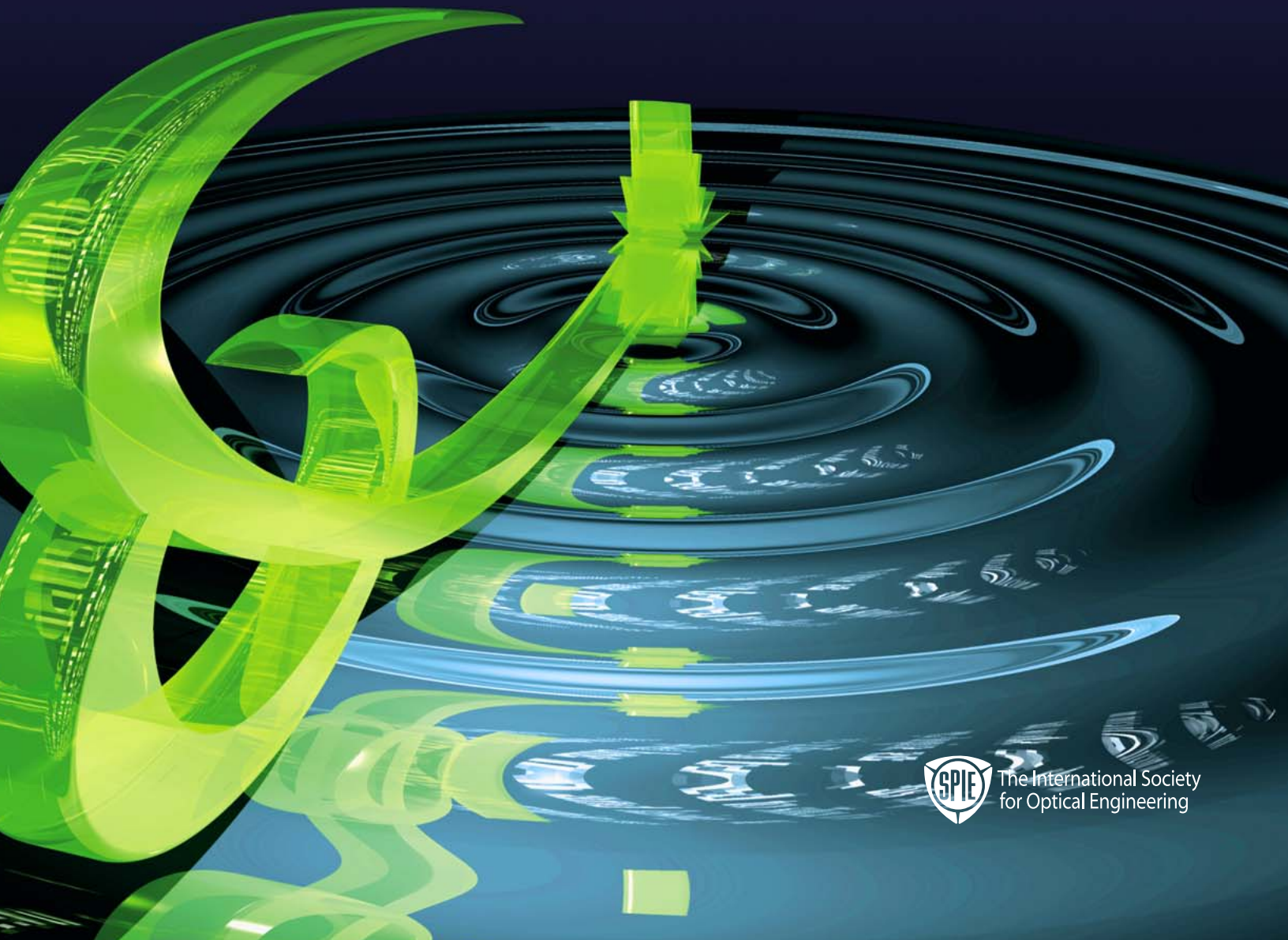
Technical Program

SPIE Optics & Photonics

13–17 August 2006

San Diego Convention Center
San Diego, California USA



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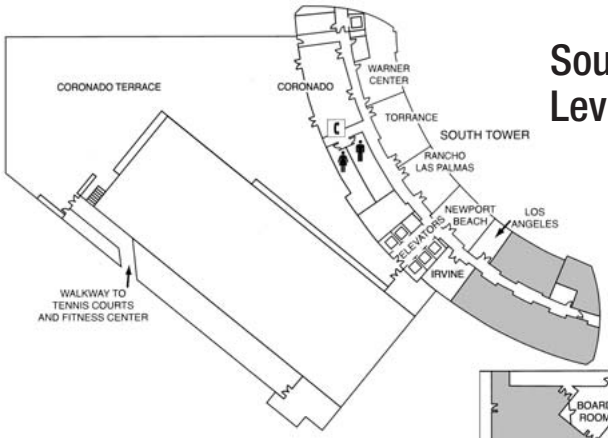
SPIE would like to express its deepest appreciation to the program chairs, conference chairs, cochairs, program committees, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.

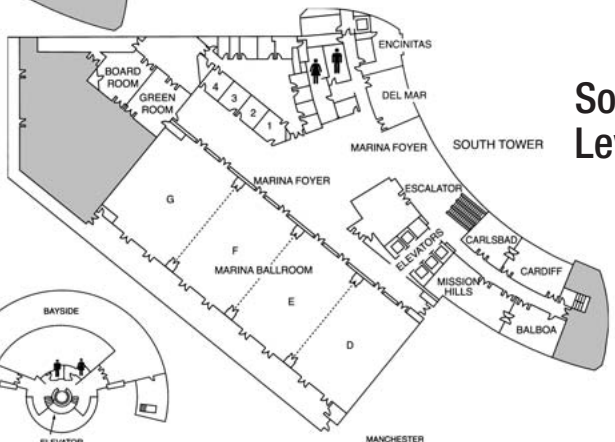
This program is based on commitments received up to the time of publication and is subject to change without notice.

Marriott Floor Plans

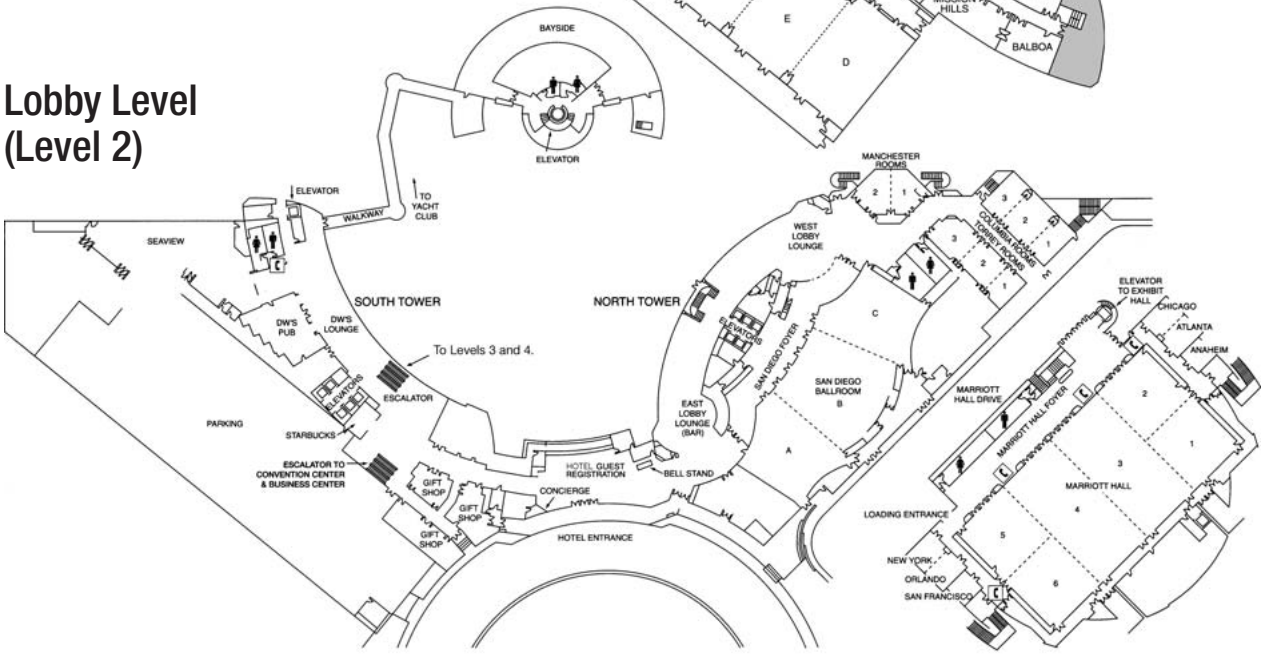
South Tower Level 4



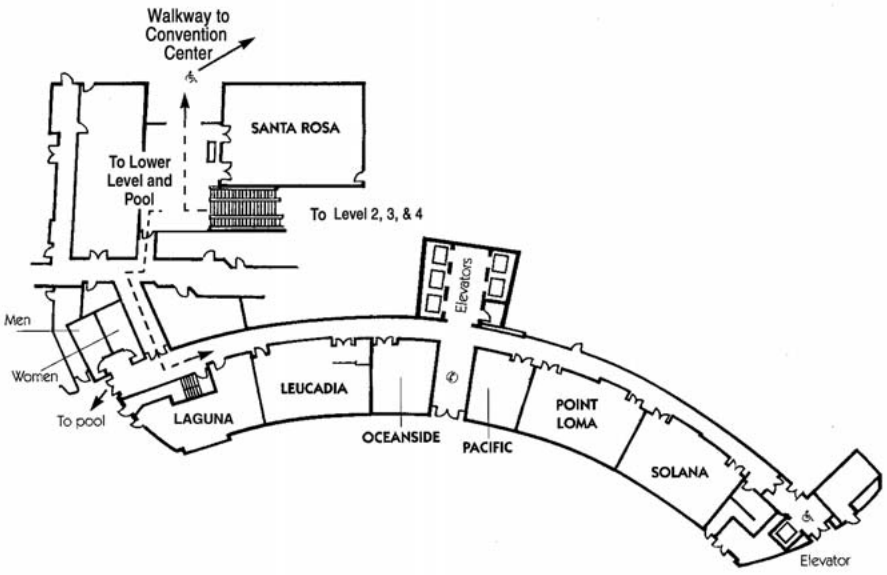
South Tower Level 3



Lobby Level (Level 2)

