Dreschmann[1], Christos Klamouris[1], Michael Hübner[1], Moritz Röger[1], T. Kueng[1], Jürgen Becker[1], Wolfgang Freude[1], Jürg Leuthold[1], Andreas W. Bett[2]; [1]Univ. of Karlsruhe, Germany, [2]Fraunhofer-Inst. for Solar Energy Systems, Germany.*

Joint FiO/LS Symposium: Optics and the Second "Magic Decade" of Quantum Mechanics

Wednesday, September 19, 8:30 a.m.–12:00 p.m.
Fairmont Hotel, Belvedere Room
Symposium organizer: Joseph H. Eberly; Univ. of Rochester, USA.

This symposium is sponsored by the Optical Society of America, the American Physical Society Division of Laser Science, the APS Forum on the History of Physics and the American Institute of Physics Center for History of Physics.

The first magic decade for quantum mechanics, 1922–1932, began with de Broglie's work on his doctoral thesis and ended when quantum theory began to be applied widely and routinely. A second magic decade occurred just 50 years later, in 1972–1982. At that time the emergence of new optical capabilities allowed tests of quantum mechanics vs. the local realist worldview of nature. The first quantitative reports of Bell Inequality violations came from pioneering experiments exposing the non-intuitive character of non-local entanglement, famous as the basis for Schrödinger's Cat and quantum teleportation, as well as the backbone of all proposals for quantum computing, quantum cryptography and the whole field of quantum information. The symposium will consider the second magic decade retrospectively 25 years later, taking a historical view of the challenges overcome and the growing accommodation to its results.

Presentation times to be announced.

Session SWA

A Perspective on the Magic Decade 1972–1982, *Abner Shimony, Emeritus; Boston Univ., USA.* Honorary Chair of the Symposium. During the first "magic decade" (1922–1932) of the New Quantum Mechanics an interpretation was formulated, centering around Bohr's "Principle of Complementarity" and von Neumann's Hilbert Space formalism, that achieved the status of orthodoxy. The extraordinary fertility of the New Quantum Mechanics encouraged a general acceptance of this interpretation, perhaps to safeguard the richness of the quantum mechanical cornucopia. Nevertheless, doubts were expressed in the period between 1932 and 1972 by highly reputable physicists (among them Einstein, Schrödinger, Bohm, Wigner and Bell), motivated largely by refutations of von Neumann's "no hidden variables" theorem and by nostalgia for a more "realistic" view of physical reality than Bohr's epistemology admitted. Consequently, there was a slow transition towards tolerance of critical analyses of the "orthodox" interpretation and serious examinations of alternatives, flowering in the second "magic decade" (1972–1982).

Ten Noteworthy Jolts to Our Thinking about Quantum Mechanics, *John F. Clauser; Walnut Creek, USA.* It is interesting to recall how difficult the challenge was to concerned members of the scientific community to accept that: (1) von Neumann's 1932 argument does not prohibit hidden-variables theories ['66]; (2) No local hidden variable theory can give the quantum-mechanical prediction for Bohm's EPR experiment ['64]; (3) Bell's 1964 argument has no experimental basis ['69]; (4) Bell's argument can be extended to allow experimental tests ['69]; (5) Two-photon polarization correlation experiments can provide an experimental test ['69]; (6) Four of five experimental reports prefer quantum mechanics over local hidden-variable theories ['72a,b,c,'76a,b]; (7) Local Realism is at the heart of the conflict with quantum mechanics ['72]; (8) Loophole-free tests of Local Realism are possible ['72]; (9) Photon localization is observed ['74]; (10) Bell-CHSH violation with time-varying analyzers eliminates conspiracy-based theories ['82].

"Are You Really Going to Publish That? 'He Was a Promising Young Physicist. . .'", *Richard A. Holt; Univ. of Western Ontario, Canada.* When you carry out an experimental test of the fundamentals of quantum mechanics and get the "wrong" answer, what kinds of reactions do you get? What do you do about it? More importantly, what is the actual impact on Physics? Could it be that wrong experiments play a very positive role in the development of a field?

From Philosophy to Experimental Physics, *Stuart Jay Freedman; Univ. of California at Berkeley, USA.* My 1972 Berkeley dissertation describes the experimental test of local hidden variable theories that was reported in *Physical Review Letters* that year (S. J. Freedman and J. F. Clauser, PRL28, 938 (1972)). I will give a personal account of how a young graduate student who had originally planned to do philosophy, then engineering, then theoretical physics wound up with the problem of testing quantum mechanics and fell in love with experimental physics. I will also describe, from my perspective, what was going on and what we were thinking.

Arrogance? Naïveté? Stupidity? An Untenured Assistant Professor Threw Caution to the Winds for a Bell Inequality Experiment, *Edward S. Fry; Texas A&M Univ., USA.* What happens when a young untenured assistant professor throws caution to the winds and pursues what he considers really interesting physics? Referee reports on my first NSF proposal will be recalled. The proposal was for an experimental test of a Bell inequality. One result of those reports was my attempt to justify work in this area in terms of more "acceptable" physics. This contrasted with the tremendous and invaluable moral support of leading physicists of the time—e.g. Abner Shimony, Frank Pipkin, Eugene Wigner, John Wheeler.

How Abner Did It, *Michael Horne; Stonehill College, USA.* I'll report on my interactions with Abner Shimony from the day, in 1968, that he took me as his student and gave me the two Bell papers ('64, '66), until the time in 1969 of our collaboration with Holt and Clauser. I'll emphasize several major contributions by Abner and two interesting, but unpublished, calculations I made at that time.

The Paper That Changed My Life, *Alain Aspect; Inst. d'Optique, France.* In October 1974, I read John Bell's famous paper "On the Einstein-Podolsky-Rosen Paradox," and it was love at first sight. I knew that testing Bell's inequalities with "the settings . . . changed during the flight of the particles" would be my quest for the next few years. All that was left was to climb onto the shoulders of giants (C, H, S, H, F, F), to design my experiment, and to learn how to convince the skeptics that it was worth following the trail that Bell had blazed.

Special International Symposium on Optical Materials

Wednesday, September 19, 1:30 p.m.
Thursday, September 20, 6:45 p.m.
Fairmont Hotel, Crystal Room
Symposium organizers: Peter Moulton, Q-Peak Inc., USA; Astrid Aksnes, Norwegian Univ. of Science and Technology, Norway; Farzin Amzajerdian, NASA Langley Res. Ctr., USA.

The special symposium is a collection of topics related to the development and application of materials in optics. Topics will include ceramic materials, structured nonlinear crystals, nanocrystals and quantum dots, photonic materials and space qualification of materials and devices for laser remote sensing instruments.

