CLEO/QELS 2007

Technical Conference: 6-11 May 2007

Baltimore Convention Center, Baltimore, MD, USA

CLEO/QELS and *PhAST* continue to be the preeminent events for those in the lasers and electro-optics community. Combining more than 1,800 presentations with 325 exhibitors from around the world for the 2007 event, the conferences brought together the leading minds from science and business and introduced important new research developments and corporate achievements.

A record-breaking year for paper submissions, the content presented at the show unveiled some of the most innovative advancements in fundamental science - from taking real-time remote THz imaging to the 25m mark to creating the shortest attosecond pulse to date. Exhibitors showcased technological breakthroughs, including Thorlabs' *PhAST/Laser Focus World* Innovation Award Winner, the Adaptive Optical Scanning Microscope (ASOM). 5,200 scientists, educators, students and business leaders came to this year's event to keep on the pulse of the field's important corporate and research developments.

The milestones reported at CLEO/QELS and *PhAST* 2007 reverberated through the industry and are certain to provide foundations for exciting future technologies. We look forward to seeing what next year holds at the 2008 event in San Jose, CA, May 4-9.

Conference Program

CLEO/QELS Abstracts

CLEO/QELS Committees

CLEO Technical Program Committee

General Chairs
Dan Botez, *Univ. of Wisconsin at Madison, USA*
Tom Carruthers, *NSF, USA*

Program Chairs
Franz Kaertner, *MIT, USA*
Jerry Meyer, *NRL, USA*

CLEO Subcommittees

CLEO 1: Laser Processing and Optical Instrumentation
Donald Harter, *IMRA America Inc., USA,* Chair
Detao Du, *General Atomics, USA*
Marc Nantel, *Photonics Res. Ontario, Canada*
Andreas Ostendorf, *Forschungszentrum Rossendorf Inst. fur Angewandte Physik, Germany*
Narasimha Prasad, *NASA Langley Res. Ctr., USA*
Chris Schaffer, *Cornell Univ., USA*
Koji Sugioka, *RIKEN, Japan*
Yunlong Sun, *Electro-Scientific Industries USA, USA*
Andreas Tünnermann, *Fraunhofer Inst. Optik Feinmechanik, Germany*

CLEO 2: Solid-State Lasers
Timothy Carrig, *Lockheed Martin Coherent Technologies, Inc., USA,* Chair
Norman Barnes, *NASA Langley, USA*
Jean-Christophe Chanteloup, *Ctr. Natl. de la Recherché Scientifique, Ecole, France*
Mark Dubinskiy, *ARL, USA*
Carsten Fallnich, *Physikalisch Technische Bundesanstalt, Germany*
Hagop Injeyan, *Northrop Grumman Corp.,USA*
Hajime Nishioka, *Univ. of Electro-Communications, Japan*
Martin Ostermeyer, *Univ. Potsdam, Germany*
Daniel Ripin, *MIT, USA*

CLEO 3: Semiconductor Lasers
Claire Gmachl, *Princeton Univ., USA,* Chair
Ann Bryce, *Univ. of Glasgow, UK*
Weng Chow, *Sandia Natl. Labs, USA*
James Coleman, *Univ. of Illinois at Urbana-Champaign, USA*
Richard Jones, *Intel Corp., USA*
Fumio Koyama, *Tokyo Inst. of Technology, Japan*
Jesper Mörk, *Danmarks Tekniske Univ., Denmark*
Cun-Zheng Ning, *NASA Ames Res. Ctr., USA*
Susumu Noda, *Kyoto Univ., Japan*
Adrienne Stiff-Roberts, *Duke Univ., USA*

George Turner, *MIT Lincoln Lab, USA*
Igor Vurgaftman, *NRL, USA*

CLEO 4: Applications of Nonlinear Optics
Robert Fisher, *R. A. Fisher Associates, USA,* Chair
William Bischel, *Gemfire Corp., USA*
Michael Damzen, *Imperial College, UK*
Jean-Claude Diels, *Univ. of New Mexico, USA*
Yujie Ding, *Lehigh Univ., USA*
Majid Ebrahim-Zadeh, *Inst. de Ciencies Fotoniques, Spain*
Vladimir Shkunov, *Raytheon Co., USA*
Ramesh Shori, *Univ. of California at Los Angeles, USA*
George Stegeman, *Univ. of Central Florida, USA*
Grover Swartzlander, *Univ. of Arizona, USA*
Takunori Taira, *Inst. for Molecular Science, Japan*
George Wong, *Hong Kong Univ. of Science & Technology, Hong Kong*
Vladislav Yakovlev, *Univ. of Wisconsin at Milwaukee, USA*
Jean-Jacques Zondy, *Observatoire de Paris, France*

CLEO 5: Terahertz Technologies and Applications
Daniel Mittleman, *Rice Univ., USA,* Chair
Richard Averitt, *Los Alamos Natl. Lab, USA*
David Citrin, G*eorgia Tech, USA*
Martin Koch, *T ech Univ. Carolo Wilhemina Braunschweig, Germany*
Edmund Linfield, *Univ. of Leeds, UK*
Oleg Mitrofanov, *Bell Labs, Lucent Technologies, USA*
Eric Mueller, *Coherent Inc., USA*
Masayoshi Tonouchi, *Osaka Univ., Japan*
Alessandro Tredicucci, *NEST-INFM, Italy*

CLEO 6: Optical Materials, Fabrication & Characterization
Mihaela Dinu, *Lucent Technologies Inc., USA,* Chair
William Brocklesby, *Univ. of Southampton, UK*
Venkatraman Gopalan, *Pennsylvania State Univ., USA*
James Randolph Heflin, *Virginia Polytechnic Inst. and State Univ., USA*
Warren Herman, *Univ. of Maryland at College Park, USA*
Sunao Kurimura, *Natl. Inst. for Materials Science, Japan*
David Nolte, *Purdue Univ., USA*
John Prineas, *Univ. of Iowa, USA*
Nelson Tansu, *Lehigh Univ., USA*

CLEO/QELS 7: High-Field Physics and High-Intensity Lasers
Michael Downer, *Univ. of Texas at Austin, USA,* Chair
Gerhard Paulus, *Texas A&M Univ.,* Chair
Jan Chaloupka, *College of William & Mary, USA*
Zenghu Chang, *Kansas State Univ., USA*

Chunlei Guo, *Univ. of Rochester, USA*
Ting Guo, *Univ. of California at San Diego, USA*
Misha Ivanov, *NRC Steacie Inst. for Molecular Sciences, Canada*
Henry Kapteyn, *Univ. of Colorado at Boulder, USA*
Karl Krushelnick, *Univ. of London, UK*
Chang Hee Nam, *Korea Advanced Inst. of Science & Tech., South Korea*
David Reis, *Univ. of Michigan, USA*
Craig Siders, *Lawrence Livermore Natl. Lab, USA*
Christian Spielmann, *Bayeris Julius-Maximilians Univ. Würzburg, Germany*
Antonio Ting, *NRL, USA*
Bernd Witzel, *Univ. Laval, Canada*