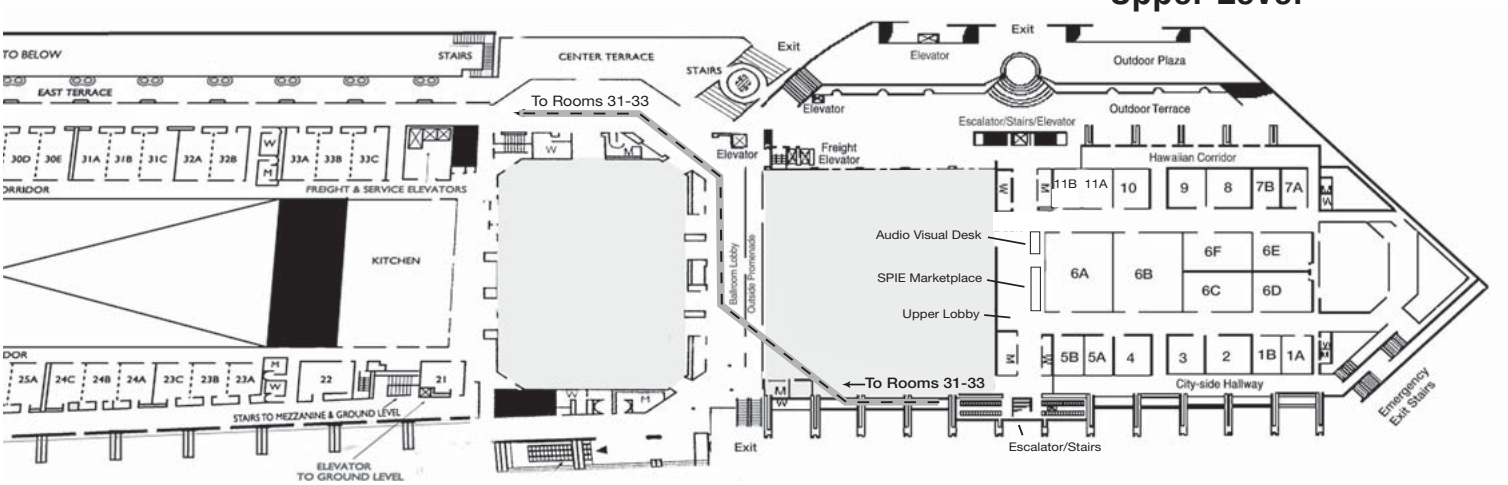


South Tower Lower Level

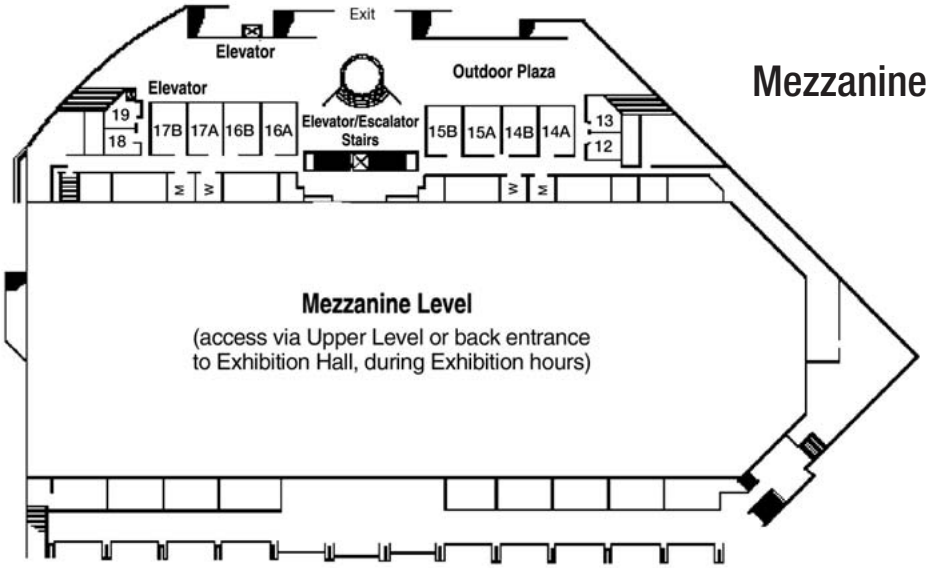


San Diego Convention Center

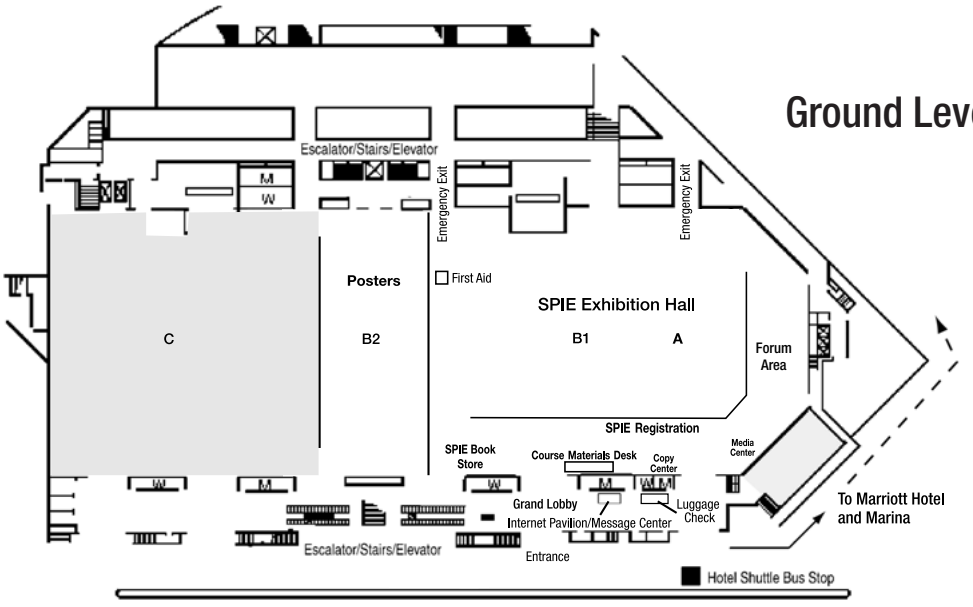
Upper Level



Mezzanine Level



Ground Level



Special Events Daily Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinema: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41 **X-Ray and Algorithms Plenary,** 8:30 to 9:50 am, p. 8 **Lunch with the Experts - A Special Student Event,** 12:30 to 1:30 pm, p. 20 **Solid State Lighting Plenary,** 1:00 to 1:50 pm, p. 8 **Solar Energy Plenary,** 1:30 to 5:30 pm, p. 9 **Poster Session,** 6:00 to 7:30 pm, p. 6 **All-Symposium Welcome Reception,** 7:00 to 8:30 pm, p. 6 *Panel:* **Life in the Cosmos,** 8:00 to 9:30 pm, p.17 **Illumination Technical Group,** 8:00 to 10:00 pm, p. 17 **Adaptive Optics Technical Group,** 8:00 to 10:00 pm, p. 18	10:00 am to 5:00 pm **Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11 *Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14 **SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20 **Fellows Luncheon,** 12:00 to 2:00 pm, p. 5 *Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15 **Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13 **Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4 **SPIE Members Reception,** 7:00 to 8:30 pm, p.5 *Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17 **Poster/Demo Session,** 8:00 to 10:00 pm, p. 6 **Lens Design Technical Group,** 8:00 to 10:00 pm, p. 18 **Nanotechnology Technical Group,** 8:00 to 10:00 pm, p. 18 **Optical Materials and Optics Fabrication Technical Group,** 8:00 to 10:00 pm, p. 19 **Optics in Information Systems Technical Group,** 8:00 to 10:00 pm, p. 19 **Optomechanical/Instrument Technical Group,** 8:00 to 10:00 pm, p. 19 **Penetrating Radiation Technical Group,** 8:00 to 10:00 pm, p. 19	**EXHIBITION,** p. 24 10:00 am to 5:00 pm **Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21 **The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22 **Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21 *Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16 *Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16 *Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15 **SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20 *Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42 **The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23 **Poster Session,** 5:30 to 7:00 pm, p. 6 **SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	10:00 am to 2:00 pm **How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22 *Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19 **SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6

Annual General Meeting of the SPIE Corporation

The Society of Photo-Optical Instrumentation Engineers
(SPIE—The International Society for Optical Engineering)

San Diego Marriott Hotel and Marina

Tuesday 15 August . . . . . 6:00 to 7:00 pm

Agenda

1. 2006 Election Results
2. Report on the "State of the Society"
3. Treasurer's Report
4. Q & A with SPIE Officers

This is the general business meeting of the Society. All SPIE members are welcome and encouraged to attend. This is your forum for expressing your ideas about the Society. Results of the 2006 election will be announced and the President and Executive Director will report on the "State of the Society."

SPIE 2006 Annual Awards Banquet

San Diego Marriott Hotel and Marina

Wednesday 16 August 2006

SPIE President **Dr. Paul F. McManamon** presiding

Marriott Hotel, Marina Ballroom

Banquet and Awards presentations . . . . . 7:30 pm

SPIE President Dr. Paul F. McManamon will preside over the 2006 Awards Banquet that will include the presentation of the 2006 Society awards, scholarship awards, and new Fellows of the Society. Join us for this gala event and enjoy a presentation by Dr. Mary Lou Jepsen.

Tickets for the banquet are not included in the registration fee but may be purchased on site at the SPIE Registration Desk until 12 noon on Tuesday 15 August. Tickets are $75 each.

Banquet Presentation

$100 Laptop, the $35 Display, and the other 4 Billion

Dr. Mary Lou Jepsen, Chief Technology Officer of One Laptop Per Child

Abstract: The most valuable natural resource - of any country - is its children.

Studies and experience have shown repeatedly that kids take to computers easily - not just in the comfort of warm and well-lit rich-country schools, dens and living rooms, but also in the slums and remote rural areas of the developing world. The $100 laptop offers a cheaper alternative to current textbook expenditures in much of the developing world, while also giving the child not only an infinite number of textbooks, but numerous entries to interactive, un-bounded, and peer-to-peer learning.

The display is the single most expensive component in the $100 laptop and has been the focus from the start of our design. I will discuss our approach to substantially lowering this cost with our new display and systems designs, while simultaneously improving its performance with a sunlight readable mode, and massively lowering its power consumption: given that 50% of the world's childrens live without easy access to electrical power and will use a peppermill-style crank to recharge the laptop's batteries.

To make this dream reality we had to create a new kind of startup: one that could get to high volume manufacturing quickly, get massive purchase orders from the outset, and in the process we have had to ignore some of the traditional tenants of business including maximizing gross margin (we have none),usually intellectual property protection (we believe in open source) and traditional sustainable competitive business advantages. I will discuss our thinking here, and why it may be relevant to other business efforts trying to reach and help the developing world.

Biography: **Dr. Jepsen** is an entrepreneur and an widely regarded expert in display systems - from the computer encoding, to the circuitry, drive schemes, light modulation, manufacturing, and optics, all the way on out to the human visual system. Her contributions have had world-wide adoption in successful Head-mounted display, HDTV and projector products. She is currently the chief technology officer of the One Laptop Per Child whose mission is to deliver a $100 laptop to every child on Earth in the next 5 - 10 years.

Previously, she co-founded the first company whose sole effort was the development of microdisplays in 1995 (www.microdisplay.com) and served as its chief technology officer through 2003. Until the end of the 2004, she was the chief technology officer of Intel's Display Division.

She divides her time between the business and technical sides of industry. On the technical side - over the last decade - she has been a pioneer in single-panel field sequential projection display systems. She has created innovative optical designs, microdisplay drive schemes and circuitry, as well as fast switching liquid crystals modes, and manufacturing processes for them - and is a well known pioneer of LCOS (liquid crystal on silicon) microdisplay devices.

Jepsen co-created the first holographic video system in the world at the MIT Media Lab in 1989, where the interference structure of the hologram was computed at video rates, and shown on her hand-made display. This system inspired a whole new field of holographic video and received numerous awards. Her PhD work combined rigorous theoretical coupled-wave analysis with lab work, in which she created large-scale, embossed surface-relief diffraction gratings with liquid crystal-filled grooves with high diffraction efficiency in un-polarized illumination.

Dr. Jepsen holds a PhD in Optics, BS in Electrical Engineering and BA req. in Studio Art all from Brown University. She also holds an MS from the MIT Media Lab. She was an assistant professor of Computer Science at the Royal Melbourne Institute of Technology in Australia.

She will become a professor at the MIT Media Lab in September 2007 where she will found and lead a research effort in nomadic displays.

SPIE Members Reception

For SPIE Members only. *(Membership will be checked at the entrance for admission)*

Coronado Terrace

Tuesday 15 August . . . . . 7:00 to 8:30 pm

All SPIE Members are invited to a reception in their honor. Come to relax and talk with your colleagues. Refreshments will be served. Please note: this reception is limited to SPIE Members only. Membership cards or invitations will be requested at the entrance. If you join SPIE during the meeting, please bring your registration receipt. Dress is casual or business attire.

Fellows Luncheon

San Diego Marriott Hotel and Marina

Tuesday 15 August . . . . . Noon to 2:00 pm

All Fellows of SPIE—The International Society for Optical Engineering are invited to join your colleagues for an SPIE hosted luncheon. The 2006 Fellows will be introduced and will receive their Fellows Pins. Please join us for this informal gathering and a chance to interact with other Fellows.

Guest Hospitality Suite

San Diego Marriott Hotel and Marina, SPIE Suite 2573

Monday-Thursday . . . . . 8:30 to 10:00 am

Guests of attendees are invited to meet, relax, and enjoy a cup of coffee and breakfast breads in SPIE's Guest Hospitality Suite. This suite is for guests of attendees only. The hotel concierge will be available during the portion of this time to answer travel, shopping, and tourist questions.

All-Symposium Welcome Reception

Convention Center Terrace Level

Monday 14 August . . . . . 7:00 to 8:30 pm

All attendees are invited to relax, socialize, and enjoy refreshments at San Diego Convention Center Terrace Level with spectacular Bay views.
Please remember to wear your conference registration badges. Dress is casual.

Poster Sessions

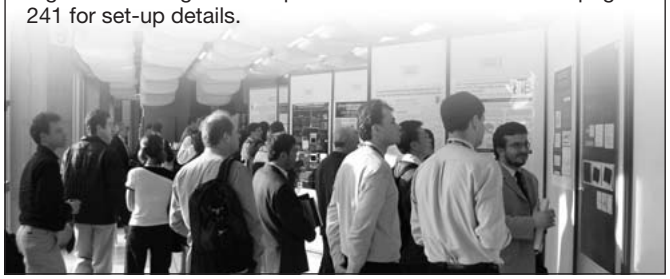
Convention Center Exhibition Hall B2

Monday 14 August . . . . . 6:00 to 7:30 pm

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Wednesday 16 August . . . . . 5:30 to 7:00 pm

Conference attendees are invited to attend the poster sessions on Monday, Tuesday, and Wednesday evenings. Each evening will represent a different set of conferences. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Authors: see page 241 for set-up details.



Special Program:

Optics & Photonics 2006: Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk

Marriott Marina D

Monday . . . . . 8:30 am to 6:30 pm

Please see p. 41 for details.

Annual Meeting of APOMA

APOMA Board Meeting

Marriott Hotel Los Angles Room

Tuesday 15 August . . . . . 3:30 to 5:30 pm

APOMA General Meeting

Marriott Hotel Green Room

Wednesday 16 August . . . . . 8:30 to 10:00 am

SPIE Women in Optics Presentation and Reception

Marriott Marina E

Thursday 17 August . . . . . 4:00 to 5:30

Wrap up your week with one last opportunity to network with your fellow attendees and colleagues. Take this time to celebrate a week of great activity - join us for drinks, appetizers and a presentation by Kristina Johnson, Professor and Dean for the Pratt School of Engineering, Duke University.

Open to all conference attendees.

Kristina M. Johnson received her B.S., M.S. (with distinction) and Ph.D. in electrical engineering from Stanford University. After a NATO post-doctoral fellowship at Trinity College, Dublin, Ireland, she joined the University of Colorado-Boulder's faculty in 1985 as an Assistant Professor, promoted to full Professor in 1994. Dr. Johnson received the NSF Presidential Young Investigator Award, the IBM Faculty Award, and the Dennis Gabor Prize, for "creativity and innovation in modern optics" in 1993. In 1997 she was awarded the Colorado Technology Transfer Award by the Colorado Advanced Technology Institute, and in 2001, the Council for Entrepreneurial Development Infrastructure Award in North Carolina. In 2003, she was inducted into the Women In Technology International (WITI) Hall of Fame and she received the Society of Women Engineers (SWE) Achievement Award in 2004. From 1994 until 1999 Johnson directed the NSF/ERC for Optoelectronics Computing Systems Center at University of Colorado and Colorado State University. She has published over 140 refereed papers and proceedings, and holds forty-three patents. A fellow of the Optical Society of America, IEEE and a Fulbright Scholar, Dr. Johnson is a director of SPIE, the International Society for Optical Engineering. She has helped start several companies including founder of ColorLink, Inc. and sits on several corporate Board of Directors including Mineral Technologies Inc., Guidant Corporation, and AES Corporation. Dr. Johnson currently serves on the advisory boards of the Colorado School of Mines, the Georgia Institute of Technology School of Engineering, the Duke Childrens' Classic, and the Institute for Emerging Issues. She has previously served as an advisor/director to the NSF Engineering Directorate, Science Foundation Ireland, Dycom Industries, Smith College Pickering School, and Carnegie Mellon University. Dr. Johnson is currently Dean of the Pratt School of Engineering at Duke University.