The following list includes invited presentations only. See the abstracts section of this program for all presentations.

Wednesday, September 19

Session SWB

1:30 p.m.
Recent Advances in Photonic Crystal Fibers, *Philip Russell; Univ. Erlangen-Nuremberg, Germany.*

2:00 p.m.
Advances in Photonic Crystal Structures, *Richard De La Rue; Univ. of Glasgow, UK.*

3:00 p.m.
Strong Photon-Photon Correlations in Photonic Crystals, *Shanhui Fan, Jung-Tsung Shen; Stanford Univ., USA.*

Session SWC

4:00 p.m.
Air-Clad Photonic Crystal Fibers for High-Power Single-Mode Lasers, *Kent E. Mattsson; Crystal Fibre, Denmark.*

4:30 p.m.
Advances in Structured Nonlinear Semiconductor Crystals, *Paulina S. Kuo[1], Konstantin L. Vodopyanov[1], J. E. Schaar[1], X. Yu[1], A. C. Lin[1], M. M. Fejer[1], J. S. Harris[1], David F. Bliss[2], Candace L. Lynch[2], Timothy Zens[2]; [1]Stanford Univ., USA, [2]AFRL, USA.*

5:00 p.m.
Domain Structured KTP: Advances in Technology, Characterization and Applications, *Valdas Pasiskevicius, Carlota Canalias, Fredrik Laurell; Royal Inst. of Technology, Sweden.*

5:30 p.m.
Advances in Structured Ferroelectric Nonlinear Crystals, *Martin M. Fejer; Stanford Univ., USA.*

Thursday, September 20

Session ThB

8:00 a.m. **Tutorial**
Qualification and Lessons Learned with Space Flight Fiber Optic Components, *Melanie Ott; NASA Goddard Space Flight Ctr., USA.*

8:45 a.m.
Radiation Testing of Er and Yb Doped Optical Fibers, *Todd Rose, G. A. Sefler, J. R. Linares, H. G. Muller; Aerospace Corp., USA.*

9:15 a.m.
Space-Qualification Testing of Laser Optics, *Wolfgang Riede[1], Helmut Schröder[1], Paul Allenspacher[1], Denny Wernham[2], Yngve Lien[2], Sébastien Becker[2]; [1]Inst. of Technical Physics, Deutches Zentrum fuer Luft- und Raumfahrt (DLR), Germany, [2]European Space Agency, Netherlands.*

Session SThE

10:30 a.m.
Rethinking the Flight Qualification Processes of Solid-State and Fiber-Based Laser Systems, *Donald Barry Coyle; NASA Goddard Space Flight Ctr., USA.*

11:00 a.m.
Design, Qualification and On-Orbit Performance of the CALIPSO Aerosol Lidar Transmitter, *Floyd E. Hovis[1], Carl Weimer[2], Jeff Applegate[2], William Luck[3], Michael Cisewski[3]; [1]Fibertek Inc., USA, [2]Ball Aerospace and Technologies Corp., USA, [3]NASA Langley Res. Ctr., USA.*

11:30 a.m.
Advances in Ceramic Laser Media, *Ken-ichi Ueda; Univ. of Electro-Communications, Japan.*

12:00 p.m.
Ceramic Materials for Advanced Domes, Windows and Lasers, *Richard Gentilman; Raytheon, USA.*

Session SThG

2:00 p.m.
Advances in Fluoride-Based Ceramic Laser Media, *Michel Mortier[1], P. Aubry[1], P. Gredin[1], D. Vivien[1], G. Patriarche[2]; [1]Ecole Natl. Supérieure de Chimie de Paris, France, [2]Lab de Photonique et de Nanostructures, France.*

3:00 p.m.
Optical Ceramics: The Promise for a New Technology for High-Power Lasers and Nuclear Radiation Detection, *Romain Gaume; Stanford Univ., USA.*

3:30 p.m.
High-Power Solid State Ceramic Laser Program, *Alexander E. Mandl, D. E. Klimek; Textron Systems, USA.*

Session SThH

4:30 p.m.
Nanocrystals for Optical Bio-Sensing, *A. Paul Alivisatos; Univ. of California at Berkeley, USA.*

5:00 p.m.
Ordered Quantum Wire and Quantum Dots Systems for Nanophotonics Applications, *Eli Kapon, Fredrik Karlsson; Ecole Polytechnique Fédérale de Lausanne, Switzerland.*

6:00 p.m.
Quantum Dots for Advanced Semiconductor Lasers, *Dennis Deppe; Univ. of Central Florida, USA.*

Organic Thin Films for Photonic Applications (OTF) Symposium

Wednesday, September 19, 12:00 p.m.–1:30 p.m.
Fairmont Hotel, Regency Ballroom (posters)
Wednesday, September 19, 1:30 p.m.–6:00 p.m.
Fairmont Hotel, Atherton Room (oral sessions)
Symposium organizers: Dean DeLongchamp, NIST, USA; Steve Foulger, Clemson Univ., USA; Warren Herman, Univ. of Maryland, USA; Ghassan Jabbour, Arizona State Univ., USA; Zakya Kafafi, NRL, USA; Dennis Smith, Clemson Univ., USA.

The following list includes invited presentations only. See the abstracts section of this program for all presentations.

Session TWA

1:30 p.m.
Surface-Emitting Distributed Feedback Lasing Based on Multilayer Polymer Films, *Kenneth D. Singer, Thomas Boatwright, Joseph R. Lott, Hyunming Song, Yeheng Wu, Eric Baer, Anne Hiltner, Christoph Weder; Case Western Reserve Univ., USA.*

2:15 p.m.
Polymers with Unprecedented NLO Response, *Nasser Peyghambarian[1], Y. Enami[1], C. T. DeRose[1], D. Mathine[1], C. Loychik[1], C. Greenlee[1], R. A. Norwood[1], T. D. Kim[2], J. Luo[2], Y. Tian[2], A. K.-Y. Jen[2]; [1]Univ. of Arizona, USA, [2]Univ. of Washington, USA.*

Session TWB

4:00 p.m.
Recent Advances in Organic Photovoltaic Cells and Integrated Modules, *Bernard Kippelen, S. Yoo, W. J. Potscavage, B. Domercq, J. Kim, J. Holt; Georgia Tech, USA.*

5:15 p.m.
Pushing the Resolution Limit in Multiphoton Absorption Polymerization, *John T. Fourkas; Univ. of Maryland, USA.*

(Guarded) Rational Exuberance: Renaissance after the Telecom Boom?