CLEO 8: Ultrafast Optics, Optoelectronics & Applications
Randy Bartels, *Colorado State Univ., USA,* Chair
Kazi Abedin, *Natl. Inst of Information & Comm. Tech., Japan*
Andrius Baltuska, *Max-Planck-Inst. für Quantenoptik, Germany*
Fiorenzo Omenetto, *Los Alamos Natl. Lab, USA*
Alphan Sennaroglu, *Koc Univ., Turkey*
Lawrence Shah, *IMRA America Inc., USA*
Jeffrey Squier, *Colorado School of Mines, USA*
Brent Stuart, *Lawrence Livermore Natl. Lab, USA*
John Tisch, *Imperial College, UK*
Kenji Torizuka, *Natl. Inst. of Adv. Industrial Science & Tech., Japan*
Paolo Villoresi, *Univ. degli Studi di Padova, Italy*
Andrew Weiner, *Purdue Univ., USA*
Zhigang Zhang, *Peking Univ., China*

CLEO 9: Components, Interconnects & Signal Processing
Paul Juodawlkis, *MIT, USA,* Chair
Daniel Dolfi, *Thales Res. & Technology, France*
John Fini, *OFS Labs, USA*
David Hutchings, *Univ. of Glasgow, UK*
Michael Krainak, *NASA Goddard Space Flight Ctr., USA*
Ming-Chang Lee, *Natl. Tsing Hua Univ., Taiwan*
Patrick Likamwa, *Univ. of Central Florida, CREOL, USA*
Christi Madsen, *Texas A&M Univ., USA*
Shayan Mookherjea, *Univ. of California at San Diego, USA*
Geert Morthier, *Univ. Gent, Belgium*
Makoto Naruse, *Natl. Inst. of Information and Communications Technology, Japan*

CLEO 10: Medical and Biological Applications
Adam Wax, *Duke Univ., USA,* Chair
Vadim Backman, *Northwestern Univ., USA*
Irene Georgakoudi, *Tufts Univ., USA*
Christoph Hitzenberger, *Medizinische Univ. Wien, Austria*
Xingde Li, *Univ. of Washington, USA*

Andrew Rollins, *Case Western Reserve Univ., USA*
James Tunnell, *Univ. of Texas at Austin, USA*
Changhuei Yang, *Caltech, USA*

CLEO 11: Fiber and Guided-Wave Amplifiers, Lasers & Devices
Karl Koch, *Corning Inc., USA*, Chair
Ingmar Hartl, *IMRA America Inc., USA*
John Harvey, *Univ. of Auckland, New Zealand*
Jesper Laegsgaard, *DTU Technical Knowledge Ctr., Denmark*
Jens Limpert, *Forschungszentrum Rossendorf, Germany*
Colin McKinstrie, *Lucent Technologies Inc., USA*
Shu Namiki, *AIST Central Library, Japan*
Jeffrey Nicholson, *OFS Labs, USA*
Jay Sharping, *Cornell Univ., USA*
Jean Toulouse, *Lehigh Univ., USA*

CLEO 12: Lightwave Communications and Networks
Peter Winzer, *Bell Labs, Lucent Technologies, USA*, Chair
Ivan Andonovic, *Univ. of Strathclyde, UK*
Pak Cho, *CeLight, Inc., USA*
Scott Hamilton, *MIT Lincoln Lab, USA*
Igor Khrushchev, *Aston Univ., UK*
Klaus Kudielka, *Contraves Space Communications, Switzerland*
Dan Marom, *Hebrew Univ. of Jerusalem, Israel*
David Moss, *Univ. of Sydney, Australia*
Ronald Phillips, *Florida Space Inst., USA*
Michael Vasilyev, *Univ. of Texas at Arlington, USA*
Ping Kong Wai, *Hong Kong Polytechnic Univ., Hong Kong*

CLEO 13: Active Optical Sensing
James Gord, *US Air Force, USA*, Chair
Mark Froggatt, *Luna Technologies, Inc., USA*
Clemens Kaminski, *Cambridge Univ., UK*
Houston Miller, *George Washington Univ., USA*
David Nelson, *Aerodyne Res. Inc., USA*
Barbara Paldus, *Skymoon R&D, USA*
Sukesh Roy, *Innovative Scientific Solutions, Inc., USA*

CLEO 14: Optical Metrology
Jun Ye, *Univ. of Colorado at Boulder/JILA, USA*, Chair
Patrick Gill, *Natl. Physical Lab, UK*
William Klipstein, *Caltech, USA*
Brian Kolner, *Univ. of California at Davis, USA*
Long-Sheng Ma, *Bureau Intl. des Poids et Mesures, France*
Alan Madej, *Natl. Res. Council Canada, Canada*
Kaoru Minoshima, *AIST, Japan*

Harald Schnatz, *Physikalisch Technische Bundesanstalt, Germany*
Thomas Udem, *Max-Planck-Inst. für Quantenoptik, Germany*
James Wyant, *Univ. of Arizona, USA*

CLEO 15: LEDs, Organic LEDs & Solid-State Lighting
Marek A. Osinski, *Univ. of New Mexico, USA*, Chair
Mary Crawford, *Sandia Natl. Labs, USA*
Volker Haerle, *Osram Opto Semiconductors GmbH, Germany*
Shinichiro Haruyama, *Keio Univ., Japan*
Zakya Kafafi, *NRL, USA*
Masayoshi Koike, *Samsung, South Korea*
Franky So, *Univ. of Florida, USA*
Tsunemasa Taguchi, *Yamaguchi Univ., Japan*
Christian Wetzel, *Rensselaer Polytechnic Inst., USA*
Michael Wraback, *ARL, USA*

CLEO 16: Micro- & Nano-Photonics
Michal Lipson, *Cornell Univ., USA*, Chair
Keren Bergman, *Columbia Univ., USA*
Bahram Jalali, *Univ. of California at Los Angeles, USA*
Thomas Koch, *Lehigh Univ., USA*
Leslie Kolodziejski, *MIT, USA*
Dennis Prather, *Univ. of Delaware, USA*
Marco Romagnoli, *Pirelli Cavi e Sistemi SpA, Italy*
Armand Rosenberg, *NRL, USA*
Steven Spector, *MIT Lincoln Lab, USA*

QELS Technical Program Committee

General Chairs
Alexander Gaeta, *Cornell Univ., USA*
Min Xiao, *Univ. of Arkansas, USA*

Program Chairs
Paul Lett, *NIST, USA*
Mordechai Segev, *Technion Israel Inst. of Technology, Israel*

QELS Subcommittees

QELS 1: Quantum Optics and Quantum Atom Optics
Phillip Gould, *Univ. of Connecticut, USA*, Chair
Ennio Arimondo, *Univ. degli Studi Pisa, Italy*
Nicholas Bigelow, *Univ. of Rochester, USA*
Alex Cronin, *Univ. of Arizona, USA*

Luis Orozco, *Univ. of Maryland at College Park, USA*
Vladan Vuletic, *MIT, USA*

QELS 2: Quantum Optics
Perry Rice, *Miami Univ., USA,* Chair
Julio Gea-Banacloche, *Univ. of Arkansas, USA*
John Howell, *Univ. of Rochester, USA*
Barry Sanders, *Univ. of Calgary, Canada*
Daniel Steck, *Univ. of Oregon, USA*
Aephraim Steinberg, *Univ. of Toronto, Canada*
Lorenza Viola, *Dartmouth College, USA*