Sponsored by SPIE Women in Optics

Symposium-Wide Plenary Presentations

Convention Center Room 6A

Sunday 13 August . . . . . 5:40 to 7:00 pm

5:40 to 6:20 pm

Nanotechnology: Managing Potential Risks in a Climate of Uncertainty

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

Abstract: The trajectory of nanotechnology research and development is determined not only by the academic and industrial technical communities but also by politicians and policy makers. One issue that is perceived to be a potential roadblock for commercialization of nanotech-enabled products is the concern over potential environmental and health impacts resulting from the production and use of nanomaterials. The political and regulatory landscape of nanotechnology is in constant flux as new information emerges. Can or should nanomaterials be treated any differently than other materials of the same or similar chemical composition? Are existing mechanisms equipped to handle this broad new class of materials? Is new regulation or legislation needed, if only to allay the concerns of the public? This talk will provide a review of the current climate for assessing potential risks of nanomaterials and a description of the International Council on Nanotechnology (ICON), a multi-stakeholder initiative created to address, minimize and communicate about such risks. Governance of the council is shared among representatives from the academic, industrial, governmental and non-governmental (public interest) communities in the US and abroad. ICON projects include a comprehensive database of environmental health and safety literature, a survey of best practices for nanomaterial handling and an expert referral service linking knowledge seekers with experts in the field.

Biography: **Dr. Kristen M. Kulinowski** is Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and a faculty fellow in the Department of Chemistry at Rice University. She obtained a B.S. in Chemistry with Honors at Canisius College and a M.S. and Ph.D. in Chemistry from the University of Rochester. After serving on the faculties at CalPoly (San Luis Obispo) and Rice University, she left academia to serve as 2001-02 Congressional Science Fellow of Optical Society of America and SPIE-The International Society for Optical Engineering. During her time as a fellow, Dr. Kulinowski worked as a legislative assistant and science policy advisor to Rep. Edward J. Markey (MA) and was instrumental in enacting legislation that protects public health in the event of a terrorist attack on a nuclear power plant. She returned to Rice in 2002 and has been active in educating the nanotechnology workforce of the future and promoting the responsible development of nanotechnology through sound public policies regarding health and the environment.

6:20 to 7:00 pm

Digital Cinema: Past, Present, and Future

Bill Werner, Texas Instruments

DLP® technology is making possible a revolution by allowing the world's leading manufacturers to develop projection and display solutions for business, home entertainment, and commercial entertainment use. These solutions offer digital accuracy, outstanding image quality, and high brightness. DLP® technology is enabling the world's lightest and brightest projectors. In addition, DLP Cinema® technology is helping turn the dream of digital cinema into a reality.

Biography: **Bill Werner** is systems engineering and electronics design team leader for DLP Cinema® development at Texas Instruments. Werner joined T I in 1982, after receiving a BSEE degree from the University of Michigan. In 1987 he received a MSEE degree from Southern Methodist University. He joined the Digital Imaging Group of T I in 1993. Werner led development of the first DLP projector based on the 1280 x 1024 Digital Micromirror Device (DMD). Tat projector evolved into the first DLP Cinema® projector. He holds eight U.S. patents.

X-Ray and Algorithms Plenary Session

Convention Center Room 8

Monday 14 August . . . . . 8:30 to 9:50 am

8:30 to 9:10 am

From Signals To Sudoku: Reconstructions From Partial Information

Veit Elser, Cornell Univ.

Abstract: A phase retrieval algorithm proposed by Fienup in 1982 can be generalized to solve a great variety of reconstruction problems. Frequently, a reconstruction must satisfy two sets of constraints, where satisfying each independently does not pose a challenge. The difference map algorithm, a generalization of Fienup's input-output algorithm, combines projections to the two constraint sets into an iterative search for reconstructions that satisfy both constraints. This talk will demonstrate the application of the algorithm to problems as diverse as diffraction microscopy, protein folding, and Sudoku.

Biography: **Veit Elser** received his PhD in physics from U.C. Berkeley in 1984. From 1984 to 1988 he worked at AT&T Bell Laboratories on various theoretical problems in condensed matter physics. He joined the physics faculty at Cornell in 1988.

9:10 to 9:50 am

Opportunities and Challenges in Instrumentation Development for Biomedical X-ray and Gamma-ray Imaging

Lars R. Furenlid, College of Optical Sciences/ The Univ. of Arizona

Abstract: Rapid advances in molecular biology are motivating the continued development of instrumentation for medical and biomedical imaging. In this presentation, we will use selected biomedical imaging applications to illustrate the performance of the current generation of laboratory x-ray and gamma-ray imagers. We identify the key system characteristics that need further refinement, and discuss opportunities and challenges related to spatial, energy, and temporal resolutions, sensitivity, count-rate capability, calibration, synchronization, reconstruction, and data interpretation.

Biography: **Dr. Furenlid** received his PhD in physical chemistry at Georgia Tech in 1988. From 1988 to 1998 he worked in x-ray spectroscopy as a staff physicist at the National Synchrotron Light Source at Brookhaven National Laboratory. In 1998, he joined the Department of Radiology and the College of Optical Sciences at the University of Arizona where he works in the field of biomedical imaging in the Center for Gamma-ray Imaging.

Solid State Lighting Plenary Session

Convention Center Room 6B

Monday 14 August . . . . . 1:00 to 1:50 pm

Chair: **Ian T. Ferguson,** Georgia Institute of Technology

1:00 to 1:50 pm

More Light for a Brighter Future: GaN

Volker Härle, OSRAM Opto Semiconductors GmbH

Abstract: Over the last 10 years GaInN-based LEDs have developed to a new and upcoming light source. All applications from mobile, automotive, displaying to general lighting will be revolutionized with this new kind of technology. To achieve this, tremendous efforts have been taken, to develop today's status. Improving internal efficiency as well as extraction efficiency, the GaInN-technology has reached a level of more than 40% wall plug efficiency at standard operating conditions, which even outperforms long existing technologies such as AlGaInP, used for red, amber and yellow.

One of today's main field of interest is the topic of high power devices. OSRAM has developed the so called ThinGaN technology, which drives this field into new performance levels. Surface emitting devices with 1mm_ emitting area show 400mW optical output power or 70lm white. Having reached this level, automotive head lights, LCD backlighting as well as front projection applications become possible. In comparison with other technologies such as Flipchip, sapphire volume emitters e.g., the OSRAM ThinGaN technology represents today's most promising onset with respect to scalability and optical performance.

Biography: **Volker Härle** graduated in 1990 with a Diploma in Physics from the University of Stuttgart after receiving a Masters degree in Physics from the University of Massachusetts in 1988. Thereafter, he joined France Telecom in Paris/Bagneux in 1991 and finished his PhD at Stuttgart University in 1994. His thesis was in the physics of strained GaInAs/InP-structures resulting in optical modulators, amplifiers, and lasers using low pressure MOVPE as growth method.

In 1994, he started as a postdoc at Stuttgart University in MOVPE growth of GaInN-structures and -devices. He joined Siemens in 1996 as a process engineer for GaInN-MOVPE growth, and in 1997 he took over the responsibility of all MOVPE-R&D including AlGaInP and GaInN. In 1999, he became head of GaInN-R&D at Siemens. Today, he is heading all nitride R&D at OSRAM-OS including MOVPE production as a senior director of R&D. Major achievements include the development of ATON- and ThinGaN-Technology as well as the first European cw Blue Laser.

Solar Energy Plenary Session

Convention Center Room 6A

Monday 14 August . . . . . 1:30 to 5:30 pm

Chair: **Ravi Durvasula,** GE Global Research

1:30 to 2:00 pm

Nanotechnology for Photovoltaics

Loucas Tsakalakos, GE Global Research

Abstract: In the past 5-10 years there has been and strong and growing interest in the fields of nanotechnology and photovoltaics. However, the convergence of the two has generally been overlooked relative to other fields, or research has focused on very specific types of solar cells. While PV performance advantages using nanotechnology have been demonstrated with limited success, much work remains to be done in harvesting the full potential of nanotechnology to transform and revolutionize PV science and technology. In this talk a general overview of the key nanotechnology physics and materials concepts that are applicable to PV will be described. While quantum phenomena may be exploited, nanoscale geometrical constructs may also be helpful in improving PV performance. Examples from our work in nano-photovoltaics will be discussed.

Biography: **Loucas Tsakalakos** is a Staff Scientist and Project Leader at the General Electric - Global Research Center in Niskayuna, NY. He received his M.S. (1998) and Ph.D. (2000) degrees in Materials Science and Engineering from the University of California, Berkeley. He is the author or co-author of 15 peer reviewed archival and conference proceeding publications, has given over 10 invited presentations at technical conferences and workshops, and holds two U.S. patents.

2:00 to 2:30 pm

The Promise of Concentrator Photovoltaics Using High-Efficiency Multijunction Solar Cells

Raed A. Sherif, Spectrolab, Inc.

Abstract: The use of photovoltaics to produce energy has long been hampered by the relatively high cost of the silicon flat plate modules, making solar energy utilization still a very small fraction of the energy produced worldwide. The high cost of the solar flat plate modules is driven by the high cost of the silicon cells on relative to their output power. The use of concentration has been sought to reduce the cost of solar energy. The economics of solar concentrators are closely tied to the particulars of the solar cells to be used in the concentrator module. For a concentrator system to be economically viable, both the output of the solar cell at a given concentration (i.e., the cell efficiency), and the cell cost (in terms of $ per area) must be taken into account.

The development of high-efficiency, multijunction solar cells has revived interest in the pursuit of solar concentrators. Multijunction solar cells are based on the dual-junction cell technology that was developed by the National Renewable Energy Laboratory (NREL). Dual- and triple-junction cells have been limited in their usage to only space applications due to their high cost. Interest in the use of these cells for terrestrial concentrator systems appears to be at an all-time high after demonstration of multiple world-record efficiencies, the latest of which is 39.0% demonstrated by Spectrolab under 236X concentration. The goal of producing electricity from the sun at competitive prices seems to be within reach.

This paper presents an overview of the status of the concentrator photovoltaics technology using multijunction solar cells. We will discuss the present status of the technology and what we believe needs to be accomplished in the near term in order to see a massive commercialization of this technology in the next twenty years.

Biography: **Dr. Raed Sherif** is the Director of Terrestrial Photovoltaic Product Line at Spectrolab. His main focus is on the commercialization of concentrator photovoltaics technology with multi-junction solar cells, working with different module manufacturers to implement the Spectrolab triple-junction concentrator cells and receivers in their modules. He also directs the effort at Spectrolab for product qualification and cost reduction. Dr. Sherif has worked at IBM for 10 years in the development of advanced packaging solutions for high-powered microelectronics devices. He joined Spectrolab in 1999 and worked as the program manager at Spectrolab for the High Performance PV program of NREL for the last 5 years. He also served as the program manager at Spectrolab for the work with Arizona Public Service and Concentrating Technologies that led to the demonstration of the world's first grid-connected concentrator system with triple-junction solar cells. Dr. Sherif has over thirty publications and holds 29 patents.

2:30 to 3:00 pm

High and Medium Concentration Photovoltaics Using III-V Multijunctions

Daniel Aiken, EMCORE Corp.

Abstract: High efficiency solar cells are valuable for lowering the module-level or system-level specific cost ($/Watt) of a photovoltaic module or system. The cost of all system components gets amortized by the higher power produced by high efficiency cells. High efficiency solar cells are especially leveraging when used in concentrator photovoltaic systems, where the non-photovoltaic elements, including lenses, mirrors, trackers, etc. are likely to be a larger fraction of the total system cost compared to the fixed flat panel case.

High efficiency III-V multi-junction solar cells are being developed for both high and medium concentration levels. Their room temperature efficiencies are greater than 34% for concentrations greater than 20 suns and less than 300 suns. A variety of solar cell geometries are being investigated to accommodate different concentrator system approaches. A prototype 50 Watt, 520 suns concentrator module has also been constructed and tested using these multi-junction cells. Aperture area efficiencies of 28% have been recorded under the very high irradiance conditions typical of the Southwestern United States.

Here we discuss multi-junction solar cell design rules for high and medium concentration. Module design approaches and characterization results are also presented, including a discussion of some of the most important design considerations such as optical efficiency and waste heat management. Finally, future opportunities for both efficiency increase and cost reduction in multi-junction photovoltaic devices and systems are examined.

Biography: **Daniel Aiken** has been senior scientist for Emcore Corporation in Albuquerque, New Mexico since 2000. He is involved in the development of next generation multi-junction solar cells and modules for both space and terrestrial power applications. Daniel has authored more than 30 papers and holds several patents related to photovoltaics.

3:00 to 3:30 pm

The Path from Niche to Mainstream Supplier of Clean Energy

Richard M. Swanson, SunPower Corp.

Dr. Swanson was a professor of Electrical Engineering at Stanford University from 1976 to 1991, when he resigned to devote full time to SunPower, a company which he founded. He is currently President and CTO of SunPower.

Solar Energy Plenary Session *continued*

Convention Center Room 6A

4:00 to 4:45 pm

The Sustainable Hydrogen Economy

John A. Turner, National Renewable Energy Lab.

Abstract: As it is rapidly becoming apparent that energy is the most important issue facing our world today, humankind finds itself faced with the following challenge: how to continue to power this society, particularly in the face of the rapidly growing economies of emerging nations like India and China, and yet answer questions of sustainability, energy security, geopolitics and global environment. One of the major issues facing America and most other countries in the world is how to supply a transportation fuel, or in other words, an energy carrier to replace gasoline. Hydrogen as part of a sustainable energy supply can meet the challenge of a domestically-produced energy carrier that can replace gasoline, and can additionally address carbon dioxide and other emissions.

Hydrogen as an energy carrier, primarily derived from water, can address issues of sustainability, environmental emissions and energy security. The "Hydrogen Economy" then is the production of hydrogen, its distribution and utilization as an energy carrier. The "Hydrogen Economy" is an oft-discussed topic with supporters and detractors on both sides. The push to use hydrogen as an energy source has even been part of a Presidential Initiative, announced in the 2003 State of the Union Address. It is important that we consider hydrogen in tandem with other technologies as an alternative to the once-abundant hydrocarbon resources on which our society depends. This talk will introduce sustainable energy systems and discuss the vision, the barriers and possible pathways for the implementation of hydrogen into the energy infrastructure.