Thursday, September 20, 8:00 a.m.–12:30 p.m.
Fairmont Hotel, Gold Room
Symposium organizers: Scott Lerner, Hewlett-Packard, USA; Jay Wiesenfeld, Alcatel-Lucent, USA; Alan Willner, Univ. of Southern California, USA; Ming Wu, Univ. of California at Berkeley, USA; Connie Chang-Hasnain, Univ. of California at Berkeley, USA.

In the shadow of the telecom boom, the optics industry is experiencing optimism that a renaissance of technology and investment has begun. This symposium will present the current status and directions of the telecom industry, telecom investments, and technologies from business, technological and political perspectives. Emerging photonics markets including solar cells, solid-state lighting, optical sensing and displays will also be discussed. Finally, speakers will reflect on lessons from the telecom boom and offer opinions on their pertinence to emerging markets.

Session SThC

8:00 a.m.
Verizon's Optical Network Transformation, *William C. Uliasz; Verizon, USA.*

8:30 a.m.
Back to the Future: High-Speed Transmission Systems Are Back, *Benny Mikkelsen; Mintera Corp., USA.*

9:00 a.m.
Preparing for the Future with a View of the Past, *Kathy Tse; AT&T Labs, USA.*

9:30 a.m.
Technologies for the Optical Renaissance, *Robert W. Tkach; Bell Labs, Alcatel-Lucent, USA.*

Session SThF

10:30 a.m.
Digital Optical Networks - PIC Based Systems for Advanced Network Architectures, *David F. Welch; Infinera Corp., USA.*

11:00 a.m.
Post Bubble Entrepreneurial Paradigm? *Milton Chang; Incubic, LLC, USA.*

11:30 a.m.
Analyzing New Technology, *Kathleen Perkins; Breault Res. Organization Inc., USA.*

12:00 p.m.
Title to Be Announced, *Richard Swanson; SunPower Corp., USA.* No abstract available.

Best of Topicals

Thursday, September 20, 8:00 a.m.–12:10 p.m.
Fairmont Hotel, Empire Room
Symposium organizer: Michael Duncan, Naval Res. Lab, USA.

The OSA offers a wide variety of topical meetings, which routinely produce numerous outstanding presentations that are cutting-edge in their respective disciplines. This year, the committee has chosen to offer a special session dedicated to these important topical meetings and the outstanding results that they bring to the OSA membership. This special session will highlight one select presentation from various topical meetings from 2007 so that other OSA members may get a perspective of the types of presentations taking place at these meetings. Each author will be recognized for his or her contribution to the topical meeting and will provide an overview of the state-of-the-art results that earned the title Best of Topicals.

Session SThA

8:05 a.m.
The Hyperlens: From Meta-Materials to Meta-Devices, *Evgenii Narimanov; Princeton Univ., USA.* (Photonic Metamaterials: From Random to Periodic, 2007)

8:30 a.m.
The Nature of Terahertz Conductivity in Nanomaterials, *Frank Hegmann[1], David G. Cooke[2], Markus Walther[3]; [1]Univ. of Alberta, Canada, [2]Technical Univ. of Denmark, Denmark, [3]Univ. of Freiburg, Germany.* (Optical Terahertz Science and Technology, 2007)

8:55 a.m.
The Atmospheric Chemistry Experiment (ACE): Interferometry in Orbit, *Peter Bernath[1,2]; [1]Univ. of Waterloo, Canada, [2]Univ. of York, UK.* (Fourier Transform Spectroscopy, 2007)

9:20 a.m.
Readout-Signal Amplification by Homodyne Detection Scheme, *Hideharu Mikami[1], Takeshi Shimano[1], Hiromi Kudo[1], Jiro Hashizume[2], Harukazu Miyamoto[1]; [1]Central Res. Lab, Hitachi, Ltd., Japan, [2]Mechanical Engineering Res. Lab, Hitachi, Ltd., Japan.* (Optical Data Storage, 2007)

9:45 a.m.
MAD On-Sky Results in Star Oriented Mode, *Enrico Marchetti[1], Roland Brast[1], Bernard Delabre[1], Rob Donaldson[1], Enrico Fedrigo[1], Christoph Frank[1], Norbert Hubin[1], Johann Kolb[1], Miska Le Louarn[1], Jean-Louis Lizon[1], Sylvain Oberti[1], Roland Reiss[1], Christian Soenke[1], Sebastien Tordo[1], Andrea Baruffolo[2], Paolo Bagnara[2], Antonio Amorim[3], Jorge Lima[3]; [1]European Southern Observatory, Germany, [2]INAF - Osservatorio Astronomico di Padova, Italy, [3]Faculdade de Ciencias, Univ. de Lisboa, Portugal.* (Adaptive Optics, 2007)

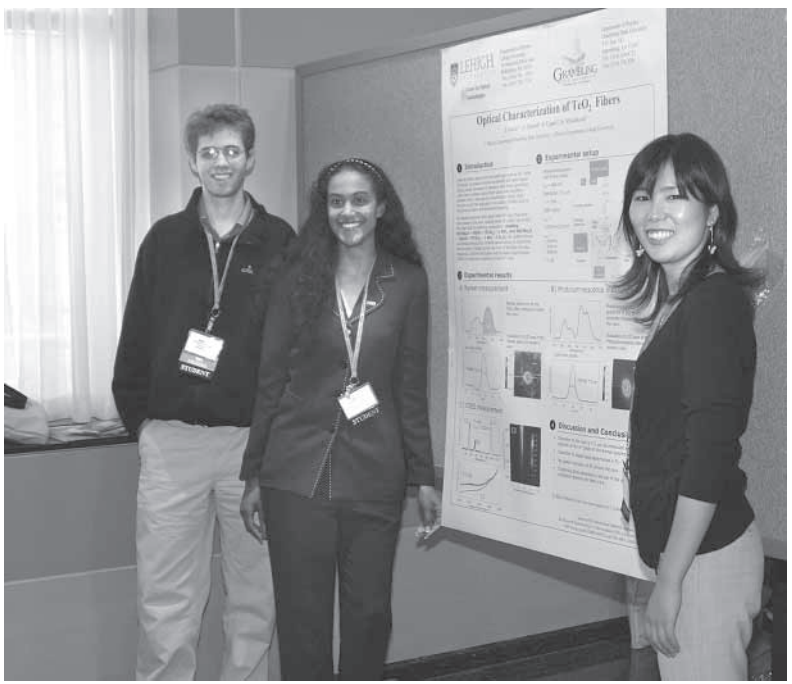
Session SThD

10:30 a.m.
Scanning Holographic Microscopy for Multifunctional Imaging, *Guy Indebetouw; Virginia Tech, USA.* (Digital Holography, 2007)