QELS 3: Fundamental Optics in Periodic and Random Media
Evgenii Narimanov, *PrInceton Univ., USA,* Chair
Vasily Astratov, *Univ. of North Carolina at Charlotte, USA*
Nader Engheta, *Univ. of Pennsylvania, USA*
Won Park, *Univ. of Colorado, USA* Stephen
Rand, *Univ. of Michigan, USA* Nikolay
Zheludev, *Univ. of Southampton, UK*

QELS 4: Ultrafast Dynamics
Sarah Bolton, *Williams College, USA,* Chair
Shun-Lien Chuang, *Univ. of Illinois at Urbana-Champaign, USA*
Susan Dexheimer, *Washington State Univ., USA*
Ilias Perakis, *Univ. of Crete, Greece*
Carlo Piermarocchi, *Michigan State Univ., USA*
Robert Schoenlein, *Lawrence Berkeley Natl. Lab, USA*
Uwe Siegner, *Physikalisch Technische Bundesanstalt, Germany*

QELS 5: Nonlinear Optics and Novel Phenomena
Jacob Khurgin, *Johns Hopkins Univ., USA,* Chair
Gaetano Assanto, *Univ. degli Studi Roma Tre, Italy*
Chi-Hsiang Lee, *Univ. of Maryland at College Park, USA*
Fedor Mitschke, *Univ. Rostock, Germany*
Alexei Sokolov, *Texas A&M Univ., USA*
Marin Soljacic, *MIT, USA*
Stefan Wabnitz, *Univ. de Bourgogne, France*
Ewan Wright, *Univ. of Arizona, USA*

QELS 6: Nano-Optics
Vladimir Shalaev, *Purdue Univ., USA,* Chair
Sergey Bozhevolnyi, *Dept. of Physics and Nanotechnology, Aalborg Univ., Denmark*
Mark Brongersma, *Stanford Univ., USA*
Hui Cao, *Northwestern Univ., USA*
Yoel Fink, *MIT, USA*
Ildar Gabitov, *Univ. of Arizona, USA*

Mikhail Noginov, *Norfolk State Univ., USA*
Igor Smolyaninov, *Univ. of Maryland at College Park, USA*
Xiang Zhang, *Univ. of California at Berkeley, USA*

CLEO/QELS Steering Committee

Optical Society of America
Peter F. Moulton, *Q-Peak, Inc., USA*, Chair
Martin M. Fejer, *Stanford Univ., USA*
Gregory J. Quarles, *VLOC, Subsidiary of II-VI Inc., USA*

IEEE/Lasers and Electro-Optics Society
Concetto R. Giuliano, *AFRL, USA*
Richard A. Linke, *Aluben Res. and OSA, USA*
Daniel M. Mittleman, *Rice Univ., USA*
Steven A. Newton, *Agilent Technologies, USA*

APS/Division of Laser Science
Wendell T. Hill, *Univ. of Maryland at College Park, USA*
Michael Raymer, *Univ. of Oregon, USA*

Exhibitor Representatives
Amy Eskilson, Thorlabs, USA
Jeff Nichols, *Photonics.com/The Photonics Directory, USA*

Ex-Officio
Dan Botez, *Univ. of Wisconsin at Madison, USA*
Thomas Carruthers, *NRL, USA*
Steven T. Cundiff, *NIST, USA*
Peter J. Delfyett, *Univ. of Central Florida, USA*
Alexander Gaeta, *Cornell Univ., USA*
Claire Gmachl, *Princeton Univ., USA*
Franz X. Kaertner, *MIT, USA*
Prem Kumar, *Northwestern Univ., USA*
James R. Leger, *Univ. of Minnesota, USA*
Paul Lett, *NIST, USA*
Jerry Meyer, *NRL, USA*
Mordechai Segev, *Techion-Israel Inst. of Technology, Israel*
Markus Pollnau, *Univ. of Twente, The Netherlands*
Aephraim M. Steinberg, *Univ. of Toronto, Canada*
Konstantin L. Vodopyanov, *Stanford Univ., USA*
Hailin Wang, *Univ. of Oregon, USA*
Min Xiao, *Univ. of Arkansas, USA*
John J. Zayhowski, *MIT, USA*

Joint Council of Quantum Electronics

IEEE/Lasers and Electro-Optics Society
Daniel M. Mittleman, *Rice Univ., USA*, Chair
Selim M. Unlu, *Boston Univ., USA*

APS/Division of Laser Science
Robert Boyd, *Univ. of Rochester, USA*
Wendell T. Hill, *Univ. of Maryland at College Park, USA*
Henry Kapteyn, *Univ. of Colorado at Boulder, USA*

Optical Society of America
Louis F. DiMauro, *Brookhaven Natl. Lab, USA*
Luis Orozco, *Univ. of Maryland at College Park, USA*

CLEO Long Range Planning Committee

Peter J. Delfyett, *Univ. of Central Florida , USA*, Chair
Philip J. Anthony, *Storm Ventures Inc., USA*
Alex Cable, *Thorlabs, USA*
Corey Dunsky, *Coherent Inc., USA*
James G. Fujimoto, *MIT, USA*
Brent Gross, *Cleveland Crystals, Inc., USA*
Henry Kapteyn, *Univ. of Colorado at Boulder, USA*
Thomas McIlrath, *APS, USA*
Elizabeth A. Rogan, *OSA, USA*
Paul Shumate, *IEEE/LEOS, USA*

Exhibitor Advisory Committee

Richard Bailey, *UltraVolt, Inc., USA*
Steve Benda, *Continuum, USA*
Alain Bourdon, *Toptica Photonics, Inc., USA*
Amy Eskilson, *Thorlabs, Inc., USA*
Warren Gutheil, *TecOptics, USA*
Wilhelm Kaenders, *Toptica Photonics, Inc., USA*
Steve McDonald, *Coherent Laser Group, USA*
Sherie Motakef, *Melles Griot, USA*
Jeff Nichols, *Photonics.com/The Photonics Directory, USA*
Fred Perry, *Boston Electronics Corporation, USA*

Rick Plympton, *Optimax Systems, Inc., USA*
Joachim Sacher, *Sacher Lasertechnik GmbH, Germany*
Jeff Smith, *Nuvonyx, USA*
Randall Wilcox, *Lightspeed Technologies, USA*
Donald Wilson, *OFR, Inc., USA*

Invited Speakers

CLEO Invited Speakers

CLEO 01: Laser Processing and Optical Instrumentation

Micro and Nanostereolithography for Production of Lab-on-a-Chip Devices, *Shoji Maruo; Yokohama Natl. Univ., Japan*
Subcellular Surgery and Nanosurgery, *Eric Mazur; Harvard Univ., USA*
Microfluidic Bead Array Device Using Laser-Machined Surface Microstructures on Silica Glass, *Tadatake Sato; Natl. Inst. of Advanced Industrial Science and Technology (AIST), Japan*
Femtosecond Laser Nanomachining Applications in Fused Silica, *Rod S. Taylor; Natl. Res. Council, Canada*