Biography: **John A. Turner, Ph. D.**, is a Principal Scientist at the National Renewable Energy Laboratory. He received his B.S. degree from Idaho State University, his Ph.D. from Colorado State University, and completed a postdoctoral appointment at the California Institute of Technology before joining the National Renewable Energy Laboratory in 1979. His research is primarily concerned with enabling technologies for the implementation of hydrogen systems into the energy infrastructure. This includes direct conversion (photoelectrolysis) systems for hydrogen production from sunlight and water, advanced materials for high temperature fuel cell membranes, and corrosion protection for fuel cell metal bipolar plates. Other work involves the study of electrode materials for high energy density lithium batteries and fundamental processes of charge transfer at semiconductor electrodes. His monolithic photovoltaic-photoelectrochemical device has the highest efficiency for any direct conversion water splitting device (>12%). He has twice received the Midwestern Research Institute President's Award for Exceptional Performance in Research. In addition, he has received the Hydrogen Technical Advisory Panel award for Research Excellence, and two Outstanding Mentor Awards from the US Department of Energy for his work with undergraduate students. He is the author or co-author of over 75 peer-reviewed publications in the areas of photoelectrochemistry, fuel cells, batteries, general electrochemistry and analytical chemistry.

4:45 to 5:30 pm

Chemical Conversion of Solar Energy and Photocatalysis

Akira Fujishima, Kanagawa Academy of Science and Technology (Japan)

Abstract: In 1972, we succeeded for the first time, in the photo-electrochemical decomposition of water without any applied electric power. 1 In this experiment, we used TiO2 as the anode and the Pt as the cathode. This discovery attracted worldwide attention and triggered enormous research activity in numerous laboratories to the photoelectrochemically decompose water with semiconductors. The principles and measurements obtained with photoelectrochemical studies at semiconductor electrodes have also led to the research activity on heterogeneous photocatalysis. 2 Again, in 1997 we reported the novel photo-induced superhydrophilicity of TiO2, and proposed the concept of self-cleaning surface based on the photocatalytic and superhydrophilic properties of TiO2. 3 Today, TiO2 photocatalysis has exhibited numerous applications in air and water purification, self-cleaning materials, medical science. In addition, applications in photoelectrochemical anti-corrosion, and microfabrication have also been proposed. We have reported a novel TiO2-based coating combining both self-cleaning and antireflection properties, which may have wide applications in the solar energy devices. 4 Our Efforts are also devoted to extending the photoresponse of TiO2 to the visible light. The most recent study shows that nitrogen-doped TiO2 has a quantum yield over 8% for phenol degradation at 436 nm, a comparable data to the quantum yield of 12% at 365 nm.5

References:

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5. A. V. Emeline, X.-T. Zhang, M. Jin, T. Murakami, and A. Fujishima, J. Phys. Chem. B, in press.

Biography: **Akira Fujishima** was born in Tokyo, Japan in 1942. He received a Bachelor Degree of Engineering in chemistry from the Yokohama National University in 1966, and a Doctor Degree of Engineering from the University of Tokyo in 1971. He then worked in Kanagawa University as an assistant professor for four years. He moved to the University of Tokyo in 1975, and became a full professor of chemistry there in 1986. He retired from the University of Tokyo in 2003, and has been the chairman of Kanagawa Academy of Science and Technology, and the leader of Technology Research and Development Department of the Central Japan Railway Company since then. He has become a Professor Emeritus of the University of Tokyo since 2003, and has been the Special University Professor Emeritus of the University of Tokyo in 2005. His research interests include photoelectrochemistry, TiO2 photocatalysis, photofunctional materials, diamond electrochemisty, and CO2 reduction. He is the author of over 600 original scientific articles, over 300 review papers, and over 40 contributed book chapters and books. He has been awarded with many awards, including the Heinz Gerischer Award in 2003 and the Japan Prize in 2004. Now he also serves as the president of the Chemical Society of Japan.

Organic and Nanophotonics Plenary Session

Convention Center Room 6A

Tuesday 15 August . . . . . 8:30 am to 12:00 pm

Chairs: **James G. Grote,** Air Force Research Lab.; **Zakya H. Kafafi,** Naval Research Lab.

8:30 to 9:00 am

Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures

Sailing He, Royal Institute of Technology - KTH (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

Abstract: Electronics circuits keep shrinking in dimensions, according to Moore's law, with FET gate lengths in the laboratory being in the tens of nm range. In contrast, photonic circuit elements and waveguides have lateral dimensions on the order of the wavelength, and the circuit elements normally are tens to thousands of wavelengths in length. In terms of integration density and maturity, photonics is several decades behind electronics. A key to make photonics have an electronics-like development is a drastic reduction of size. One way to reduce the size of photonic devices is to use high-index materials, e.g. Si. Surface plasmon (SP) waveguides, which utilize the fact that light can be confined in a single interface between a metal and dielectric, can offer a tight confinement for the light field. The cross-sectional size of a SP waveguide could be pushed down to tens of nanometers. Nano-structured artificial materials (metamaterials) with negative index can give unprecedented physical properties and functionality unattainable with naturally-existing materials. We will present our recent results on some ultra-compact planar lightwave circuits based on Si nano-waveguides and SP nano-waveguides, as well as some nano-structured materials of negative index and their applications.

Biography: **Sailing He** received the Licentiate of Technology and Ph.D. degree from the Royal Institute of Technology (KTH), Stockholm, Sweden, in 1991 and 1992, respectively. After obtaining his PhD degree, he has worked at the Royal Institute of Technology as an assistant professor, an associate professor and a full professor. He also serves as chief scientist for the Joint Research Center of Photonics of KTH (Sweden) and Zhejiang University (China). Prof. Sailing He has first-authored one monograph (Oxford University Press) and authored/co-authored over 200 papers in refereed international journals, and has been granted a dozen of patents. Prof. He's current research interests are in the area of meta-materials and photonic crystals, photonic integration technologies, nano-photonics, and optical communication technologies, etc.

9:00 to 9:30 am

Plasmonic Nanostructures: Artificial Molecules

Naomi Halas, Rice Univ.

Abstract: Metallic nanoparticles possess unusually vibrant optical properties controlled by their geometry, spawning intense interest in their fundamental properties as well as their applications which range from optical interconnects to biomedicine. The collective electronic resonance of metallic nanoparticles, also known as their plasmon resonance, gives rise to their unique behavior. We have found that the collective electronic resonances of metallic nanostructures behave remarkably like wave functions in simple quantum systems. The resonant states of a metallic nanostructure can be understood as the interaction of plasmons supported by metallic nanostructures of more elementary shapes. This simple and intuitive picture known as "plasmon hybridization" provides a powerful and general design principle that can be used both qualitatively and quantitatively to guide the design of metallic nanostructures and predict their resonant properties. We have developed a family of metallic nanostructures of varying symmetries and complexities whose properties can be understood quite easily through this approach. Individual nanoparticles and collections of nanoparticles such as dimers, trimers or quadrumers support "bonding" and "antibonding" plasmon states. The coupling between the localized plasmons of metallic nanoparticles and the propagating surface plasmons of extended macroscopic structures such as films, wires or waveguides can also be understood in this picture.

Biography: **Naomi Halas** is currently Professor of Electrical and Computer Engineering and Professor of Chemistry at Rice University. She received her Ph.D. degree in Physics from Bryn Mawr College while a graduate fellow at IBM Research. Following her postdoctoral research at AT&T Bell Laboratories, she joined the faculty at Rice. She is author of over 100 peer reviewed publications, has presented over 200 invited talks, and has nine issued patents. Dr. Halas is a Fellow of the American Association for the Advancement of Science, the American Physical Society and the Optical Society of America.

9:30 to 10:00 am

Organic Thin Film Electronics

Zhenan Bao, Stanford Univ.

Abstract: Organic semiconducting materials are now being considered as the active materials in displays, electronic circuits, solar cells, chemical and biological sensors, actuators, lasers, memory elements, and fuel cells. The flexibility of their molecular design and synthesis makes it possible to fine-tune the physical properties and material structure of organic solids to meet the requirements of technologically significant applications. In contrast to inorganic materials, active organic thin films can be deposited at much lower substrate temperatures (less than 120 _C) in low vacuum or atmospheric pressure environments. It has been demonstrated that low-cost deposition techniques such as solution spin-coating, casting, and even printing can be used for deposition of solution soluble organic materials. These processing advantages, together with the natural abundance of organic solids, make semiconducting organics attractive for large-area and low cost applications.

The performance of OTFTs, key elements for all electronic devices, depends on the construction of each of the active layers, which are the organic semiconductor layer, insulating (dielectric) layer and the electrodes. The deposition method, condition, sequence, post-deposition treatment, and surface treatment significantly impact OTFT performance. Therefore, it is important to fully understand various factors that affect the thin film growth processes. In this talk, semiconductor materials design in context of controlling the semiconducting material properties, such as electronic properties, molecular orientation, molecular packing, and morphology, will be discussed. A general overview of the current status of organic material based flexible electronic devices will be given.

Biography: **Zhenan Bao** is an Associate Professor of Chemical Engineering in Stanford after 8 years at Bell Labs, Lucent technologies as a Distinguished Member of Technical Staff. In her research, she takes an interdisciplinary approach to address technologically important issues related to using organic materials for electronic devices. One of her major contributions has been the development of high performance organic semiconductors for large area flexible circuits and displays. Her current research interests include understanding of self-assembly at different length scales, using building blocks such as organic molecules and nano-objects. The devices of interest are chemical and biological sensors, nanoelectronic devices, and molecular memories. She has more than 80 refereed publications 19 US patents.

Organic and Nanophotonics Plenary Session *continued*

Convention Center Room 6A

Biography: **Zhenan Bao** *continued.*
She currently serves as a member of Executive Committee for the Polymer Materials Science and Engineering division of the American Chemical Society. She is an Editor for Polymer Reviews. She is on the international advisory board for Chemistry of Materials and Materials Today. She is a recipient of the American Chemical Society Team Innovation Award 2001, R&D 100 Award, and R&D Magazine's Editors Choice of the "Best of the Best" new technology for 2001. She has been selected in 2002 by the American Chemical Society Women Chemists Committee as one of the twelve "Outstanding Young Woman Scientist who is expected to make a substantial impact in chemistry during this century". She is also selected by MIT Technology Review magazine in 2003 as one of the top 100 young innovators for this century. She has been selected as one of the recipients of Stanford Terman Fellow and Sloan Research Fellow. She has been appointed as the Robert Noyce Faculty Scholar and Finmeccanica Faculty Scholar.

She received her M.S. (1993) and Ph.D. (1995) degrees in Chemistry from the University of Chicago.

10:30 to 11:00 am

Nanoscience and Technology in the Navy and DoD

Richard J. Colton, Naval Research Lab.

Abstract: In support of the National Nanotechnology Initiative (NNI), the Department of Defense (DOD) conducts research and development programs in seven program component areas, relating to areas of investment that are critical to accomplishing the overall goals of the NNI: fundamental nanoscale phenomena and processes; nanomaterials; nanoscale devices and systems; instrumentation research, metrology, and standards for nanotechnology; nanomanufacturing; major research facilities and instrumentation acquisition; and societal dimensions. The Naval Research Laboratory's Institute for Nanoscience conducts multidisciplinary research at the intersections of the fields of materials, electronics and biology including basic research programs in optics and photonics. The Institute also operates a new nanoscience research building containing nanofabrication facilities and environmentally-controlled measurement laboratories. This presentation will provide an overview of nanoscience research programs conducted at the Naval Research Laboratory. In addition, a brief overview of related DOD nanotechnology programs and application will be presented.

Biography: **Richard J. Colton** is Director of the Institute for Nanoscience at the Naval Research Laboratory (NRL) in Washington, DC. The Institute conducts multidisciplinary research at the intersections of the fields of materials, electronics and biology. The Institute also operates a new nanoscience research building containing nanofabrication facilities and environmentally-controlled measurement laboratories. Dr. Colton earned B.S. and Ph.D. degrees from the University of Pittsburgh in 1972 and 1976, respectively. He performed graduate work in the areas of ultraviolet and X-ray photoelectron spectroscopy. In 1976, he became a National Research Council Resident Research Associate at NRL working on secondary ion mass spectrometry (SIMS). Dr. Colton joined the NRL staff in 1977 and conducts basic and applied research in surface chemistry and nanoscience/nanotechnology. His current research interests include the measurement of the nanomechanical properties of materials using atomic force microscopy and the development of new sensors using electron tunneling and force transducers. He has published over 130 technical papers, including ten book chapters and five patents, which have be cited in the literature over 5000 times. Dr. Colton is a member of the American Chemical Society (ACS), Sigma Xi, American Vacuum Society (AVS), American Physical Society (APS), and Materials Research Society (MRS). He was the first chairman of the AVS Division on Nanometer-scale Science and Technology in 1993, former chair of the AVS Applied Surface Science Division, and served on the AVS Board of Directors in 1992-93. He received the 1992 Hillebrand Prize awarded by the Chemical Society of Washington, was elected AVS Fellow in 1995, received the NRL-Edison Chapter of Sigma Xi Applied Research Award in 1999, and won numerous technical publication and technology transfer awards including the Federal Laboratory Consortium Award for Excellence in Technology Transfer in 2001. Dr. Colton also received the Navy Meritorious Civilian Service Award in 2003.

11:00 to 11:30 am

Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications

Franky So, Univ. of Florida

Abstract: Ever since the invention of organic light emitting devices (OLEDs), there has been a strong interest in considering these devices for flat panel display applications. Both small molecular and polymeric materials are suitable large area processing and OLED devices can be fabricated by roll-to-roll processes. With the recent development in phosphorescent OLEDs, these devices are also attractive for solid state lighting because of their very high efficiencies.

In this presentation, we will first review the requirements for OLED display and solid state lighting applications, and the current status of both small molecule and polymer OLED technologies. We will then discuss the challenges and opportunities of both technologies in terms of material issues, device physics and processing.