10:55 a.m.
Optical Frequency Comb Generation from a Monolithic Micro-Resonator via the Kerr Nonlinearity, *Pascal Del'Haye, Albert Schliesser, Tobias Wilken, Ronald Holzwarth, Tobias Kippenberg; Max-Planck-Inst. for Quantum Optics, Germany.* (Nonlinear Optics: Materials, Fundamentals and Applications, 2007)

11:20 a.m.
Fiber-Top Cantilevers: A New Generation of Micromachined Sensors for Multipurpose Applications, *Davide Iannuzzi[1], Szabolcs Deladi[2], Herman Schreuders[1], Martin Slaman[1], Jan H. Rector[1], Michael Elwenspoek[2]; [1]Vrije Univ. Amsterdam, Netherlands, [2]Univ. of Twente, Netherlands.* (18th International Conference on Optical Fiber Sensors, 2006)

11:45 p.m.
THz Tunable Slow Light and Fast Light of Ultrashort Pulses in Semiconductor Optical Amplifiers, *Bala Pesala[1], Forrest G. Sedgwick[1], Alexander V. Uskov[1], Connie Chang-Hasnain[1], Tony H. Lin[2]; [1]Univ. of California at Berkeley, USA, [2]Calmar Optcom Inc., USA.* (Slow and Fast Light, 2007)



Students at the Laser Science Undergraduate Research Symposium at FiO/LS 2006

Short Courses

With a strong commitment to continuing technical education, FiO Short Courses are designed to increase your knowledge of a specific subject while offering you the experience of expert teachers. Top-quality instructors stay current with the subject matter required to advance your research and career goals. An added benefit of attending a Short Course is the availability of Continuing Education Units (CEUs).

All courses will take place on Sunday, September 16. Locations will be provided at registration.

Continuing Education Units (CEUs)

The CEU is a nationally recognized unit of measure for continuing education and training programs that meet established criteria. CEUs are awarded to each participant who completes a Short Course and submits the necessary paperwork. CEUs will be calculated and certificates will be mailed to participants after the conference.

Short Course Fees and Registration

Short Course registration includes Short Course Notes and admittance to the selected Short Course and the Exhibit Hall. Short Course registration is separate from the technical registration and does not include the Technical Digest or admission to technical sessions. Please refer to the registration form for fee information.

Short Course Schedule

Sunday, September 16, 9:00 a.m.–12:30 p.m.

SC235 Nanophotonics: Materials, Fabrication and Characterization, *Joseph W. Haus, Andrew Sarangan, Qiwen Zhan; Univ. of Dayton, USA.*

SC252 The Phase-Space Diagram: A New Paradigm for Analyzing Optical Signals and Systems, *Markus Testorf[1], Jorge Ojeda-Castañeda[2]; [1]Dartmouth College, USA, [2]Univ. de Guanajuato, Mexico.*

SC253 Medical Imaging and Beyond, *Arthur Gmitro; Univ. of Arizona, USA.*

SC304 Free-Form Optics Design for Illumination, *Pablo Benítez, Juan C. Miñano; Univ. Politecnica de Madrid, Spain.*

Sunday, September 16, 1:30 p.m.–5:00 p.m.

SC274 Polarization Engineering, *Russell Chipman; Univ. of Arizona, USA.*

SC303 Lighting and Illumination, *William Cassarly; Optical Res. Associates, USA.*

SC305 Solid-State Optical Materials for Advanced Photonic Applications, *David S. Sumida; HRL Labs, LLC, USA.*

SC306 Exploring Optical Aberrations, *Virendra Mahajan; Aerospace Corp., USA.*

Course Descriptions

Sunday, September 16, 9:00 a.m.–12:30 p.m.

► **SC235 Nanophotonics: Materials, Fabrication and Characterization,** *Joseph W. Haus, Andrew Sarangan, Qiwen Zhan; Univ. of Dayton, USA.*

Category
Nanophotonics and Plasmonics

Course Level
Advanced beginner (basic understanding of topic is necessary to follow course material)

Course Description

Nanophotonics is an emerging multidisciplinary field that deals with optics on the nanoscale. Recent progress in nanophotonics has created new and exciting technological opportunities. The interaction of light with nanoscale matter can provide greater functionality for photonic devices and render unique information about their structural and dynamical properties.

This nanophotonics course examines the key issues of optics on the nanometer scale. The course covers novel materials, such as photonic crystals, quantum dots, plasmonics, and metamaterials and their applications; it then identifies and explains selected fabrication and synthesis techniques. Photonic devices that exploit nanoscale effects, such as nonlinear optical effects and quantum confinement, will be discussed. Finally, various nanocharacterization techniques used in metrology, nondestructive evaluation and biomedical applications will be explained.

Benefits and Learning Objectives

This course should enable you to:

- Explain the basic linear and nonlinear optical properties of photonic crystals and metals.
- Learn how nanoscale effects are exploited in photonic devices.
- Discuss nanofabrication and design tools.
- Learn the principles of nanocharacterization tools.
- Describe computational and modeling techniques used in nanophotonics.
- Identify the latest advances in the field of nanophotonics.

Intended Audience

This course is intended for optics professionals who are interested in learning the fundamentals of nanoscale light-matter interactions, nanophotonic devices, fabrication, synthesis and nanocharacterization techniques.

Instructor Biographies

Joseph W. Haus is professor and director of the Electro-Optics Program at the Univ. of Dayton. His current research is concentrated on the linear and nonlinear optical properties of photonic crystals, especially novel photonic sensors, modulators and coherent light sources from THz to UV based on electromagnetic resonance effects. Andrew M. Sarangan is an associate professor of the Electro-Optics Graduate Program at the Univ. of Dayton. His research interests are in the general area of semiconductor devices, integrated optics and computational electromagnetics. His current research is focused on photonic crystals devices, specifically on novel nanophotonic resonator structures for applications in diode lasers and detectors. Qiwen Zhan is an assistant professor of the Electro-Optics Graduate Program at the Univ. of Dayton. He received his M.S. and Ph.D. in electrical engineering from the Univ. of Minnesota. Dr. Zhan's research interests are in the general area of physical optics, including nanophotonics, optical metrology and sensors techniques. His current research focuses on developing new polarization sensing and manipulation techniques for nanotechnology applications.