CLEO 02: Solid-State Lasers

Synthesis and Performance of Advanced Ceramic Lasers, *Akio Ikesue; World Lab Co., Ltd., Japan*
Progress on the Development of High-Power Solid-State Lasers for Directed Energy Applications, *Mark Niece; HEL-JTO, USA*
Solid-State Laser Development Activities in China, *Jianqiang Zhu; Shanghai Inst. of Optics, China*

CLEO 03: Semiconductor Lasers

GaSb QW on Silicon VCSELs, *Diana Huffaker; Ctr. for High Technology Materials, USA*
Electrically Pumped Photonic Crystal Lasers, *Yong Hee Lee; KAIST, Republic of Korea*
Infrared Lasers Using Colloidal Quantum Dots, *Edward Sargent; Univ. of Toronto, Canada*
Interband Cascade Lasers, *Rui Q. Yang; JPL, USA*

CLEO 04: Applications of Nonlinear Optics

Energy Harvesting in Silicon Amplifiers, Lasers and Wavelength Converters, *Bahram Jalali; Univ. of California at Los Angeles, USA*
Nano- and Microdomain Engineering in KTP and Its Application, *Fredrik Laurell; Royal Inst. of Technology, Sweden*

Advances in Mid-IR Materials, *Peter G. Schunemann; BAE Systems, USA*
New Nonlinear Electronic and Vibrational Spectroscopy to Study Liquid Interfaces, *Tahei Tahara; RIKEN, Japan*
New Light from Gallium Arsenide: Micro-Structured GaAs for Mid-IR and THz-Wave Generation, *Konstantin Vodopyanov; Stanford Univ., USA*

CLEO 05: Terahertz Technologies and Applications

Terahertz Time-Domain Spectroscopy of Crystalline and Aqueous Systems, *Peter Uhd Jepsen; Technical Univ. of Denmark, Denmark*

TBA, *Hartmut Roskos; Johann Wolfgang Goethe Univ., Germany*
Terahertz Quantum Cascade Lasers: High-Power and High-Temperature Operation, *Benjamin Williams; MIT, USA*

CLEO 06: Optical Materials, Fabrication & Characterization

Nanofabricated Negative Permeability Media, *Alex Grigorenko; Univ. of Manchester, UK*
Ferroelectric Photonic Structures: Characterization and Device Demonstration, *A. H. Kung; Inst. of Atomic and Molecular Sciences, Taiwan*
Integrated Semiconductor Chips for EIT, *Holger Schmidt; Univ. of California at Santa Cruz, USA*
Biomimetic Optical Polymers, *James Shirk; NRL, USA*
Directly Pumped Silicon Lasing, *Jimmy Xu; Brown Univ., USA*

CLEO/QELS 07: CLEO/QELS Joint Subcommittee on High-Field Physics and High-Intensity Lasers

Probing Proton Dynamics in Molecules on an Attosecond Time Scale, *Sarah Baker; Imperial College, UK*
Laboratory Simulations of Astrophysical Blastwaves Using Intense Laser Interactions, *Todd Ditmire; Univ. of Texas at Austin, USA*
Attosecond Nonlinear Optics, *Katsumi Midorikawa; RIKEN, Japan*
High Field Physics with XUV Light Pulses from a Free Electron Laser, *Hubertus Wabnitz; Saclay, France*

CLEO 08: Ultrafast Optics, Optoelectronics & Applications

Ultrafast Imaging of Wakefields, *Michael Downer; Univ. of Texas at Austin, USA*
Generation of Terawatt Sub-10 fs Laser Pulses Using Optical Parametric Chirped Pulse Amplification, *Kjeld S. Eikema; Laser Ctr. Vrije Univ., FEW, Netherlands*
Actively Mode-Locked Optical Parametric Oscillator, *Nicolas Forget; Lab pour l'Utilisation des Lasers Intenses, France*
Complete Temporal Reconstruction of Attosecond Harmonic Pulses, *Chang Hee Nam; KAIST, Republic of Korea*

High Resolution Spectroscopy with Femtosecond Optical Combs, *Jason Stalnaker; NIST, USA*

CLEO 09: Components, Interconnects & Signal Processing

Geiger-Mode Avalanche Photodiodes for Near-Infrared Photon Counting, *Mark Itzler; Princeton Lightwave, USA*
InP Waveguide Optical Isolator for Photonic Integrated Circuits, *Yoshiaki Nakano; RCAST, Univ. of Tokyo, Japan*
Advances in Monolithic Integration of InP-Based Optoelectronics, *David Robbins; Bookham Technology, UK*
Artificial Compound-Eye Camera and Its Application to Visual Information Processing, *Jun Tanida; Osaka Univ., Japan*

CLEO 10: Medical and Biological Applications

The Guiding Light: Holographic Manipulation of Mesoscopic Systems, *David G. Grier; New York Univ., USA*
Advances in Optical Coherence Tomography: Frequency Domain Technologies and Applications, *Seok-Hyun (Andy) Yun; Harvard Medical School and Massachusetts General Hospital, USA*

CLEO 11: Fiber and Guided-Wave Amplifiers, Lasers & Devices

Pulse Compression Techniques Using Highly Nonlinear Fibers, *Takashi Inoue; Furukawa Electric Co., Ltd., Japan*
Fiber Laser Frequency Combs, *Nathan R. Newbury; NIST, USA*
Ultra-Large Modal Area Fibers for High-Power Lasers and Amplifiers, *Siddharth Ramachandran; OFS Labs, USA*
Quantum Optics in Microstructured Waveguides, *John G. Rarity; Univ. of Bristol, UK*
Fiber-Based All-Optical Sampling, *Mathias Westlund; Chalmers Univ. of Technology, Dept. of Microelectronics, Photonic Lab, Sweden*

CLEO 12: Lightwave Communications and Networks

Ultra-Long Distance Free Space Laser Communications, *David Caplan; MIT Lincoln Lab, USA*
Advanced Modulation Formats and Digital Signal Processing in Optical Communications, *Joseph Kahn; Stanford Univ., USA*
Advanced $LiNbO_3$ Modulation, *Tetsuya Kawanishi; Natl. Inst. of Information and Communications Technology, Japan*
Parametric Amplification, *Stojan Radic; Univ. of California at San Diego, USA*

CLEO 13: Active Optical Sensing

Recent Advances in Cavity Ring-Down Spectroscopy, *Kevin Lehmann; Univ. of Virginia, USA*
RADAR REMPI: A New Approach to Detection, Spectroscopy, and the Dynamics of Gases for Combustion, Fluid Dynamics and Homeland Defense, *Richard Miles; Princeton Univ., USA*

CLEO 14: Optical Metrology

Accurate Optical Clocks Based on Single Trapped Ion, *Jim Bergquist; NIST, USA*
GEO600, *Karsten Danzmann; Max-Planck-Inst., Germany*
Precision Measurement of Rydberg State Wave-Packet Dynamics, *Robert Jones; Univ. of Virginia, USA*
Quantum Metrology (Including both Ions and Atoms), *Fritz Riehle; PTB, Germany*