Biography: **Franky So** received his B.A degree in physics from Hamilton College, M.S. in materials science from MIT and Ph.D. in electrical engineering from the University of Southern California. After his graduation in 1991, he was a research scientist at Hoechst Celanese Corporation working on high speed polymer electro-optical modulators and organic light emitting devices. In 1993, he joined Motorola Phoenix Corporate Laboratories working on organic light emitting devices (OLED) for flat panel displays. He was then promoted to be the Program Manager responsible for the R&D activities in OLED technology development. During his tenure at Motorola, he received the Distinguished Innovator Award and the Master Innovator Award. In 2001, he joined OSRAM Opto-Semiconductors, formerly known as Siemens Optoelectronics Division, and became the Head of Materials and Devices Research. He had the worldwide responsibility managing the R & D activities in OLEDs for flat panel displays and solid state lighting. In summer 2005, he joined the faculty in the Department of Materials Science and Engineering at the University of Florida. He is now currently an Associate Professor in the Department. Dr. So holds over 50 issued patents in the area of organic electronics and is a Senior Member of IEEE.

11:30 am to Noon

Organic Solar Cells

Christoph J. Brabec, Konarka Technologies GmbH (Germany)

Abstract: Direct conversion of sunlight into energy using photovoltaic technology is a way to address growing global energy needs with a renewable resource while minimizing detrimental effects on the environment by reducing atmospheric emissions. This presentation looks at a new generation of solar cells that can be reel to reel processed and have the potential for a lowest cost photovoltaic technology. Recent developments in the materials and in the technology have resulted in solar power conversion efficiencies which propelled organic-based photovoltaics out of the realm of fundamental research into the industrial laboratory setting. Printing of organic materials-polymers and molecules- these technologies allow potentially easier manufacturing than current technologies based on silicon or other materials.

Parallel to the exciting product and market scenario, the current research in organic solar cells opens up and touches fascinating and new aspects of photophysics and in the field of nanotechnology, i.e. nano scaled p-n junctions which lead to a photogeneration process occurring in the femtosecond scale. A second topic attracting more

and more interest from the R&D community is to understand the driving forces being responsible to form nanoscaled networks in a bulk heterojunction composite.

In this lecture, we describe the state of the art of organic based photovoltiacs and give an outlook to the future technological challenges to be overcome in order for organic photovoltaics to realize their potential as an economically viable product.

Biography: **Christoph J. Brabec** is director of the polymer photovoltaics programme at Konarka technologies. Before he and his team joined Konarka, he was project leader at SIEMENS Corporate Technology with strong dedication to organic semiconductor devices. During his PhD (1995) he investigated the rheology of polymer melts with respect to molar mass correlations. In 1996 he joined the group of Prof Alan Heeger at the University of Santa Barbara for a sabbatical, and continued to work on the opto-electronic properties of organic semiconductors later on as assistant professor at the University of Linz (Prof. Sariciftci). In 1998 he became senior scientist of a Christian Doppler Laboratory on organic solar cells which he left in 2001 to join SIEMENS research labs. He is author and co-author of more than 100 papers and filed over 30 patents. He finished his habilitation in physical chemistry at the Johannes Kepler University Linz in 2003.

Future of Imaging Plenary Session

Convention Center Room 6A

Tuesday 15 August . . . . . 1:00 pm to 2:20 pm

Chair: **Wei Gao,** Colorado State Univ.

1:00 to 1:40 pm

Riding the Light: How Dedicated Optical Circuits are Enabling New Science

Dr. Larry Smarr, Director, California Institute for Telecommunications and Information Technology, Harry E. Gruber Professor, Dept. of Computer Science and Engineering, Jacobs School of Engineering, UCSD

Abstract: During the last few years, a radical restructuring of optical networks supporting e-Science projects is beginning to occur around the world. U.S. universities are now able to acquire access to private, high bandwidth light pipes (termed "lambdas") through the National LambdaRail, providing direct access to scalable Linux clusters in individual user laboratories. These dedicated connections have a number of significant advantages over shared internet connections, including high bandwidth (10Gbps+), controlled performance (no jitter), lower cost per unit bandwidth, and security. These lambdas enable the Grid program to be completed, in that they add the network elements to the compute and storage elements which can be discovered, reserved, and integrated by the Grid middleware to form global LambdaGrids. I will describe our experience in setting up and using LambdaGrids as part of the NSF- funded OptIPuter (www.optiputer.net) and LOOKING (http://lookingtosea.ucsd.edu/), and Moore Foundation funded CAMERA research projects. These three projects explore how the lambdas enable new capabilities in medical imaging, earth sciences, interactive ocean observatories, and marine microbial metagenomics. A glimpse into future of global e-science was provided by the iGrid2005 workshop held at Calit2 in September 2005. I will review some of the most exciting new uses for lambdas demonstrated there by the two dozen countries participating.

Biography: **Larry Smarr** is director of the California Institute for Telecommunications and Information Technology and Harry E. Gruber professor in the Jacobs School's Department of Computer Science and Engineering at UCSD. Smarr is Principal Investigator on the NSF OptIPuter LambdaGrid project, the Moore CAMERA marine microbial metagenomics project, and is Co-PI on the NSF LOOKING ocean observatory prototype.

As founding director of the National Center for Supercomputing Applications and the National Computational Science Alliance, Smarr has driven major contributions to the development of the national information infrastructure: the Internet, the Web, the emerging Grid, collaboratories, and scientific visualization. His views have been quoted in Science, Nature, the New York Times, Wall Street Journal, Time, Newsweek, Fortune, and Business Week, and he gives frequent keynote addresses at professional conferences and to popular audiences.

He was a member of the President's Information Technology Advisory Committee and served until 2005 on the Advisory Committee to the Director of the National Institutes of Health and the NASA Advisory Council. He is a member of the National Academy of Engineering, and is a Fellow of the American Physical Society and the American Academy of Arts and Sciences.

1:40 to 2:20 pm

Remote Sensing in the Coming Decade: The Vision and the Reality

Speaker: **William B. Gail,** Microsoft Corporation

Investment in understanding the Earth pays off twice. It enables pursuit of scientific questions that rank among the most interesting and profound of our time - from the stability of planetary climates to the fate of biological systems in the universe. And it is critical to meeting society's practical need for increased prosperity and security. Governments rely on this understanding for treaty verification, disaster management, and resource planning; businesses require it to improve the efficiency of their operations; and consumers depend on it for everyday decisions. Over the next decade and beyond, use of remote sensing as a primary observational tool for understanding the Earth will grow rapidly as emerging user needs push demand. The vision of what can be accomplished is tantalizing. Advanced sensor technologies will allow us to observe the Earth in full 3D at nested scales, blurring the boundary between remote and in-situ information. Consumer-focused internet geospatial portals will revolutionize how remote sensing information is organized and distributed. Ironically, declining funding threatens our ability to achieve this vision and meet society's growing needs. In 2005, for example, the US National Academy of Sciences (NAS) concluded that the nation's satellite observing system is "at risk of collapse". What actions must we take today to ensure the availability of needed remote sensing capabilities tomorrow? Ongoing long-term planning activities, including GEOSS and the NAS Decadal Survey, are focused on addressing this issue. But establishing tomorrow's vision within today's reality requires the efforts of the entire remote sensing community. The challenges are daunting, but continued commitment to pushing the forefront of remote sensing is essential for both this community and society as a whole.

Biography: **William B. Gail** is Director of Strategic Development within Virtual Earth at Microsoft Corporation, with responsibility for expanding the capabilities of Virtual Earth and its use throughout the community. He was previously Vice President of the Mapping and Photogrammetric Solutions division at Vexcel Corporation (acquired in 2006 by Microsoft), where he directed a global organization responsible for a range of Earth information systems and services. Prior to joining Vexcel, he was Director of Earth Science Advanced Programs at Ball Aerospace where he led the development of spaceborne instruments and missions for Earth science and meteorology. Dr. Gail received his undergraduate degree in Physics and his PhD in Electrical Engineering from Stanford University, focusing his research on wave-particle interactions in the Earth's magnetosphere. During this period, he spent a year as cosmic ray and upper atmospheric field scientist at South Pole Station. Dr. Gail is currently on the Board of Directors of Peak Weather Resources, Inc. and is the Director of Industry Relations for the IEEE Geoscience and Remote Sensing Society. He is a member of the Executive Committee for the National Research Council's Earth Science and Applications from Space: A Community Assessment and Strategy for the Future (the "Decadal Survey"), and previously served as a member of the NRC Committee on Earth Studies (2002-05), the NRC Task Group on Principle Investigator-Led Earth Science Missions (2001-03), the NRC Committee on NASA-NOAA Transition from Research to Operations (2002-03), the NRC Committee to Review the NASA Earth Science Enterprise Strategic Plan (2003), and the NASA Earth Science and Applications from Space Strategic Roadmap Committee (2005).

Industry Perspectives

Technology reviews and forecasts

Free to all attendees and exhibition visitors.

Solar Energy: Roadblocks and Possibilities for the Future

Tuesday 15 August . . . . . 9:00 to 10:00 am

Moderator: **Steve Eglash,** Principal, Worldview Technology Partners

In this executive panel discussion, visionary leaders representing different aspects of the marketplace share their insight regarding trends and opportunities in solar and alternate energies. With the extraordinary experience and resources these executives bring to the table, you are sure to learn new things about the direction and priorities for the industry.

Executives from the following companies will discuss key issues, strategy and vision of great importance in the business of solar energy and our future:

Panelists:

Teresa Jester, Sr. Director, Engineering and Operations, Shell Solar Industries

Terry Jester has worked in photovoltaics for 26 years in various capacities ranging from leading engineering on thin film equipment development to leading the launch of a consumer product division to heading Silicon Operations. She has worked on a number of array design projects and developed the standard Cz module package in production today using EVA and Tedlar composite backsheets. She currently directs Silicon Operations and Engineering for Shell Solar Industries, a group of over 400 employees developing and producing solar modules at the 60 MW plant in Camarillo, California.

Richard M. Swanson, President and CTO, SunPower Corp.

Dr. Swanson was a professor of Electrical Engineering at Stanford University from 1976 to 1991, when he resigned to devote full time to SunPower, a company which he founded. He is currently President and CTO of SunPower.

Gary D. Conley, CEO, SolFocus

The SolFocus CEO is a seasoned high technology executive who has turned around several companies. Gary D. Conley has extensive business, marketing, and technical skills and experience with a solid reputation in the global business community. A key skill is in building world-class teams, finding it is always cheaper to go with the best. A quality focus and the reliance on Hoshin planning combine in achieving the most aggressive strategic plans and optimal return for all stakeholders.

Chris Eberspacher, Vice President of Engineering, NanoSolar

Dr. Eberspacher was Head of all R&D of the world's largest photovoltaics company, ARCO Solar / Siemens Solar Industries (today Shell Solar) where he led a team in the development of the vacuum-deposited thin-film solar-cell technology that is now one of the leading thin-film technologies in commercial production.

Christoph J. Brabec, Konarka Technologies Austria and Konarka Technologies GmbH Germany

Christoph J. Brabec is director of the polymer photovoltaics programme at Konarka technologies. Before he and his team joined Konarka, he was project leader at SIEMENS Corporate Technology with strong dedication to organic semiconductor devices. During his PhD (1995) he investigated the rheology of polymer melts with respect to molar mass correlations. In 1996 he joined the group of Prof Alan Heeger at the University of Santa Barbara for a sabbatical, and continued to work on the opto-electronic properties of organic semiconductors later on as assistant professor at the Univ.of Linz (Prof. Sariciftci). In 1998 he became senior scientist of a Christian Doppler Laboratory on organic solar cells which he left in 2001 to join SIEMENS research labs. He is author and co-author of more than 100 papers and filed over 30 patents. He finished his habilitation in physical chemistry at the Johannes Kepler Univ. Linz in 2003.

Michael Fulton, President, Ion Beam Optics Inc

Thirty-three years thin-film optical coatings: (1) OCLI: introduced IAD into production. (2) Boeing: UV blocking coating on silicone Fresnel lenses on space solar power (3) ZC&R Coatings for Optics: window coatings for the International Space Station (4) Rockwell Science Center: Mars Reconnaissance Orbiter (CRISM hyper-spectral filter) (5) Ion Beam Optics: Phase II SBIR radiation resistant coatings for space solar cell covers.

High-Brightness LEDs

Tuesday 15 August . . . . . 12:30 to 1:15 pm

Solid State Lighting: New Applications Needed to Sustain Growth

Jabdish Rebello, iSuppli

2005 was another marquee year for the solid-state lighting industry as the global market grew by almost 12% over 2004. Driven by continuous improvements in output intensities and packaging technologies, LEDs continued to penetrate new applications while increasing its dominance over competitive technologies in existing markets. During the year High Brightness LEDs rapidly become the lighting source of choice for diverse applications including traffic sig§qls; signs and displays, small LCD backlighting handset keypad lighting and decorative illumination. And the commercialization of Ultra high Brightness LEDs enabled solid state lighting to expand the reach of this lighting technology.

But in 2006 the solid state lighting industry finds itself at a critical crossroads. Over the past three years backlighting of LCDs and keypads has emerged as the single dominant application for LEDs. Now as growth in the mobile handset industry starts to slow down, the solid state lighting industry is actively seeking out new applications that will help it to sustain the growth levels of the past two years.

Large screen LCD backlighting, automotive lighting, LED signage and the general illumination are being touted as the next growth application drivers for the solid state lighting industry. The dynamics of these application markets are very different from each other and from existing markets. For solid state lighting to successfully penetrate these market segments, LED manufacturers must carefully develop product development and marketing strategies that will ensure long term success while managing short term expectations.

Biography: **Jagdish Rebello,** PhD, Principal Analyst, Communications Systems, Optical Components And Emerging Markets

Jagdish is a principal analyst with the iSuppli Market Intelligence team and works within the Application Markets and Application-Specific Devices Practice. His responsibilities include development of research and competitive analysis of various optical and opto-electronic components, wireless infrastructure and applications in optical networking communications. Jagdish Rebello also directs the iSuppli India research initiative and analyses the rapidly growing demand for consumer, automotive and wireless electronics in India as well as the emerging supply of electronic design and integration capabilities in India.

Jagdish has authored several comprehensive marketing studies on the state of the solid state lighting industry and has advised leading LED manufacturers and lighting system developers on evolving strategies targeted towards successfully penetrating the LED market.