▶ SC252 The Phase-Space Diagram: A New Paradigm for Analyzing Optical Signals and Systems, *Markus Testorf[1], Jorge Ojeda-Castañeda[2]; [1]Dartmouth College, USA, [2]Univ. de Guanajuato, Mexico.*

Category
General Optics in Information Science

Course Level
Advanced beginner (basic understanding of topic is necessary to follow course material)

Course Description

The terms joint time-frequency transformation and local frequency spectrum refer to mathematical tools for dealing with the inevitable trade-off between two physical variables that form a Fourier transform pair. The first term is commonly used in signal processing; the latter term is employed for analyzing physical systems. For applications in optical sciences, we denote this type of tools as a phase-space representation, or as the Wigner distribution function. We show the signal representation in the phase-space domain not only facilitates the separation of different signal components, but also contains information about the evolution of the optical wave as it propagates through an optical system. Fundamental properties, such as geometrical optics invariants, which are useful when describing the light gathering power of optical instruments, as well as the space bandwidth-product, are intimately related to the phase-space representation of optical signals and systems.

This Short Course introduces optical phase space as a natural representation of optical rays. Based on heuristic arguments the phase-space representation of optical signals is modified in several steps to incorporate the terminologies of radiometry and Fourier optics. From this exploration the Wigner distribution function emerges as central joint transform, which is subsequently used to develop a signal and system theory based on phase-space representations. We also discuss an alternative motivation for a phase-space description which takes Fourier optics as its starting point and which leads to the signal representation in terms of the Ambiguity function. A significant part of the course is devoted to applications of phase-space optics, including the design of novel imaging devices extending the depth of field of an imaging system, as well as phase retrieval and signal recovery.

Benefits and Learning Objectives

This course should enable you to:

- Translate conventional signal representations into phase-space and particularly into phase-space diagrams.
- Associate simple optical elements with the corresponding phase space transform.
- Know the phase-space representation of signals which are important in optics.
- Summarize the limitations of phase-space optics.
- Analyze paraxial optical systems and their response in terms of phase-space diagrams.
- List at least five applications for which phase-space diagrams are benefical.
- Derive the phase-space diagram for a composite optical system from its generic components.

- Describe the relationship between signal descriptions in optics based phase-space concepts.

Intended Audience

The course is intended for graduate students and professionals who have some optics background and who want to familiarize themselves with the concepts of phase-space optics and diagrams. The content should be comprehensible for anybody working on optics-related research and development projects. While the course is largely designed without prerequisites, basic knowledge of Fourier optics or signal and systems theory is recommended. The course is not recommended for a non-technical audience.

Instructor Biographies

Markus Testorf received his doctorate in physics from the Univ. of Erlangen in Germany. He has worked at the National Institute of Astrophysics, Optics and Electronics in Puebla, Mexico; at the Univ. of Hagen in Germany; and at the Univ. of Massachusetts-Lowell. He is currently an assistant professor at the Thayer School of Engineering at Dartmouth College. He has written or co-authored more than 130 articles and conference proceedings, including numerous articles related to phase-space concepts in optics and electromagnetism. Testorf has taught undergraduate and graduate optics courses for a number of years, which has allowed him to gain experience with the use of phase-space concepts for optics education. Jorge Ojeda-Castañeda earned his doctorate in applied optics, under the supervision of H. H. Hopkins, F.R.S., at Univ. of Reading, UK. He has written more than 200 papers in academic journals and conference proceedings. He has acted as invited speaker at more than 30 international meetings on optics. For more than 25 years, he has been teaching courses in physics and mathematics at both graduate and undergraduate levels. In many of his oral and written contributions, he has pioneered the use of phase-space representations for extending the field of view of optical systems.

► **SC253 Medical Imaging and Beyond,** *Arthur Gmitro; Univ. of Arizona, USA.*

Category
General Optics in Biology and Medicine

Course Level
Advanced beginner (basic understanding of topic is necessary to follow course material)

Course Description

This course will present the basic physical principles, relevant mathematical concepts, practical hardware realizations, performance characteristics and clinical applications of modern medical imaging systems. The imaging modalities covered include projection X-ray imaging, X-ray computed tomography (CT), projection nuclear medicine imaging, single photon emission computed tomography (SPECT), positron emission tomography (PET), magnetic resonance imaging (MRI), ultrasound (US), and optical endoscopy. Emerging new techniques such as confocal microendoscopy, optical coherence tomography and diffuse optical tomography will also be presented and discussed in relation to the more established imaging methods. Participants should gain a fundamental understanding of how the major medical imaging instruments operate and how they are used in modern clinical medicine. An important aspect of the course will be the description of the latest developments in each of the imaging areas. The course will end with a summary of where the field of medical imaging is heading and what advances might be expected in the future.

Benefits and Learning Objectives

This course should enable you to:

- Describe the fundamental physical concepts and interactions underlying X-ray, nuclear medicine, magnetic resonance, ultrasound and optical imaging systems.
- Explain the key mathematical principles behind both tomographic and projection imaging systems.
- Identify and explain the key system components of modern medical imaging instruments.
- Define and summarize the performance characteristics of current medical imaging equipment.
- Discuss the major clinical applications and describe how these instruments are used in modern clinical practice.
- Explain and discuss the new emerging technologies of optical coherence tomography, confocal microendoscopy and diffuse optical tomography.

Intended Audience

The course is intended for individuals with a basic knowledge of imaging and imaging systems who are interested in gaining a deeper understanding of modern medical imaging technologies. The course will present the basic physical, mathematical and engineering principles behind these imaging systems. The instructor will assume participants have familiarity with basic engineering and mathematics concepts (e.g., Fourier transforms). No background in biology or medical technology is expected.

Instructor Biography

Arthur Gmitro is a professor of Radiology and Optical Sciences at the Univ. of Arizona. He received his doctorate in optical sciences from the Univ. of Arizona in 1982 and was an assistant professor of diagnostic radiology at Yale Univ. from 1982 to 1987. Dr. Gmitro has been involved in medical imaging research for more than 28 years and has published

more than 50 papers on a variety of topics in medical imaging and/or optics. He is the recipient of the Rudolph Kingslake award from SPIE and the Francois Erbsmann prize from IPMI (Information Processing in Medical Imaging). Dr Gmitro's major areas of research are magnetic resonance imaging and biomedical optics. He has worked on fundamental development of these technologies and continues to direct an active research program in these areas.

► **SC304 Free-Form Optics Design for Illumination,** *Pablo Benítez, Juan C. Miñano; Univ. Politecnica de Madrid, Spain.*

Category
Optical Design and Applications in General Lighting and Illumination

Course Description

Optics' origins are intimately linked with spherical surfaces. There are two reasons behind that specific surface-shape selection: (1) the easiest surface to manufacture precisely (and polish!) was the sphere; (2) pre-computer-age optical design methods were based on algebra for which spherical surfaces are a useful simplification, known as the paraxial, or Gaussian, approximation.

Aspheric surfaces came later. Eliminating the spheric constraint introduces degrees of freedom that can be used to improve system performance, reduce cost (via system simplification) or both.