CLEO 15: LEDs, Organic LEDs & Solid-State Lighting

OLED Displays Based on Phosphorescent Chromophores, *Vadim Adamovich; Universal Display Corp., USA*
100 Years of LEDs, *George Craford; Lumileds, USA*
Visible Light Communications, *Masao Nakagawa; Keio Univ., Japan*
Organic Lasers, *Ifor Samuel; Univ. of St. Andrews, UK*

CLEO 16: Micro- & Nano-Photonics

III-V/Silicon Integrated Photonics, *John Bowers; Univ. of California at Santa Barbara, USA*
Metamaterial Nanophotonics, *Nader Engheta; Univ. of Pennsylvania, USA*
High-Q Photonic Crystal Cavities, *Susumu Noda; Kyoto Univ., Japan*

QELS Invited Speakers

QELS 01: Quantum Optics and Quantum Atom Optics

TBA, *Alexander Kuzmich; Georgia Tech, USA*
TBA, *Jun Ye; JILA, Univ. of Colorado & NIST, USA*

QELS 02: Quantum Information

Tolerable Noise in Scalable Quantum Computing, *Manny Knill; NIST/Univ. of Colorado at Boulder, USA*
Entanglement in Atomic Ensembles, *Eugene Polzik; Kobenhavns Univ., Denmark*

QELS 03: Fundamentals of Metamaterials, Periodic & Random Media

TBA, *Claudio Andreani; Univ. degli Studi di Pavia, Italy*
TBA, *Graeme W. Milton; Univ. of Utah, USA*

QELS 04: Ultrafast Dynamics

Adaptive Control in Ultrafast Nano-Optics, *Tobias Brixner; Univ. Würzburg, Germany*
TBA, *Alexey Kimel; Radboud Univ. Nijmegen, Netherlands*

QELS 05: Nonlinear Optics and Novel Phenomena

Quantum Limit in Nonlinear Optics, *Gerd Leuchs; Inst. fur Optik, Information und Photonik, Germany*
Synchronization and Chaos, *Rajarshi Roy; Univ. of Maryland, USA*
Laser Cooling in Solids, *Mansoor Sheik-Bahae; Univ. of New Mexico, USA*

QELS 06: Nano-Optics and Plasmonics

TBA, *Alexandra Boltasseva; COM, Denmark* **TBA,**
Nabil Lawandy; Solaris Nanosciences, USA **TBA,**
Anatoly V. Zayats; Queen's Univ. of Belfast, UK

CLEO/QELS 07: CLEO/QELS Joint Subcommittee on High-Field Physics and High-Intensity Lasers

Probing Proton Dynamics in Molecules on an Attosecond Time Scale, *Sarah Baker; Imperial College, UK*
Laboratory Simulations of Astrophysical Blastwaves Using Intense Laser Interactions, *Todd Ditmire; Univ. of Texas at Austin, USA*
Attosecond Nonlinear Optics, *Katsumi Midorikawa; RIKEN, Japan*
High Field Physics with XUV Light Pulses from a Free Electron Laser, *Hubertus Wabnitz; Saclay, France*

Tutorials

CLEO 01: Laser Processing and Optical Instrumentation

Ultrafast Micro and Nanomachining, *Gerard Mourou; Ecole Polytechnique de Paris, France*

CLEO 02: Solid-State Lasers

Rod-Slab-Disc-Fiber, Design and Performance Comparison of High Power Laser Architectures, *Dieter Hoffmann; Fraunhofer Inst. Lasertechnik ILT, Germany*

CLEO 03: Semiconductor Lasers

Mode-Locked Quantum Dot Lasers, *Ian White; Univ. of Cambridge, UK*

CLEO 04: Applications of Nonlinear Optics

Ultrafast X-Ray Studies, *Roger Falcone; Univ. of California at Berkeley, USA*

CLEO 05: Terahertz Technologies and Applications

Terahertz Technology in Outer *and Inner* Space, *Peter Siegel; NASA JPL, USA*

CLEO 06: Optical Materials, Fabrication & Characterization

Organic Photovoltaics, *Bernard Kippelen; Georgia Tech, USA*

CLEO/QELS 07: CLEO/QELS Joint Subcommittee on High-Field Physics and High-Intensity Lasers

Attosecond Technology and Wavefunction Tomagraphy, *Mauro Nisoli; Politecnico di Milano, Italy*

CLEO 08: Ultrafast Optics, Optoelectronics & Applications

Optical Parametric Amplifiers: Towards Ultrashort Light Pulses of Extreme Power, *Algis Piskarskas; Vilnius Univ., Lithuania*

CLEO 09: Components, Interconnects & Signal Processing

Microwave Photonic Signal Processing, *Robert Minasian; Univ. of Sydney, Australia*

CLEO 10: Medical and Biological Applications

TBA, *Scot Kuo; Johns Hopkins Univ., USA*

CLEO 11: Fiber and Guided-Wave Amplifiers, Lasers & Devices

Photonic Crystal Fibers Tapers and Devices, *Tim Birks; Univ. of Bath, UK*

CLEO 12: Lightwave Communications and Networks

Scaling Packet Routers Using Optics, *David T. Neilson; Bell Labs, Lucent Technologies, USA*

CLEO 13: Active Optical Sensing

Rare-Earth-Doped Fiber Lasers for Spectroscopic Trace-Gas Detection, *Dahv Kliner; Sandia Labs, USA*

CLEO 14: Optical Metrology

Attosecond Metrology, *Paul Corkum; Natl. Res. Council of Canada, Canada*

CLEO 15: LEDs, Organic LEDs & Solid-State Lighting

OLEDs Based on Quantum Dots, *Vladmir Bulovic; MIT, USA*

CLEO 16: Micro- & Nano-Photonics

Silicon Nanophotonics and Its Applications in Sensing, *Roel Baets; Ghent Univ. - IMEC, Belgium*

QELS 01: Quantum Optics and Quantum Atom Optics

TBA, *Jeff Kimble; Caltech, USA*

QELS 02: Quantum Information

Entanglement, *Carlton Caves; Univ. of New Mexico, USA*

QELS 03: Fundamentals of Metamaterials, Periodic & Random Media

TBA, *Lute Maleki; JPL, USA*

QELS 04: Ultrafast Dynamics

Ultrafast Spectroscopy on Photonic Metamaterials, *Martin Wegener; Karlsruhe Univ., Germany*

QELS 05: Nonlinear Optics and Novel Phenomena

Temporaly Focused Pulses, *Yaron Silberberg; Weizmann Inst. of Science, Israel*

Special Symposia

Panel on Solid-State Laser Power Scaling through Beam Combination

Organizer: Timothy J. Carrig; *Lockheed Martin Coherent Technologies, USA*

The scalability of individual solid-state lasers is limited by a number of factors that can include thermal effects in the gain media, the size of available crystals, and the ability to efficiently pump large gain media, mode control, nonlinear processes and system complexity. Coherent and incoherent methods of combining the beams from multiple lower-power lasers have been proposed as means to mitigate these issues while enabling the power-scaling of lasers to the multi-kW level. Toward this goal, several techniques have been proposed and demonstrated including wavelength combination, polarization combination, temporal multiplexing, Talbot re-imaging and the co-phasing of coherent arrays. However, these techniques are not without their own issues which can include the coherence of the resultant beam, beam spatial quality, optical efficiency of the combiner, the ability to focus the combined beams, and the number of beams that can be reliably and practically combined. This panel will explore these issues, review recent work, debate the pros and cons of several technologies and provide perspectives on future work.