Jagdish earned his Ph. D. in mechanical engineering from Ohio State University and his MBA in finance and marketing from Rutgers University. His MS in mechanical engineering is also from Ohio State University while his BS in mechanical engineering was from the University of Bombay.

High-Brightness LED Applications and Market Trends

Wednesday 16 August . . . . . 12:30 to 1:15 pm

Robert V. Steele, Strategies Unlimited

High-brightness LEDs (HB LEDs) have been one of the most successful technologies in the history of compound semiconductors. From modest beginnings in the mid-1990s, when high-brightness InGaAlP (red-orange-yellow) and InGaN (blue, green and white) LEDs were introduced, the worldwide HB LED market has grown to $4 billion in 2005, encompassing a wide variety of applications that were previously inaccessible by conventional LEDs.

The HB LED market is currently undergoing a period of dramatic change. After experiencing an average annual growth rate of 46% from 2001 to 2004, market growth for 2005 was just 8%. This slowdown is largely due to the fact that the mobile appliance market (mobile phones, PDAs, MP3 players, etc), which has been the primary engine of growth in recent years, is maturing, and the future growth potential in this application is limited. Other applications such as signs, automotive lighting and signals continue to provide strong markets, but growth rates are generally in the 10-15% range. Lighting is a high growth market, but it still accounts for just 6% of the overall HB LED market.

In addition to lighting, the most exciting growth prospects for HB LEDs are automobile headlamps and backlights for larger LCD displays. Both of these applications have a multibillion market potential, but they are still in the early stages of development. Thus, the main near term challenge for the HB LED industry is how to manage the transition from the high-growth markets of recent years to the slower growth markets of the next few years, until these newer applications can have a major impact.

This presentation will review the recent market and application growth trends in HB LEDs, discuss the structure of the worldwide HB LED supply chain, and provide an outlook on the application trends that will drive the market in the next five years.

Biography: **Robert V. Steele** is the Director of Optoelectronics Programs at Strategies Unlimited, and is responsible for all of the company's activities in the area of optoelectronic components. Since 1994, Dr. Steele has supervised and co-authored six editions of Strategies Unlimited's biannual report on the visible LED market, and also co-authored the report "Solid-State Lighting: New Growth Opportunities for High-Brightness LEDs." For the past six years, he has been the chair of Strategies Unlimited's annual industry conference on high-brightness LEDs, known as Strategies in Light. Dr. Steele writes regularly for industry publications on high-brightness LED markets and applications, and gives invited presentations at major conferences around the world.

Industry Perspectives

continued on next page

Industry Perspectives

Technology reviews and forecasts

Continued from previous page.

Nanotechnology Marketplace

Convention Center, Exhibition Hall A, Forum Area

Wednesday 16 August . . . . . 9:00 to 9:30 am

Patricia (Patti) Glaza. Vice President, Group Publisher, Small Times / Pennwell Corporation.

Nanotechnology has the potential to transform our lives and the companies we work in. Products utilizing nanotechnology are now hitting the market at a rapid rate. Current applications are evolutionary - improvements on what already exist. Revolutionary, disruptive nanotechnologies are still in the labs. Getting these technologies to market will take patience, resources, sound strategy, and strong relationships.

The road to the future will not be an easy one. When charting new territory, companies will face new regulations, market roadblocks, product development delays and financial woes. Success will come to the companies that can navigate the funding options and build short-term and long-term product pipelines. Build it and they will come is not an option. Leaders must clearly communicate their value proposition - not just to the public, but to corporations that are creating the tomorrow's product plans today.

While still a young technology, there are companies building track records and positioning themselves for long-term growth. Lessons from these early leaders can help guide those that are looking for commercial opportunities in nanotechnology.

Biography: **Ms. Glaza** leads Small Times, the key source of business information on micro and nanotechnologies. Ms. Glaza served as CEO until the acquisition in 2005. Ms. Glaza's experience includes technology start-ups, venture capital, and consulting. She has an MBA from the University of Michigan.

Engineering Public/Private Partnerships

Harvesting the Crops of Innovation from the Federal Laboratories

Convention Center, Exhibition Hall A, Forum Area

Wednesday 16 August . . . . . 9:30 to 10:15 am

J. Susan Sprake, Esq. Vice Chair FLC, New Business Development Executive, Los Alamos National Laboratory

Federal agencies are home to hundreds of laboratories involved in scientific research and development, across many disciplines, with a mandate to transfer technology into the mainstream of the U.S. economy. This provides great opportunities for industry to obtain innovative technologies from these laboratories. In this session, participants will hear from and engage representatives of the U.S. federal laboratory system with specific technology transfer responsibilities. Insights into how best to partner or license such federally developed technologies will be highlighted. The Federal Laboratory Consortium for Technology Transfer (FLC) is the nationwide network of federal laboratories that provides the forum to develop strategies and opportunities for linking the laboratory mission technologies and expertise with the marketplace. This session will provide an overview of the FLC and the interface between the labs and industry; focusing on how that interface works in practice.

Biography: **J. Susan Sprake** is the current Vice Chair of the Federal Laboratory Consortium (FLC). The FLC offers training and education, publication of premier laboratory technologies, and a nationally recognized awards program for outstanding technologies and partnership coming from the federal laboratories.

Ms. Sprake is also the New Business Development Executive for the Technology Transfer Division of Los Alamos National Laboratory (LANL). In this role Susan is tasked with developing long term strategic relationships with global business whose R&D needs match well with the attributes of LANL. She participates in the continued involvement of venture capital firms with the laboratory, spin out opportunities, and promoting Pacific Rim economic involvement. With over 22 years of experience in technology transfer, Ms. Sprake continues to be responsible for advising LANL on policy and legislation considerations affecting technology transfer activities. These roles include liaison duties to DOE agency level Technology Transfer Working Group (TTWG) and the DOE laboratory level Technology Partnership Working Group (TPWG).

Innovation Forum: Opportunities in Optics Instrumentation, Detectors, and Imaging from Eurasia

Conv. Ctr. Exhibit Hall A Forum Area

Wednesday 16 August . . . . . 1:30 to 3:30 pm

Facilitator: **Joanne Neuber,** U.S. Civilian Research & Development Foundation (CRDF)

Connect with companies and researchers with promising technologies from Eurasia. Speakers will present business partnership opportunities and commercially viable innovations developed in the former Soviet countries. Technologies featured will include silicon optical fibers, an x-ray imaging system, a medical device to measure oxygen, a holographic measuring device, and a laser analyzer of biological microparticles. Also, learn about joint U.S.-Eurasia research grant opportunities from the U.S. Civilian R&D Foundation (CRDF).

Panelists:

Detection Unit Prototype based on GaAs Detectors for X-ray Scanning Imaging Systems for Non-Destructive Testing Applications
Dr. Anton V. Tyazhev, Chief Engineer, RID Ltd. (Russia)

Multi-Channel NIRS System for Blood, Brain, and Other Tissue Oxygenation Monitoring
Dr. Vladimir A. Hovhannisyan, Yerevan Physics Institute (Armenia)

Modern Industrial Holography Systems for Non-Destructive Testing
Dr. Michael Gusev, Director of Research, Algorithm-Opto Ltd. (Russia)

A New Approach to the Detection of Biological Micro-Particles in the Liquid Flow
Mr. Rostyslav Bilyy, Researcher, Institute of Cell Biology - NAS of Ukraine (Ukraine) and Ivan Franko L'viv National Univ. (Ukraine)

Plasma Outside Deposition (POD) Technology for the Production of Optical Fiber Preforms
Mrs. Natalia Andronova, General Director, Fiberus Co. Ltd. (Russia)

Dynamic Aberrometry for Visual Acuity Testing
Dr. Andrey Larichev, Director of Research, VISIONICA Ltd. (Russia)

Panel

Life in the Cosmos

Marriott Marina E

Monday 14 August . . . . . 8:00 to 9:30 pm

Since liquid water is critical to all known life forms on Earth, Astrobiologists have adopted the mantra *"Follow the Water"* as a guide to where they should seek evidence of life elsewhere in the Cosmos. The ESA Mars Express mission has found evidence for a frozen lake and sea on Mars. High resolution images from NASA/ESA/Italian Space Agency Cassini Spacecraft have provided dramatic evidence of liquid water reservoirs that erupt in Yellowstone-like geysers on Saturn's tiny moon Enceladus. The NASA Deep Impact probe has shown that the nucleus of comet Temple 1 is much hotter than previously thought and that geyser-like jets frequently erupt from the surface spewing water vapor, dust, and portions of the black crust into space. These observations combined with new knowledge about the ability of microbial extremophiles to thrive in the most hostile environments on Earth enhance the potential for the existence of life elsewhere in the Solar System. This Panel will review recent discoveries and provide their own insights into these fundamental questions. The audience will be encouraged to participate in a lively question and answer session with members of the Panel.

Convenor: **Richard B. Hoover,** NASA Marshall Space Flight Ctr.

Moderators:
Paul C. W. Davies, Australian Ctr. for Astrobiology, MacQuarie Univ. (Australia)
Everett K. Gibson, Astromaterials Research Office, NASA Johnson Space Ctr.

Panelists:
Michael H. Engel, Univ. of Oklahoma
Martin Fisk, Oregon State Univ.
Gilbert V. Levin, Spherix Inc.
Gene McDonald, Univ. of Texas at Austin
Francois Raulin, LISA, CNRS & Univ. Paris XII (France)
Alexei Yu. Rozanov, Paleontological Institute, Russian Academy of Sciences (Russia)
Caleb Scharf, Columbia Astrobiology Ctr.
Michael Storrie-Lombardi, Kinohi Institute
Jonathan Trent, NASA Ames Research Ctr.

Biographies: **Paul Davies** is theoretical physicist, cosmologist, astrobiologist and professor of natural philosophy in the Australian Centre for Astrobiology at Macquarie University, Sydney, Australia. He is author of many popular and specialist science books including *Other Worlds, Are We Alone?, God and the New Physics, The Edge of Infinity, The Cosmic Blueprint, The Fifth Element: The Search for the Origin of Life,* and *About Time. The Mind of God* won the Eureka book prize in 1992. His previous academic appointments were at the Universities of Cambridge, London, Newcastle upon Tyne and Adelaide. His research has ranged from the origin of the universe to the origin of life, and includes work on black holes, the nature of time and quantum gravity. In 1995, Professor Davies was recipient of the Templeton Prize (1995) for his work on the deeper significance of science; the Kelvin Medal by the UK Institute of Physics (2001). He was awarded the 2002 Michael Faraday Prize by the Royal Society for his contributions to promoting science to the public. In April 1999, the asteroid 1992 OG was officially named (6870) Pauldavies in his honor.

Everett K. Gibson is a senior scientist in the Astromaterials Research Office at NASA Johnson Space Center, Houston, TX. Dr. Gibson is a geochemist and meteoriticist and has been with NASA for 37 years. He manages the Light Element Analysis Laboratory and is a specialist in the elemental and isotopic analysis of trace quantities of the biogenic elements. For 20 years Dr. Gibson was a Principal Investigator in NASA's Lunar Sample Analysis Program focusing on the abundances, distributions and isotopic compositions of the light elements (i.e. H, C, N, S). He is currently conducting research in NASA's Exobiology Program in the area of carbon components in terrestrial and extraterrestrial materials. He was co-leader of the ALH84001 research team with David McKay which reported in 1996 the possible signatures of biogenic activity in the Martian meteorite. Dr. Gibson has received NASA's Exceptional Scientific Achievement Medal and has been honored by the International Astronomical Union by having Asteroid 14593 named "Everett". He has published and presented more than 350 papers in the area of planetary sciences and analytical chemistry. Recently he was named the 2005-2006 Papadopoulos Fellow in Biology.

Richard B. Hoover leads the Astrobiology Group at NASA/MSFC/NSSTC, which is currently investigating anaerobic microbial extremophiles, bacterial paleontology, and searching for elemental biomarkers and microfossils in ancient rocks and meteorites. He was Science Team Leader for the *Antarctica 2000 Expedition* to collect meteorites and microbial extremophiles in the Thiel Mountains of Antarctica. He was the only American scientist on the Joint Russia/US *International Paleontological Expedition "Beringia"* searching for microbial extremophiles that inhabit the permafrost of the Kolyma Lowlands of North Siberia. He is author of one genus and six species of bacterial extremophiles. He was elected a Fellow of the Explorers Club in 2001 in recognition of his contributions on these Scientific Expeditions to the Polar Regions. He is an Honorary Life Member of the Planetary Studies Foundation and was the 2001 President of SPIE.

Workshop

X-Ray Mirror Optics

Marriott Del Mar

Tuesday 15 August . . . . . 8:00 to 9:00 pm

Chair: **Ali M. Khounsary,** Argonne National Lab.

This workshop is an informal meeting of colleagues interested in the fabrication, metrology, and implementation of advanced mirrors for x-ray, laser, and related applications.

Illumination Technical Group

Marriott Solana

Monday 14 August . . . . . 8:00 to 10:00 pm

Chair: **R. John Koshel,** Lambda Research Corp.

Following the speakers and other agenda items the floor will be open for our traditional "Problems and Solutions Workshop" session so bring some challenges for the group.

The primary topic for this meeting is "Challenges and Examples of Fabricated Illumination Optics." Speakers from industry will talk about the issues associated with the design, optimization, and tolerancing of illumination systems and components that are ultimately manufactured. While the illumination industry is growing rapidly, especially with the incorporation of novel scientific techniques and new sources, the fabrication of the systems and components has to contend with demands of minimal cost, fabrication error (e.g., sinks or warping in injection-molded parts), and source variation. Some samples of manufactured illumination systems (production, prototype, or limited run) will be shown. For example,

Bill Cassarly (Optical Research Associates) will discuss and show "Rippled Mixers for Uniformity." Uniformity remains a central topic in illumination system design and mixing rods provide an effective means to providing uniformity. Typically, flux enters one end of a

mixing rod and the flux exiting the other end provides improved spatial and/or angular uniformity. We investigate the use of mixing rods with rippled surface structures to provide enhanced uniformity.