The field of illumination and nonimaging optics has proven to be a good arena for greater surface complexity. Its design techniques and goals are different from those of imaging optics. Also, manufacturing tolerances and performance goals are usually less demanding than for imaging optics.

The latest step in escaping prior restrictions on optical-surface geometry is to transcend rotational symmetry. Free-form surfaces (also called anamorphic surfaces, their formal name from Greek etymology) dramatically increase the degrees of design freedom. Illumination optics has pioneered free-form design and manufacturing. At present free-form design techniques in illumination are much more advanced than those of imaging optics.

The future of optical design will probably be dominated by free-form surfaces. The course will be a comprehensive introduction to this advanced topic. We will review the present free-form design methods to understand trends and difficulties in the progress towards a complete free-form surface design methodology. The course will cover topics from fundamental principles (as the consequences of the etendue invariants) to practical applications, manufacturing and testing.

Benefits and Learning Objectives

This course should enable you to:

- Define the types of optical design problems in illumination and nonimaging optics.
- Compute the basic formulae to deduce the fundamental limits of performance in comprehensible specific design problems.
- Explain the limitations of classical symmetrical optics to solve some practical illumination problems.
- Justify the capabilities of free-form optics to find solutions unattainable with symmetrical optics.
- Compare the present methods of design of free-form optics in illumination.
- Identify the usual techniques to model free-forms surfaces and visualize their parameterization with the help of a user-friendly CAD program.
- Describe the state-of-the-art of manufacturing and testing equipment for these surfaces.
- List the specific applications in which free-forms are being proposed.

Intended Audience

Scientists and engineers with a basic background in optics. It can be of interest to basic researchers, optical designers and application engineers. A degree in physics or engineering would be useful to follow the course but not necessary.

Instructor Biography

Pablo Benítez and Juan C. Miñano, both professors at the Technical Univ. of Madrid (UPM), have worked in the field of nonimaging optics and illumination engineering since 1990 and 1984, respectively. Dr. Benítez and Dr. Miñano have contributed to the development of the leading-edge optical design methods in the field, the best known being the SMS method. Their work has covered not only fundamental theory and design, but also applied research and product development in collaboration with LPI-LLC. They have published the book "Nonimaging Optics" (Academic-Elsevier, 2005), coauthored with Dr. Roland Winston.

Sunday, September 16, 1:30 p.m.–5:00 p.m.

► **SC274 Polarization Engineering,** *Russell Chipman; Univ. of Arizona, USA.*

Category
Coherence and Polarization

Course Level
Advanced beginner (basic understanding of topic is necessary to follow course material)

Course Description

This course provides a survey of issues associated with calculating polarization effects in optical systems using optical design programs. Many optical systems are polarization critical and require careful attention to polarization issues. Such systems include liquid crystal projectors, imaging with active

laser illumination, very high numerical aperture optical systems in microlithography and data storage, DVD players, imaging into tissue and turbid media, optical coherence tomography and interferometers. Polarization effects are complex: Retardance has three degrees of freedom; diattenuation (partial polarization) has three degrees of freedom; and depolarization, the coupling of polarized into partially polarized light, has nine degrees of freedom. Due to this complexity, polarization components and the polarization performance of optical systems are rarely completely specified.

The polarization aberrations introduced by thin films and uniaxial crystals can be readily evaluated in several commercial optical design codes. These routines are complex and most optical engineers are unfamiliar with the capabilities and the forms of output, but these polarization ray tracing routines provide better methods to communicate polarization performance and specifications between different groups teamed on complex optical problems. Better means of technical communication speed the development of complex systems.

The course emphasizes the practical aspects of polarization elements and polarization measurements. The basic mathematics of the Poincare sphere, Stokes vectors and Mueller matrices are presented and applied to describe polarized light and polarization elements. Polarizers and retarders are introduced and their principal uses explained. The nonideal characteristics of polarization elements, liquid crystals and birefringent films are discussed with examples.

Benefits and Learning Objectives

This course should enable you to:

- Understand how to follow the polarization changes along a ray path through a series of lenses, mirrors, polarization elements and anisotropic materials.
- Learn to calculate the Jones matrices for ray paths through sequences of thin film coated optical elements and interpret the "instrumental polarization" or polarization aberrations associated with ray paths.
- Understand how polarization state dependent point spread functions and modulation transfer functions are calculated.
- Visualize the Maltese cross, linear polarization tilt, and other fundamental polarization aberration patterns which occur in many systems and picture configurations like the crossed folding mirror which reduce polarization aberrations.
- Develop appropriate polarization specifications for optical systems.

Intended Audience

This class is intended for optical engineers, scientists and managers who need to understand and apply polarization concepts to optical systems. Some prior exposure to optical design programs and to linear algebra would be helpful.

Instructor Biography

Russell Chipman is a professor of optical sciences at the Univ. of Arizona in Tucson. He runs the Polarization Laboratory, which performs measurements and simulations of polarization elements, liquid crystals and polarization aberrations. He managed optics departments at JDS Uniphase and Johnson & Johnson and was also a physics professor at the Univ. of Alabama at Huntsville. He has developed many unique spectropolarimeters and imaging polarimeters and conducted studies into polarization in fiber components, waveguides, liquid crystals, polarization elements and natural polarization signatures. He holds 12 patents in optics. He received his B.S. from MIT and Ph.D. in optical science from the Univ. of Arizona. Chipman is a Fellow of OSA and SPIE and a topical editor for *Applied Optics*. He chairs the Polarization Engineering group within OSA.

► **SC303 Lighting and Illumination,** *William Cassarly; Optical Res. Associates, USA.*

Category
Optical Design and Applications in General Lighting and Illumination

Course Level
Advanced beginner (basic understanding of topic is necessary to follow course material)

Course Description

Lighting and Illumination has received much attention in recent years because of advances in sources, especially LEDs. The design of lighting and illumination systems requires balancing uniformity, collection efficiency and packaging requirements. Some of the fundamental building blocks for illumination system design include an understanding of Etendue and the design principles behind lightpipes, lens arrays, faceted optics, and diffusers. In this Short Course, these building blocks are discussed through a combination of compute simulations, hardware demonstrations and in depth discussions.

Benefits and Learning Objectives

This course should enable you to:

- Define the meaning of luminance, intensity, illuminance and Etendue.
- Compare the output characteristics of commonly used incoherent sources.

- Describe the principles for obtaining uniformity using mixing rods.
- Discuss the use of simulations to quantify the output of illumination systems.
- Compare different approaches used to obtain uniformity in lighting systems.

Intended Audience

Individuals who design illumination systems or need to interface with those designers will find this course appropriate. Previous exposure to optical fundamentals (reflection, refraction, lenses, reflectors) is expected.