Moderator: Mark Neice; *HEL-JTO, USA*
Panelists: Anthony Siegman; *Stanford Univ., USA*
T. Y. Fan; *MIT Lincoln Lab, USA*
Robert Rice; *Northrop Grumman, USA*
Iain McKinnie; *Lockheed Martin Coherent Technologies, USA*
Arnaud Brignon; *Thales Res. & Technology, France*

QELS Symposium on Degenerate Fermi Gases

Invited Presentations Only

Organizers: Philip Gould; *Univ. of Connecticut, USA*
Paul Lett; *NIST, USA*

The study of degenerate Fermi gases is currently a rapidly-evolving topic in the area of cold atom physics. Clouds of Fermionic atoms and Fermi-Bose gas mixtures cooled to a degenerate energy state are providing a wealth of new physics to explore. The so-called BEC-BCS transition (the transition between a Bose-Einstein condensate of strongly-paired fermions that form molecules and weakly-paired fermions that form Cooper pairs) can be explored. Phenomena such as Fermi superfluidity, the creation of vorticies in a degenerate Fermi gas, the measurement of pairing gaps in coupled Fermions, and a degenerate Fermi gas released into an optical lattice have also recently been investigated. The analogy of these systems to condensed matter systems could provide insights into problems in that field as well.

Collective Excitation Modes in the BEC-BCS Crossover, Rudi Grimm; *Univ. of Innsbruck, Austria*
Phases of a Paired Fermi Gas with Unequal Spin Populations, Randall Hulet; *Rice Univ., USA*
Superfluid Ultracold Fermi Gases, Wolfgang Ketterle; *MIT, USA*

CLEO/QELS Joint Symposium on Self-Phase Modulation in Its 40th Year

Organizers: Robert Fisher, *R. A. Fisher Associates, USA*
Jacob Khurgin; *Johns Hopkins Univ., USA*

Now celebrating its 40th anniversary, self-phase modulation is making contributions to many disciplines, including ultrashort pulse generation; specific waveform generation; generation of pulses with specific absolute phase; custom pulse shape engineering; telecommunication effects, such as four-wave mixing, temporal solitons and their effects, wavelength conversion, cross-phase modulation, etc; supercontinuum generation and pulse trains of supercontinuum-broadened pulses for tomographic and related investigations; and for the very highest yet attained spectroscopic resolution. This Symposium seeks contributions in all aspects of Self-Phase Modulation and Cross-Phase Modulation, whether produced by a direct nonlinear effect or by a cascade nonlinear effect.

Self-Phase Modulation: The Formative Years, T. K. Gustafson; *Univ. of California at Berkeley, USA*
Self-Phase Modulation in Optical Fiber Communications: Good or Bad?, Govind P. Agrawal; *Inst. of Optics, Univ. of Rochester, USA*
From Supercontinuum Generation to Carrier Shocks: Extreme Nonlinear Propagation in Photonic Crystal Fiber, John Dudley; *Univ. de Franche-Comté, France*
Better and Bigger: The Critical Role of Self-Phase Modulation in Ultraprecise Optical Frequency Combs, Scott Diddams; *NIST, USA*

Joint CLEO/PhAST Symposium on Ultrafast Laser Processing and Applications

CLEO Chair: Don Harter, *IMRA America Inc., USA,* ***PhAST*** **Chair:** Bo Gu, *GSI Group., USA*

The *PhAST* and CLEO committees have jointly organized a forum to highlight all aspects of the field of ultrafast laser processing . The CLEO part of this symposium will focus on the scientific advances in this field while the *PhAST* part of this symposium will focus on recent advances in industrial applications that have been or are close to commercial implementation. The CLEO Symposium on Ultrafast Laser Processing and Applications will be located in the CLEO portion of the conference and is open to CLEO attendees only. The Joint CLEO/ *PhAST* Symposium on Ultrafast Laser Processing and Applications is open to both CLEO and *PhAST* attendees and will be located in the *PhAST* rooms.

CLEO Topics:

- laser ablation
- laser induced material modification (waveguide writing)
- multiphoton-polymerization
- laser nanomachining
- laser material interaction
- laser-mediated addition of material
- laser microwelding
- laser/tissue interactions and ablation

PhAST **Topics:**

- applications in the microelectronics, display, and solar industries
- laser micromachining in the automotive and aerospace industries
- lasers in MEMS and sensor manufacturing
- laser processing of telecom and data storage components
- applications in biology, medicine, and bio- or medical- device manufacturing
- emerging micromachining technologies and applications (transparent media modification, sub-wavelength structures generation, ultra-precise metal or semiconductor ablation)
- new and cost effective ultrafast lasers and systems

CLEO Speakers:

Micro and Nanostereolithography for Production of Lab-on-a-Chip Devices, Shoji Maruo; *Yokohama Natl. Univ., Japan*
Subcellular Surgery and Nanosurgery, Eric Mazur; *Harvard Univ., USA*
Microfluidic Bead Array Device Using Laser-Machined Surface Microstructures on Silica Glass, Tadatake Sato; *Natl. Inst. of Advanced Industrial Science and Technology (AIST), Japan*
Femtosecond Laser Nanomachining Applications in Fused Silica, Rod Taylor; *Natl. Res. Council of Canada, Canada*

***PhAST* Speakers**

Double Pulse Laser Machining, Andrew Forsman; *General Atomics, USA*
Industrial Applications of Laser Direct-Write Processing: A Review, Andrew Holmes; *Imperial College, UK*
3-D Photofabrication by Femtosecond Laser Pulses and Its Applications in Photonics and Biomedicine, Aleksandr Ovsianikov; *Laser Zentrum Hannover e.V., Germany*
Overview and Recent Topics in Industrial Laser Applications in Japan, Kunihiko Washio; *Paradigm Laser Res. Ltd., Japan*
A View from a Leading Chinese Laser System Manufacturer, Rangda Wu; *Wuhan Chutian Laser (Group) Corp., China*

Tutorial: Ultrafast Micro and Nanomachining, Gerard Mourou; *Ecole Polytechnique de Paris, France*

Joint CLEO/PhAST Symposium on Biophotonics and Applications

Organizers: Adam Wax, *Duke Univ., USA*
Tom Baer, *Stanford Univ., USA*
James Fujimoto, *MIT, USA*

Biophotonics, the application of optics, photonics and laser technologies in medicine and the life sciences, represents one of the most rapidly growing areas of scientific research and commercial development. The scope of activities within biophotonics is extremely broad, ranging from diagnostic imaging for cancer screening and single molecule detection for genomics and proteomics, to laser photodynamic therapy and image guided robotic surgery. This joint CLEO/*PhAST* symposium will be held in the exhibit hall and will provide an overview of recent advances in instrumentation and product development for the biomedical and clinical marketplace.