The presenters will highlight the issues that they encountered during the design and fabrication processes. Bill and other speakers will show their optics in an informal environment that encourages questions. Systems range from lightpipes to luminaires to displays. If you would like to participate, please contact John Koshel via email (jkoshel@lambdares.com) or at the meeting. It is advised to contact him sooner rather than later due to the limited time slots available. At the end of the planned topic for the meeting, the floor will be opened to the audience to present other illumination results, trends, or questions. By attending this Illumination Technical Group meeting, you will hear and see state-of-the-art technology and concerns from the illumination community! Light refreshments will be served. We look forward to seeing you there.

Adaptive Optics Technical Group

Marriott Leucadia

Monday 14 August . . . . . 8:00 to 10:00 pm

Chair: **Scot Olivier,** Lawrence Livermore National Lab.

Panel on Adaptive Control of Large Optical Systems

The SPIE International Technical Group on Adaptive Optics will hold a panel discussion on Adaptive Control of Large Optical Systems. Leading experts from around the world will discuss the latest concepts, plans and developments in active and adaptive optics for application to optical systems with aperture sizes at the meter scale and above. All those interested are welcome to attend and participate in the discussion.

Adaptive optics has become an established technology for use on large, ground-based telescopes and in high-energy laser systems. This technology is also rapidly finding uses in commercial and defense applications, such as consumer imaging, industrial and medical lasers, optical communications, vision care and ophthalmology, surveillance, targeting and tracking, military communications, laser weapons, vibrometry and hyperspectral imaging. In addition, new adaptive optics technology continues to be developed for scientific applications, such as astronomy, vision science and scientific laser systems. In order to address these numerous emerging and established applications, an international community of researchers from around the world is advancing the state of the art in adaptive optics methods, components and systems.

The SPIE International Technical Group on Adaptive Optics provides a forum for communication within the specialized fields of active and adaptive optics. The group is intended for scientists and engineers who are working or interested in these and related disciplines, including sensor technologies, control systems, real-time computing, optical and mechanical precision engineering.

Lens Design Technical Group

Marriott Marina D

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Chairs: **Mary Turner,** Engineering Synthesis Design, Inc.; **Steve Johnston,** Photon Engineering, LLC; **Rich Pfisterer,** Photon Engineering, LLC

This group provides a forum for information exchange on lens design and techniques, materials spanning the spectrum, zoom lenses, diffraction/binary problems and solutions, athermalization, gradient index, microscope optics, mirror systems, illumination systems, geometrical optics, and aberration theory. Participants discuss lens design and analysis programs: how they work, how to use and manage them, their strengths/limitations. Most of all, they learn from one another and share "tricks of the trade."

The subject of this meeting will be "The Myth and Magic of Asphere Tolerances" (After not quite hitting the mark last year, we're going to tackle this one again!) In advance of the meeting, we shall propose an aspheric design to several experienced optical designers who will then share with us their insights on how this design would be toleranced with current, state-of-the-art optical design software. Our goal is to stimulate some informative discussions on how aspherics can be toleranced in a straightforward, unambiguous manner with some connection to the desired performance of the optical system.

Nanotechnology Technical Group

Marriott Cardiff

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

Michael Holman conducts in-depth research on the commercialization of nanoscale science and technology. He works with academics, regulators, non-governmental organizations, and other experts to gauge the potential impact of nanomaterials and approaches to minimize risk. In addition, he leads development of Lux Research's reference study, The Nanotech Report. Mike joined Lux Research from Columbia University's Nanoscale Science and Engineering Center, where he obtained his Ph.D following a B.A. in Chemistry and Philosophy from Rice University.

Lux Research is a world-leading nanotechnology research and advisory firm, with clients including top decision makers at large corporations, portfolio managers and analysts at leading financial institutions, CEOs of the most innovative start-ups, and visionary public policy makers.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

Donald Payne is the President and CEO of Nanospectra Biosciences, a Rice University spin-out developing medical therapeutic and diagnostic applications. Don has held progressively senior positions in the life science industry since 1992, holding executive positions with biopharmaceutical, tissue engineering and diagnostic companies. Prior to 1992, he held executive positions in the energy industry. He has an MBA from Rice University and a BBA from Texas A&M University.

Nanospectra Biosciences has an exclusive license to a new class of therapeutic and diagnostic optically activated nanoshell materials developed at Rice University. The company, advised by world-class researchers and biotech entrepreneurs, is focused on developing a therapy applicable to virtually all solid tumors.

Optical Materials and Optics Fabrication Technical Group

Marriott Torrance

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Chair: **Francis T. S. Yu,** The Pennsylvania State Univ.

Cochairs: **Walter Czajkowski,** Edmund Optics; **Ruyan Guo,** The Pennsylvania State Univ.

This meeting will begin with a status report on the Technical Group, followed by discussion of SPIE Optical Materials and Optics Fabrication conferences and short courses for 2006 and beyond, including ideas for new conferences and short courses.

Optics in Information Systems

Marriott Rancho Las Palmas

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Chairs: **Bahram Javidi,** Univ. of Connecticut; **Demetri Psaltis,** California Institute of Technology

This group addresses issues dealing with applications of optical processing, pattern recognition, digital optical computing, optical interconnections, neural network implementations with optics, analog image and signal processors, optical memories, and more.

Featured this year will be a panel discussion:
Optofluidics
Panel Moderator: **David Erickson,** Cornell Univ.

Optomechanical/Instrument Technical Group

Marriott Leucadia

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Chair: **Alson E. Hatheway,** Alson E. Hatheway Inc.

This is a special meeting to talk about the engineering challenges in the manufacture of metal optics. The speaker will be Robert Bernier of SSG/Tinsley. He will discuss techniques applied to current projects as well as some broader apsects of precision engineering as applied to the manufactur0ing wokrplace. The talk will highlight the application of precision engineering principles to design and manufacturing problems.

This is open to all attendants to the Optics and Photonics Symposium. Anyone who wishes to put an item on the agenda should contact the Chair [Al Hatheway: aeh@aehinc.com]. One agenda item will certainly be the planning of our biennial conference on Optomechanics for next year's (2007's) Optics and Photonics Symposium.

Following the speakers and other agenda items the floor will be open for our traditional "Problems and Solutions Workshop" session so bring some challenges for the group.

Penetrating Radiation Technical Group

Marriott Mission Hills

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Chair: **Warnick J. Kernan,** Bechtel Nevada

This group brings together technologists and scientists with interests in neutron, x- and gamma-ray detection, spectroscopy, and imaging for all applications.

This meeting will feature a special presentation on "Opportunities for Dramatic Improvements in Radiation Detection", **Douglas S. McGregor,** Kansas State Univ. The presentation will lead into a panel discussion on future opportunities.

Special Panel/Workshop

Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies

This panel/workshop is held in conjunction with conference 6301.
Convention Center Room 32A

Thursday 17 August . . . . . 3:50 to 4:50 pm

A special panel/workshop hybrid will be held in addition to the technical oral and poster presentations. The panel/workshop will consist of four 30 minutes lectures in the areas of:

- The importance of applying sufficient resources for calibration/validation (cal/val) of operational Earth satellite remote sensing system
- Current initiatives/new concepts and strategies for adequate calibration of systems
- Gaps and issues in achieving optimal and accurate validation.

Moderator: **Joseph Tansock,** Space Dynamics Laboratory, Utah State Univ.

Panelists:

Karen St. Germain, NPOESS - National Oceanic and Atmospheric Administration

Raju U. Datla, Optical Technology Division - National Institute of Standards and Technology,

Mitchell D. Goldberg, Office of Research and Applications - National Oceanic and Atmospheric Administration

William L. Smith, Jr., Langley Research Ctr.

Each panelist will deliver a short presentation to address their specific views and pose questions and issues for general deliberations. The moderator, Joseph Tansock, will summarize the presentations and overview the findings from the recent workshop on Achieving Satellite/Instrument Calibration for Climate and global Change (ASIC3), etc. The moderator will also lead the general discussions and question-and-answer. The panelists represent government agencies, remote sensing community, and users who have the responsibility, capability, incentive, and stake in the pursuit of calibration/validation activities.

Student Chapter Leadership Workshop: Service, Outreach, & Scholarship

Saturday 12 August . . . . . 8:00 am to 5:00 pm

Event by Invitation only

Meet SPIE Student Chapter Leaders (and leaders-in-the-making!) from around the world. Join us for a discussion of optics and photonics education in pre-college schools, presentations of successful outreach projects, entrepreneurship, and career advice from experts in the field. Collaborate with your peers, find colleagues, and learn how to get the most from your student chapter involvement.

Lunch with the Experts - A Special Student Event

Monday 14 August . . . . . 12:30 to 1:30 pm

Sponsored by SPIE Student Services

Take advantage of this opportunity to talk with leaders in the field of optics and photonics. Exchange ideas, share experiences, and make valuable contacts at this enjoyable, informal networking luncheon. You must sign-up to attend by Sunday at 5pm. The sign-up sheet will be located at the SPIE Marketplace. Please have your student identification available.

Student Exhibit Hall Section

Tuesday to Thursday . . . . . Exhibition hours

Visit the student section of the exhibit, and see what your fellow students have to display as part of the "Eye to the Future" section. Student Services representatives willbe available from 10:00 am to 12:00 pm Tuesday and Wednesday to answer questions about SPIE Programs.

SPIE Scholarship and Grant Winners Reception

Exhibition Hall A, Forum Area

Tuesday 15 August . . . . . 3:30 pm

The SPIE Scholarship Committee and Board of Directors have planned a special program on the exhibit floor to honor the 2006 winners of SPIE scholarships and grants. All students and 2006 Scholarship and Grant recipients are invited.

Newport Spectra-Physics Research Excellence Travel Awards

The Newport Spectra-Physics Research Excellence Travel Awards Program provides financial support for university students to attend the two largest SPIE meetings in order to present their research. These travel grants are open to any student who has an accepted paper for presentation at Photonics West or Optics & Photonics. Recipients are selected based on both the quality of the original research described in the submitted paper(s) and financial need.

For application information for this and other SPIE travel grants go to spie.org, click on Scholarships and Grants.

spieworks.com SPIE·WORKS APPLY YOUR MIND.

Special 2-Day Event!

SPIEWorks Career Fair

Tuesday 15 August . . . . . 10:00 am to 5:00 pm

Wednesday 16 August . . . . . 10:00 am to 5:00 pm

Located near registration, front of 100 aisle

Begin or advance your career with a visit to the SPIEWorks Career Fair. Meet face to face with recruiters from companies actively hiring and come prepared to discuss your skills and experience, network with technical staff and human resource recruiters; learn more about employment opportunities and interview for positions. Don't forget to post your resume and search job listings on SPIEWorks.com.

Membership in SPIE is not required.

Free Services for Employers

Stop by the SPIEWorks booth in the Career Fair and gain access to our proprietary resume database at no charge during this event.

Post jobs for free. That's right, there's no charge to post jobs to the Optics & Photonics Career Fair. Go to spieworks.com, create an account and sign-in to post jobs online. Your free job(s) will be live 14-20 August.

For information on future recruiting events contact Robert Dentel or Dave Baggenstos at +1 360 715 3705 or email sales@spieworks.com

Focus on Early Career Professionals

Document Engineering: Publishing Your Journal Papers

Sunday 13 August . . . . . 2:00 to 3:00 pm

Donald C. O'Shea, Editor, Optical Engineering

Learn about publishing from a pro. Don O'Shea, Editor of the Journal of Optical Engineering will discuss the challenges of moving from print publications to electronic media. Learn how to get your articles published and gain insight into the future of print and electronic publishing in the era of open-access, real-time publishing, and virtual journals.

The publication of the results of our research is the final step in our scientific effort. The distribution of a researcher's findings though a scientific journal began on February 16, 1672 in the Philosophical Transactions of the Royal Society of London. Until recently the way we publish our work has changed little. As Editor of Optical Engineering, I will describe the procedures that we currently use to publish papers in this digital electronics era and provide some guidance on publishing papers in today's rapidly changing methods of communication. As we move from print publications to their electronic versions we gain flexibility, but we also create problems. Concepts such as real-time publishing and virtual journals are being to be introduced and problems as old as plagiarism and new as open access journals must be addressed. Open to all technical badge holders.

New Career? Come Get a Head Start

Sunday 13 August . . . . . 3:00 to 4:00 pm

Improve your knowledge of scientific trends, develop professional connections, and realize your career potential. Join an open panel discussion with conference chairs and SPIE technical program staff. Learn how to get involved with conference committees that provide excellent networking opportunities with seasoned experts. Come with questions, leave with answers. Open to all technical badge holders.

Meet Conference Chairs

Monday 14 August . . . . . 6:00 to 7:30 pm

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Wednesday 16 August . . . . . 5:30 to 7:00 pm

During each evening poster session (Monday, Tuesday, and Wednesday) a select group of confernece chairs will be available for discussions with those interested in becoming more involved in the conference process.

Information Session

Hands-On Optics: Making an Impact with Light (HOO)

Monday 14 August . . . . . 2:00 to 5:00 pm

This three-year informal science program is designed to bring optics education to tens of thousands of underserved students nationwide. SPIE-The International Society for Optical Engineering and the Optical Society of America (OSA), along with the National Optical Astronomy Observatory (NOAO), were awarded a $1.7 million grant from the U.S. National Science Foundation (NSF) in 2003 to design and implement a science enrichment program intended for children in middle school (ages 11 to 14 years old).

Now in its third year, the HOO project has developed six hands-on activity modules intended to engage and enrich the math/science learning experience for students in the middle grades. Each module offers three to six hours of exploratory science activities that can be grouped into 30- to 90-minute sessions. This informational session will provide an introduction to some of the materials used in the program and give participants information on how they can purchase the modules for use in their regions.

Intended Audience: This informational session is intended for anyone who would like information about the Hands-On Optics Project.

Presenters: **Stephen Pompea** earned his Ph.D. in Astronomy from the University of Arizona and is currently Manager of Science Education and Astronomer at the National Optical Astronomy Observatory in Tucson, AZ. He is responsible for program creation and management in the areas of teacher professional development and teacher leadership, research experiences for teachers, and the creation of curricula and instructional materials. He is a Co-Principal Investigator for Hands-On Optics.