Instructor Biography

William Cassarly is a driving force in the movement to develop the field of computer-aided illumination engineering. His efforts include illumination optimization, illumination engineering consulting, papers, talks and educational course development. Some highlights of his efforts include two SPIE illumination courses, submitting the winning solution for the 2006 IODC Illumination Design Problem, and authoring a chapter in the *OSA Handbook of Optics on Illumination Engineering*. In addition, William Cassarly is the inventor on 34 U.S. patents and 15 patents pending.

► **SC305 Solid-State Optical Materials for Advanced Photonic Applications,** *David S. Sumida; HRL Labs LLC, USA.*

Category
General Photonics

Benefits and Learning Objectives

This course should enable you to:

- Understand the physical basis of optical and thermo-mechanical crystalline properties.
- Develop familiarity with conventional nomenclature and units of doped and undoped crystalline media.
- Compare the properties of approximately 100 optical materials, both crystalline and polycrystalline.
- Assess the relative strengths and weaknesses of various solid-state laser crystals.
- Evaluate the impact of crystalline properties on solid-state laser and photonic devices.

Intended Audience

This course is tailored to help scientists, engineers, students and managers become more comfortable in making a design decision given the usual "real-world" conflict between what the intended photonics application calls for and what the material can actually do given its material properties. Hence, this course is intended to provide tools with which to evaluate the relative merits of particular crystals for specific laser and photonic applications.

Course Description

The selection of a solid-state optical material for a particular photonics application involves the consideration of its numerous properties. In this Short Course, the instructor focuses extensively on the physical, optical and thermo-mechanical properties of such materials for laser and other optical elements, including a very brief discussion regarding the spectroscopy and laser properties of dopant ions. The various intrinsic material properties (e.g., crystal structure, refractive index, dn/dT, thermal expansion, thermal conductivity, fracture toughness, etc.) of a wide range of crystalline materials are discussed, including their measurement and relevance to device operation. Existing data on oxide and fluoride crystals as well exciting data on polycrystalline optical ceramic media are presented to provide a comparison of the properties of available crystals. Important optical design issues (e.g., thermally induced distortions and thermal stress resistance) are evaluated in light of these properties. Finally, the class will discuss the impact of these properties on solid-state laser and other optical applications.

Biography

David S. Sumida of HRL Laboratories LLC in Malibu, Calif. has more than 22 years of professional experience in advanced solid-state lasers. He received his doctorate in physics at the Univ. of Southern California in 1984. He has managed several advanced solid-state laser research projects involving diode-pumped solid-state laser media, architectures and applications. He has authored more than 100 technical papers and presentations, including a book chapter on laser host crystals (CRC Press), and received 20 U.S. patents. He is a member of the Optical Society of America and has taught similar Short Courses on this topic for more than 10 years.

► **SC306 Exploring Optical Aberrations,** *Virendra Mahajan; Aerospace Corp., USA.*

Category
General Optical Design and Instrumentation

Course Level
Advanced beginner (basic understanding of topic is necessary to follow course material)

Course Description

The quality of an optical system is determined by its aberrations. This Short Course will explore the effect of aberrations on image quality. Starting with basic aberrations of optical systems, attendees will discuss how they affect central irradiance on a target, energy on a detector, and line of sight and resolution of a system. The importance of the use of Zernike polynomials in optical testing and design, spot diagrams in optical system analysis and Strehl ratio for aberration tolerance will be covered. The chromatic aberrations and the polychromatic PSF and OTF will be explained.

Benefits and Learning Objectives

This course should enable you to:

- Acquire a working knowledge of aberrations and their effect on energy on detector, line of sight error, and MTF.
- Determine aberration tolerance based on Strehl ratio and Rayleigh's quarter wave rule.
- Specify fabrication and assembly errors based on a certain aberration tolerance.
- Understand the significance and use of the Zernike polynomials in optical design and testing.
- Develop effective working interface between system engineers/engineering managers and optical designers.
- Communicate effectively with optical engineers and designers.

Intended Audience

Anyone interested in acquiring a working knowledge of aberrations. Those who have a background in lens and optical system design or optical testing will also benefit from this course. Managers and system engineers will learn to communicate effectively with optical engineers and designers.

Instructor Biography

Virendra (Vini) Mahajan is a graduate of the Optical Science Ctr., Univ. of Arizona, where he is an adjunct professor teaching courses on aberrations. He has 32 years of experience working on space optical systems, the last 23 with The Aerospace Corp. He is a Fellow of OSA, SPIE and the Optical Society of India. He is the author of *Aberration Theory Made Simple* (1991), the editor of *Selected Papers on Effects of Aberrations in Optical Imaging* (1993), and the author of *Optical Imaging and Aberrations, Part I: Ray Geometrical Optics* (1998), *Part II: Wave Diffraction Optics* (2001), all published by SPIE Press. He is also an Associate Editor of OSA's *Handbook of Optics* in the area of classical optics.

Attendees during a coffee break at FiO/LS 2006

Exhibit Information

Visit the Frontiers in Optics 2007 Exhibit and get a glimpse of the latest optical innovations! The FiO 2007 Exhibition will feature more than 70 companies representing a broad range of the best new products and applications in the optics and photonics industry. Don't miss this opportunity to learn about new products, find technical and business solutions, and gain the most up-to-date market perspective of your industry.

The exhibit will be open Tuesday, September 18 and Wednesday, September 19 in the Imperial Ballroom of the Fairmont Hotel. Dedicated exhibit-only time is scheduled on Tuesday, September 18 from 12:30 p.m. to 2:00 p.m.

NOTE: There is no charge to attend the exhibit!

Exhibit Hours

Tuesday, September 18	10:00 a.m.–5:00 p.m.
Exhibit-Only Time	12:30 p.m.–2:00 p.m.
Wednesday, September 19	10:00 a.m.–4:00 p.m.

FiO 2007 Exhibitors Include
(as of August 15, 2007):

4D Technology Corp.

American Physical Society

Breault Research Organization

Cambridge University Press

Chroma Technology Corp.

Coherent Inc.

CVI Melles Griot

Del Mar Photonics

Femtolasers, Inc.

Hamamatsu Corp.

IOP Publishing Ltd.

The Institute of Optics, University of Rochester

Laser Focus World

Materials Research Society

Micro Laser Systems Inc.

Nature Publishing Group

New Focus, a Division of Bookham

Newport Corp.

Novawave Technologies

OFS-Specialty Photonics Division

OP-TEC

Optics & Photonics News

Optikos Corp.

OptoSigma Corp.

Optical Society of America

Photonics Spectra

Physics Today

Polymicro Technologies LLC

Santec USA Corp.