Advances in Fourier Domain Optical Coherence Tomography, Eric Buckland; *Bioptigen, USA*
Multi-Functional Video-Rate Optical Coherence Tomography Microscopy, James Jiang; *Thorlabs, USA*
***In vivo* Imaging Using Harmonic Generation Microscopy,** Sun Chi-Kuang; *Natl Taiwan Univ., Taiwan*
Laser Capture Microdissection in Prostate Cancer, Angelo De Marzo; *Johns Hopkins Univ., USA*
Time-Domain Optical Imaging: Toward Clinical Applications, Mario Khayat; *ART Advance Res. Technologies, Canada*
Intraoperative Near-Infrared Fluorescence Imaging, Sivash Yazdanfar; *GE Global Res., USA*
Teraherz Imaging, David Zimdars; *Picometrix, USA*
Upcoming Commercial Applications of Biomedical Optical Spectroscopy: Applications to Heart Disease and Gynecology, Andres Zuluaga; *Remicalm LLC, USA*

CLEO/QELS Joint Symposium on Nanophotonics

Organizers:
Michal Lipson, *Cornell Univ., USA*
Vladimir Shalaev, *Purdue Univ., USA*

Novel concepts of ultrasmall microphotonic devices show the great potential for revolutionizing communications technologies. Confining and guiding light with high confinement leads to gigantic field enhancement that enables active and passive devices with unprecedented performance for a variety of applications. Fuelled by the rapid advancement of computational, fabrication and characterization techniques, two approaches for ultra-strong confinement have recently emerged: one is based on metallic sub-wavelength structures sustaining lower-dimensional, sub-diffraction light waves (surface plasmon polaritons); and the other on building up resonance photonic states in these microphotonic materials. Both result in a dramatic enhancement of light-matter interaction, which can be utilized in a number of optoelectronic devices. This symposium is aimed at bringing together material scientists, physicists, and optical engineers to discuss current material, theoretical and technological challenges in the field.

TBA, Anvar Zakhidov; *Univ. of Texas at Dallas, USA*
Nanostructured Optics and Optoelectronics for Dense Optical Interconnects, David Miller; *Stanford Univ., USA*
Micro- and Nano-Photonics for Chip-Scale Solid-State and Atomic Cavity QED, Oskar Painter; *Caltech, USA*
Near-Field Characterization of Plasmon Polariton Propagation Along Periodically Nano-Structured Metal Thin Films, Jean-Claude Weeber; *Univ. of Bourgogne, France*

Plenary

QELS Plenary Speaker

Metamaterials and Negative Refraction; Sir John Pendry, *Blackett Lab, Imperial College London, UK.*

The possibility of materials with a negative refraction index was first raised seriously by Veselago (1968) who showed that $\varepsilon < 0$, $\mu < 0$ was a sufficient condition for this to happen. Further progress was stalled by the absence of any known material with this property and it was only with the advent of metamaterials with $\varepsilon < 0$ and $\mu < 0$ that this possibility could be realised. Smith, et al, in 2000 were the first to combine these properties in a single structure and demonstrate negative refraction. In the same year the then controversial concept of a perfect lens was proposed and has now been experimentally verified. Subsequent progress has been rapid and our ability to make negatively refracting metamaterials function at RF frequencies is well developed. Applications in this region of the spectrum will be described, as well as progress on negative refraction at optical frequencies.

Sir John Pendry is a condensed matter theorist. He has worked at the Blackett Laboratory, Imperial College London, since 1981. He began his career in the Cavendish Laboratory, Cambridge, followed by six years at the Daresbury Laboratory where he headed the theoretical group. He has worked extensively on electronic and structural properties of surfaces developing the theory of low energy diffraction and of electronic surface states. Pendry is also interested in transport in disordered systems where he produced a complete theory of the statistics of transport in one dimensional systems. In 1992 he turned his attention to photonic materials and developed some of the first computer codes capable of handling these novel materials. This interest led to his present research on metamaterials which concerns the remarkable electromagnetic properties of materials where the normal response to electromagnetic fields is reversed leading to negative values for the refractive index.

CLEO Plenary Speakers

"Plastic" Electronics and Opto-Electronics; Alan Heeger, *Univ. of California at Santa Barbara, USA.*

Semiconducting polymers are important as active materials in electronic and optical devices. I will focus on progress in two areas:

1. Field induced insulator-to-metal transition in polymer FETs.
2. Plastic solar cells fabricated from semiconducting polymers.

Alan Heeger received his B.S. in physics and mathematics from the Univ. of Nebraska and his Ph.D. in physics from the Univ. of California at Berkeley. He has been a professor at the Univ. of Pennsylvania where he served as the Director of the Laboratory for Research on the Structure of Matter and, subsequently, as Vice Provost for Research. Currently, he holds the Presidential Chair at the Univ. of California at Santa Barbara where he serves as Professor of physics and Professor of materials. Widely known for his pioneering research in and the co-founding of the field of semiconducting and metallic polymers, Heeger is also the recipient of numerous awards, including the Nobel Prize in Chemistry in 2000, the Oliver E. Buckley Prize for Condensed Matter Physics, and the Balzan Prize for the Science of New Materials. He founded UNIAX Corporation in 1990, and serves on the Board of Directors of Konarka Technologies Inc. and RitDisplay (Taiwan). He is a Venture Partner in NGen Partners, a materials-based venture capital firm in Santa Barbara and Chairman of Diode Solutions Inc. in Santa Barbara, a new start-up that

is focusing on opportunities for printing "plastic electronics". He is Vice-Chairman of CytomX a newly founded venture to exploit micro fluidics in cell sorting and related areas. Heeger is a member of the National Academy of Science (USA), and the National Academy of Engineering (USA). He has more than 700 publications in scientific journals and holds approximately 50 patents.

Spinning Atoms with Light; William D. Phillips, *NIST, USA.*

Coherent light fields (laser beams) can transfer orbital angular momentum to coherent atom fields (Bose-Einstein condensates). This adds mechanical rotation to linear momentum and spin angular momentum to the toolkit for manipulating atoms with light.

William D. Phillips received a B.S. in physics from Juniata College in 1970 and a Ph.D. from MIT in 1976. After two years as a Chaim Weizmann postdoctoral fellow at MIT, he joined the staff of the National Institute of Standards and Technology (then the National Bureau of Standards) in 1978. He leads the Laser Cooling and Trapping Group in the Atomic Physics Division of NIST's Physics Laboratory. The group is part of the Joint Quantum Institute, a cooperative research venture of NIST and the University of Maryland, begun in 2006. It has developed many of the techniques for cooling, trapping and manipulating atoms that are in general use in the cold-atomic-gas community. The group's research interests include: laser cooling and trapping; Bose-Einstein condensation; optical tweezers; atom optics; collisions of cold atoms; quantum information processing; cold atoms in optical lattices; and the study of cold-atom analogs to condensed matter systems. In 1997 Phillips shared the Nobel Prize in Physics "for development of methods to cool and trap atoms with laser light."

PhAST Plenary Speaker

The Photonics Industry: Enabling Technology or Mature Market?; John Ambroseo, *President and CEO of Coherent, Inc.*

The Photonics market will soon celebrate the golden anniversary of the invention of the laser. During the last fifty years, there have been tremendous successes. Lasers have helped create the high-speed backbone of the Internet, enabled Moore's Law, restored eyesight, and satisfied our vanity through aesthetic procedures, just to name a few. Despite these remarkable feats, industry growth more closely resembles that of farm equipment. The question, of course, is why? John Ambroseo, President and Chief Executive Officer of Coherent Inc. will share his insight into how the Photonics industry can evolve, to go beyond the superficial dazzle of the technology, beyond the repetition of techniques, to ultimately become a growth industry.

John Ambroseo is the president and chief executive officer of Coherent, Inc. Mr. Ambroseo joined Coherent in August 1988. Since June 2001, he served in the role of executive vice president and chief operating officer until becoming president and chief executive officer in October 2002. During his 14-year tenure at Coherent, he held various positions in domestic and international operations, marketing, and sales. Mr. Ambroseo has also led several acquisitions for

Coherent including those for Microlase, DEOS, Crystal Associates, Molectron, Positive Light, and Lambda Physik AG.

He is the past president of LEOMA (Laser Electro-Optics Manufacturers Association) and is a trustee with the Purchase College Foundation. Mr. Ambroseo received his Ph.D. in chemistry from the University of Pennsylvania and his Bachelor's degree from the State University of New York College at Purchase.

Short Courses

Short Course Chairs
James R. Leger, *Univ. of Minnesota, USA*
Keith Williams, *NRL, USA*

The CLEO/QELS Short Course Program includes a range of topic areas at a variety of educational levels. This year's program has courses for the experienced professional looking to gain insight into a new field, or for the student looking to gain an edge by learning from an industry expert. Accomplished instructors will highlight areas such as Quantum Information - Technologies and Applications, Biological and Chemical Sensing for Homeland Security, High Power Fiber Lasers and Amplifiers, and many more. Short Courses are an excellent opportunity to learn about new products, cutting-edge technology and vital information at the forefront of the laser science and electro-optics fields. Additionally, Continuing Education Units (CEUs) are available.

Continuing Education Units (CEUs)
Demonstrate your commitment to education and advancement in the field of lasers and electro-optics by earning CEUs. Certificates awarding CEUs are presented to all individuals who complete a Short Course, CEU form and course evaluation. Forms will be available on-site.

Short Course Schedule By Time

Sunday, May 6, 2007

9:00 a.m.-5:30 p.m.
SC136 Understanding Lasers and Critical Optical Components, *Shaoul Ezekiel, MIT, USA*
SC200 Laser Remote Sensing, *Philip Gatt, Timothy Carrig; Lockheed Martin Coherent Technologies, USA*

12:30 p.m.-3:30 p.m.
SC164 THz Technology, *Alan Cheville, Oklahoma State Univ., USA*
SC189 Quantum Technologies, *Ian Walmsley, Univ. of Oxford, UK*
SC197 Radio Over Fiber Communications, *Dalma Novak, Pharad, USA*
NEW! SC300 Silicon Photonics, *Bahram Jalali, Univ. of California at Los Angeles, USA*

4:30 p.m.-7:30 p.m.
SC199 Micro- and Nano-Machined Optics, *Ernst-Bernhard Kley, Inst. of Applied Physics, Friedrich-Schiller-Univ. Jena, Germany*

SC271 Quantum Information - Technologies and Applications, *Prem Kumar, Northwestern Univ., USA; Matthew Goodman, Telcordia Technologies, USA*
SC272 Biological and Chemical Sensing for Homeland Security, *Stephen Lane, Lawrence Livermore Natl. Lab/Univ. of California at Davis, USA; Thomas Huser; Univ. of California at Davis, USA*
NEW! SC301 Quantum Cascade Lasers: From Band Structure Engineering to Commercialization, *Federico Capasso, Harvard Univ., USA*

Monday, May 7, 2007

9:00 a.m.-12:00 p.m.
SC147 Optical Fiber Communication Systems, *Alan Willner, Univ. of Southern California, USA*
CANCELLED SC165 Laser Diode-Pumped Solid-State Lasers, *Larry Marshall, Arasor, USA*
SC221 Nano-Photonics: Physics and Techniques, *Axel Scherer, Caltech, USA*
NEW! SC302 MetaMaterials, *Vladimir M. Shalaev, Purdue Univ., USA*

9:00 a.m.-5:30 p.m.
SC219 Understanding Laser-Based Sensors, *Shaoul Ezekiel, MIT, USA*

1:00 p.m.-5:00 p.m.
SC123 Erbium-Doped Fiber Amplifiers and Raman Fiber Amplifiers, *John Zyskind, JDSU, USA*
SC149 Foundations of Nonlinear Optics, *Robert Fisher, R. A. Fisher Associates, USA*
SC157 Laser Beam Analysis, Propagation and Shaping Techniques, *James R. Leger, Univ. of Minnesota, USA*
SC160 Microwave Photonics, *Keith Williams, NRL, USA*
SC167 Advances in VCSELs and Microcavity Lasers, *Kent D. Choquette, Univ. of Illinois, USA; Weng Chow, Sandia Natl. Labs, USA*
SC194 Photonic Crystal Fibers and Devices, *Benjamin J. Eggleton, Univ. of Sydney, Australia*

Tuesday, May 8, 2007

8:30 a.m.-12:30 p.m.
SC163 Practical OPOs, *Majid Ebrahim-Zadeh, Inst. de Ciencies Fotoniques, Spain; Malcolm Dunn, Univ. of St. Andrews, UK*
SC166 Photonic Crystal Devices and Integrated Circuits, *Dennis Prather, Univ. of Delaware, USA*
SC191 Tissue Optics: Fundamentals and Applications to Biomedical Optical and Laser Diagnostics, *Valery V. Tuchin, Saratov State Univ., Russian Federation*
SC192 Fiber Optic Sensors: Principles and Applications, *Michel Digonnet, Stanford Univ., USA*
SC196 Solid-State Lighting, *Ghassan Jabbour, Arizona State Univ., USA; E. Fred Schubert, Rensselaer Polytechnic Inst., USA*
SC220 Diffractive Optics, Design, Analysis and Applications, *James R. Leger, Univ. of Minnesota, USA*
SC270 High Power Fiber Lasers and Amplifiers, *W. Andrew Clarkson, Optoelectronics Res. Ctr., UK*

1:30 p.m.-5:30 p.m.
SC143 Introductory and Intermediate Topics in Polarized Light, *Robert Fisher, R. A. Fisher Associates, USA*
SC153 Quasi-Phasematching for Wavelength Conversion and All-Optical Nonlinear Processing, *Peter G.R. Smith, Univ. of Southampton, UK*
SC154 Quantum Well Devices for Optics and Optoelectronics, *David A. B. Miller, Stanford Univ., USA*
SC155 Ultrashort Laser Pulse Measurement, *Rick Trebino, Georgia Tech, USA*
SC182 Biomedical Optical Diagnostics and Sensing, *Thomas Huser, Univ. of California at Davis, USA*
SC198 Packaging of Optoelectronic Components, *Andreas Rose, Ondine Biopharma Corp., USA*
SC245 New Directions in Nanoscale Lithography and Pattern Transfer, *Steven Brueck, Univ. of New Mexico, USA*