Society of Vacuum Coaters

Stanford Photonics Research Center (SPRC)

Swamp Optics, LLC

Taylor & Francis

TeachSpin, Inc.

Thorlabs

Universal Photonics, Inc.

University of Arizona, College of Optical Sciences

University of Central Florida

Wiley-Blackwell

Zygo Corp.

Student Information

Student Activities

Frontiers in Optics 2007 includes a wide range of events and educational sessions especially designed for student attendees. These programs provide great opportunities to learn and network with peers from around the world.

OSA Student Chapter Leadership Meeting

Sunday, September 16, 8:00 a.m.–5:00 p.m.
Stanford University, Room AP 200

OSA Student Chapter leaders gather for this invitation-only meeting to hear guest speakers, network and have fun! 2007 meeting topics will include leadership training, building management skills and community-based education outreach programs.

Going for the Goal! Workshop

(sponsored by the OSA Foundation)

Monday, September 17, 1:00 p.m.–3:00 p.m.
Sainte Claire Hotel, Ballroom

This session is ideal for students that are charting their professional course. Guest speaker Mitzi Weinman, President of TimeFinder, will discuss strategies for defining and achieving career goals. This session is free of charge and open to all student attendees.

OSA Student Member Welcome Reception

Monday, September 17, 7:30 p.m.–9:30 p.m.
Smoke Tiki Lounge
152 Post St., Tel.: 408.292.4266

OSA Student Members are invited to attend this social event that provides a perfect opportunity to meet new friends and have a good time! The reception is free of charge for OSA student members.

Student Grants

The OSA Foundation (OSAF)

The OSAF provides financial and programming support for students attending Frontiers in Optics. This year's sponsorships include:

- Travel grants for students from developing countries
- OSA Student Chapter Leadership events

You can help to inspire and support the next generations of science and engineering innovators by making a donation. OSA's national organization matches every dollar that is donated—so your gift will have twice the impact. To learn more and to make a donation online, visit the OSA Foundation website at *http://www.osa-foundation.org*.

Incubic/Milton Chang Travel Award

Funded by an endowment from Milton and Rosalind Chang, this program provides 10 awards of up to US$1,000 each to enable students who present papers to travel to CLEO and the Frontiers in Optics/OSA Annual Meeting. Funds are awarded to the presenter and usually the first author of the paper.

Symposium on Undergraduate Research

See Page 13 for more information.

FiO Best Student Paper Awards

Two awards will be selected from each of the seven technical divisions of the OSA. Selections will be made based on the quality of the submitted technical summary and presentation. Winners will be announced at the end of the conference and in the next issue of *Optics & Photonics News*.

General Information

Registration

Fairmont Hotel, Market Street Foyer

Registration will be open during the following hours:

Sunday, September 16	7:00 a.m.–6:00 p.m.
Monday, September 17	7:00 a.m.–6:00 p.m.
Tuesday, September 18	7:00 a.m.–6:00 p.m.
Wednesday, September 19	7:30 a.m.–4:00 p.m.
Thursday, September 20	7:30 a.m.–4:00 p.m.

Speaker Preparation Room

Fairmont Hotel, Plaza Room

Speakers are encouraged to stop by the Speaker Prep Room to test their computer and presentations prior to their session. The room will be equipped with LCD projectors and screens.

Hours of Operation

Monday, September 17	12:00 p.m.–5:00 p.m.
Tuesday, September 18	7:00 a.m.–5:00 p.m.
Wednesday, September 19	7:00 a.m.–5:00 p.m.
Thursday, September 20	7:00 a.m.–5:00 p.m.

Business Center

Fairmont Hotel, B Level

The Fairmont Business Center offers one-stop shopping for all business needs, including email and high-speed Internet access, secretarial/transcription services, photocopying and faxing. Open Monday–Friday, 7:00 a.m.–7:00 p.m. and Saturday, 9:00 a.m.–1:00 p.m.

Lost and Found

For Lost and Found please check at the registration counter in the Imperial Ballroom Foyer of the Fairmont Hotel. 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.

Technical Program Overview

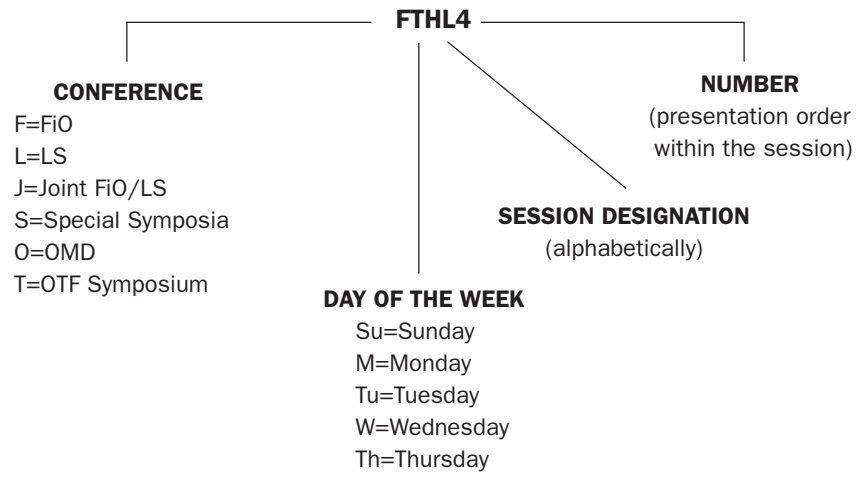
FiO, LS and OMD have more than 800 papers scheduled for presentation, including symposia. There will be two joint plenary speakers and one award lecture.

FiO has 175 invited presentations, 12 tutorials and 440 contributed papers, of which 95 will be presented in the poster sessions. FiO postdeadline papers will be presented in an oral session on Wednesday, September 19; time and location will be announced at the conference. FiO/LS has eight half-day Short Courses scheduled.

LS has 91 invited presentations, one tutorial and 56 contributed papers, of which nine will be presented in the poster session.

OMD has two plenary presentations, 18 invited presentations and 15 contributed papers.

EXPLANATION OF SESSION CODES



The first part of the code designates the conference (F=FiO, L=LS, J=Joint, S=Special Symposium, O=OMD, T=OTF Symposium).

The next part designates the day of the week (Su=Sunday, M=Monday, Tu=Tuesday, W=Wednesday, Th=Thursday).

The next part indicates the session within the particular day the talk is being given. Each day begins with the letter A and continues alphabetically.

The number on the end of the code signals the position of the talk within the session (first, second, third, etc.).

For example, a presentation numbered FThL4 indicates that this FiO paper is being presented on Thursday during the 12th session (L) and that it is the fourth paper presented in session FThL.