Constance E. Walker earned her Ph.D. in Astronomy from the University of Arizona and is Senior Science Education Specialist and Astronomer at the National Optical Astronomy Observatory in Tucson, AZ. She is part of a team responsible for the development and implementation of programs and workshops that train and partner pre-college teachers and community educators with professional and amateur astronomers. These programs involve students and their families in hands-on, inquiry-based activities in astronomy and science. She works with Stephen Pompea in developing modules for Hands-On Optics.

Robert T. Sparks earned an M.S. in Physics from Michigan State University and is a Science Education Specialist at the National Optical Astronomy Observatory in Tucson, AZ. He taught high school physics, math and astronomy for 11 years before joining the HOO Team. He has been revising the HOO modules, planning and delivering HOO professional development workshops, and working on the development of new modules.

There is no charge to attend.

Optimizing Your Resume

Note: This student-only workshop is free to SPIE Student Members, but you must register to attend.

Today's job market pits you against hundreds, if not thousands, of candidates who have approximately the same credentials as you do. How do you stand out in the crowd? This workshop, which concentrates on students and recent graduates, will review a number of strategies, tips, and tools that you can use to increase the impact of your resume and cover letter. We'll examine ways to translate your educational experience into a format that is attractive to potential employers, and how to create tailored versions of your job search materials for multiple targets. The process of creating your resume will be discussed, with a focus on both layout/formatting and writing style. We'll also look at cover letters, lists of references, and other materials used in your job search.

Please visit the registration desk to register for these workshops.

LEARNING OUTCOMES
This course will enable you to:

- translate your educational and work experience into a focused and effective resume
- avoid common mistakes and misconceptions
- understand how HR and hiring managers typically review resumes
- tailor your resume and cover letter for multiple job targets
- use an effective layout and format to ensure maximum impact
- write a cover letter that helps you stand out from the crowd

INTENDED AUDIENCE
This material is intended primarily for students, recent graduates, and early-career professionals who want to improve the quality and effectiveness of their job search materials.

INSTRUCTOR
John Cain is a former professional resume writer, and has written more than 500 resumes and cover letters for multiple industries and professions, focusing primarily on technical fields. He currently develops technical education programs for SPIE.

COURSE LEVEL: Introductory; WS777, CEU:.25
Wednesday, 1:30 to 4:00 pm

NEW!

Essential Interpersonal Skills for Technical Professionals

This one-day workshop provides a comprehensive overview of essential interpersonal skills and detailed discussion of key skills that apply to most engineering jobs and other technical work. Interpersonal skills - including teamwork, communication, networking, public speaking, negotiation, and leadership - are the techniques you need to effectively work with others.
The objective of this course is to accelerate learning by enabling technical professionals to continuously develop the most important interpersonal skills in today's fast-paced and competitive work environment. Participants will leave with tools that will help them excel quickly as engineers and technical leaders, and they will be inspired to apply what they learn to improve their personal productivity and productivity in their respective workgroups.

COURSE PRICE INCLUDES a comprehensive workbook and email/phone follow-up with the instructor after the workshop to assist with implementation.

LEARNING OUTCOMES
This course will enable you to:

- identify the "soft" skills needed to excel as a technical professional
- demonstrate improved ability to lead projects and work with teams
- assess your current abilities in key interpersonal skill areas
- set development goals specific to your individual needs

INTENDED AUDIENCE
This material is intended for anyone who can benefit from improving interpersonal skills. The course is tailored for engineers, managers, prospective managers, and other technical professionals through the use of real-world case studies, exercises and examples pertaining to the experiences of individuals and teams involved in technology projects.

INSTRUCTOR
Gary C. Hinkle is President and founder of Auxilium, Inc. His experience includes a broad variety of management and staff assignments with small, medium, and large companies involved in the development and manufacturing of high-tech products. His design and management experience spans the electronics, mechanical and software engineering disciplines.

COURSE LEVEL: Intermediate; WS774, $395 / $475
Wednesday, 8:30 am to 5:30 pm

NEW!

Book Publishing for Engineers and Scientists

Authors are often surprised at just how different book publishing can be from the process of publishing proceedings or journal articles. Writing a book can take months or even years of your time - don't be caught off-guard. This course takes you through the publishing process from the moment the idea strikes you (or the moment an Acquisitions Editor approaches you) to that unforgettable first moment of seeing your book on the shelf.

LEARNING OUTCOMES
This course will enable you to:

- determine the right publisher (and co-publishers) for your book
- write a persuasive query letter
- develop a convincing book proposal
- understand the peer-review process
- navigate the details of a basic contract
- put together a manuscript to publishers' specifications
- request permission to use figures and excerpts from other authors' work
- see the full workflow and timeline of the publishing process and where you fit into it

INTENDED AUDIENCE
This material is intended for all engineers and scientists interested in the book-publishing process. Those who are interested in writing or are currently penning a technical book will find this course valuable.

INSTRUCTOR
Timothy Lamkins earned a Bachelor's degree in Physics from the University of Texas at Dallas and a Master's degree in Optics from the University of Rochester. He has been an optical engineer, mathematics instructor, and novelist, and is currently the Acquisitions Editor for SPIE Press.

COURSE LEVEL: Introductory; WS775 $50 / $100
Wednesday, 8:30 to 11:00 am

How to Start a Small High Tech Business Almost Anywhere

This course focuses on the elements that can minimize investment capital and the time needed to set up a viable and vibrant small business capable of functioning on its own and of growing. It is possible to set up such an entity within a large company, where one or a handful of individuals can grow new ideas and technology into high tech products. These products can have a significant impact on the competitiveness of the company.

And the individuals can learn skills that in turn can be used to set up small high tech businesses as spin-offs or standalone entities. In fact running a small, high tech business independently within a larger organization will develop and hone these skills. The course provides an overview of the skills necessary to operate a successful high tech business within a large organization and points out how these skills can form the basis for developing a standalone business.

It addresses the steps needed to start a small high tech business, even under less than ideal conditions. Elements to be considered include: motivation; start up planning; types of organizations that can be operated; and the set up of structures that will greatly aid success. Crucial topics such as consulting, small business contracts, subcontracts, intellectual property, licensing, product development, long term planning, and mergers/acquisitions will be reviewed.

These topics are woven into the course structure and are intended to help attendees understand how to smooth out some of the bumps associated with traversing a difficult but often exciting road to a viable small high tech business.

LEARNING OUTCOMES

This course will enable you to:

- Outline certain skills that can have high payoff for individuals establishing high tech operations and discuss ways to hone these skills
- Describe many of the advantages and pitfalls associated with operating a small high tech business
- List the series of steps necessary for starting a small high tech business (decision to leave a job, vision for the new company, funding, the type of organization to be formed, a strategic and tactical plan, an operational plan, marketing)
- Discuss intellectual property and how to minimize the cost of acquiring and developing an effective patent base, and how to offset some costs by licensing/joint ventures
- Show examples of small companies that establish leverage to develop relationships with other organizations
- Outline some of the pitfalls that a small business may face during a merger or acquisition

INTENDED AUDIENCE

Engineers, scientists, technicians and managers in both large and small organizations can benefit from this course. People from large organizations will benefit from developing skills that can make their own organizations more cost effective and efficient, as well as from understanding the advantages and disadvantages of having small businesses as partners. For individuals contemplating or engaged in starting a small business understanding the process can literally be the difference between success and failure.

INSTRUCTOR

Eric Udd is President of Columbia Gorge Research, LLC. He worked at McDonnell Douglas from 1977 to 1993 as an Engineer/ Scientist, Unit Chief, Manager and McDonnell Douglas Fellow, building a fiber optic sensor program that grew to a large organization-wide effort. In 1993 he left McDonnell Douglas to found Blue Road Research in Troutdale, Oregon, where he now serves as Vice President of Technology. He founded Columbia Gorge Research, LLC in 2004 as his second company and plans to "retire into it". Eric Udd has taught many courses for SPIE, UCLA Extension, OSA, Sensors Expo and other organizations. He has chaired approximately 30 international conferences, holds over 40 issued patents, has written approximately 150 papers, edited two books on fiber sensors, and is a Fellow of the SPIE. Mr. Udd is currently working on a book titled "How to Start a Small High Tech Business in Troutdale, Oregon!?!"

Course level: Introductory; **WS756 CEU .35 $220 / $260 USD**
Thursday 8:30 am to 12:30 pm

The Craft of Scientific Presentations: a Workshop on Technical Presentations

This course provides attendees with an overview of what distinguishes the best scientific presentations. The course introduces a new design for presentation slides that is both more memorable and persuasive from what is typically shown at conferences.

LEARNING OUTCOMES

This course will enable you to:

- account for the audience, purpose, and occasion in a presentation,
- logically structure the introduction, middle, and ending of a scientific presentation,
- create a memorable and persuasive set of presentation slides, and
- deliver a presentation with more confidence.

INTENDED AUDIENCE

This material is intended for anyone who needs to present scientific research. Those who either have not yet presented or have made several presentations will find this course valuable.

INSTRUCTOR

Kathryn Krages, AMLS, MA, holds degrees in library science and journalism. Assistant professor of medical informatics & clinical epidemiology at Oregon Health & Science University in Portland, Ms. Krages also serves as editorial manager of the journal Medical Decision Making. Together with Cody Curtis, she teaches a scientific writing and communication course to OHSU graduate students, both on campus and via the Internet.

COURSE PRICE INCLUDES the text *The Craft of Scientific Presentations* by Michael Alley. This workshop is **free** to SPIE Student Members. **You must register to attend.**

Course level: Introductory; **WS667 CEU .35 $75 / $125 USD**
Wednesday 8:30 am to 12:30 pm

The Craft of Scientific Writing: a Workshop on Technical Writing

This course provides an overview on writing a scientific paper. The course focuses on the structure, language, and illustration of scientific papers.

LEARNING OUTCOMES

This course will enable you to:

- account for the audience, purpose, and occasion in a scientific paper,
- logically structure the introduction, middle, and ending of a scientific paper,
- understand how to make your language clear, energetic, and fluid, and
- avoid the most common mechanical errors in scientific writing.

INTENDED AUDIENCE

This material is intended for anyone who needs to write about scientific research. Those who either have not yet written a paper or have written several papers will find this course valuable.

INSTRUCTOR

Kathryn Krages, AMLS, MA, holds degrees in library science and journalism. Assistant professor of medical informatics & clinical epidemiology at Oregon Health & Science University in Portland, Ms. Krages also serves as editorial manager of the journal Medical Decision Making. Together with Cody Curtis, she teaches a scientific writing and communication course to OHSU graduate students, both on campus and via the Internet.

COURSE PRICE INCLUDES the text *The Craft of Scientific Writing* by Michael Alley. This workshop is **free** to SPIE Student Members. **You must register to attend.**

Course level: Introductory; **WS668 CEU .35 $75 / $125 USD**
Wednesday 1:30 to 5:30 pm

Please visit the registration desk to register for these workshops.

SPIE Optics & Photonics

Make Time for the *Free* Exhibition!

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10:00 am to 5:00 pm

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2006 SPIE Award Recipients

Each year SPIE recognizes outstanding achievements through its awards program. The Awards Committee is pleased to announce the 2006 SPIE award recipients.

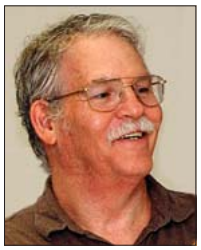
Gold Medal of the Society

Duncan T. Moore

The Gold Medal is the highest honor that the Society bestows. It is awarded annually in recognition of outstanding engineering or scientific accomplishments in optics, electro-optics, or photographic technologies or applications. To receive the award, the recipient must have made an exceptional contribution to the advancement of relevant technology.

This year the Gold Medal is presented to Duncan T. Moore, University of Rochester, USA, for his numerous contributions and innovative research in optical engineering as well as his significant contributions in the field of gradient index systems.

Read a profile of Moore in this issue of *SPIE Professional*, page 22.

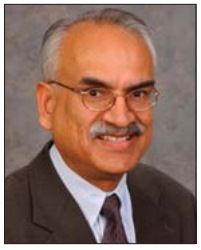


George W. Goddard Award

Martin C. Weisskopf

The George W. Goddard Award is given annually in recognition of exceptional achievement in optical or photonic instrumentation for aerospace, atmospheric science, or astronomy. The award is for the invention and development of a new technique, photonic instrumentation, instrument, or system.

Martin C. Weisskopf, NASA Marshall Space Flight Center, USA, is the 2006 George W. Goddard Award recipient for his vital contributions to the Chandra X-ray Observatory.



A. E. Conrady Award

Virendra N. Mahajan

The A.E. Conrady Award is given annually in recognition of exceptional contributions in design, construction, and testing of optical systems and instrumentation. The recognition of this award is based on developments of new equipment, techniques, and applications for designing, testing, analyzing, and/or evaluating optical systems, components, and theories.

Virendra N. Mahajan, Aerospace Corporation, USA, is this year's A.E. Conrady Award recipient for his innovative contributions to optical imaging and aberrations.

Harold E. Edgerton Award

Takeharu Goji Etoh

The Harold E. Edgerton Award recognizes outstanding contributions to optical or photonic techniques in the application and understanding of high-speed physical phenomena. The development of new technologies and the new application of existing technologies are considered in the determination of the award.

Takeharu Goji Etoh, Kinki University, Japan, is the 2006 Harold E. Edgerton award recipient for his significant contributions to the development and reduction to practice of the ultra-high-speed digital camera.

Nominate a Colleague for Outstanding Achievements

SPIE presents awards each year that recognize outstanding individual and team technical accomplishments and meritorious service to the Society.

Nominations for a 2007 SPIE Award may be made through 1 October 2006. Anyone may nominate an individual for an award of the Society, and the nominee does not have to be a member of SPIE to be eligible for an award.

For more information on the nomination process and nomination forms, visit spie.org/awards.

SPIE Educator Award

James M. Palmer

The SPIE Educator Award is given in recognition of outstanding contributions to optics education by an SPIE instructor or an educator in the field.

James M. Palmer, University of Arizona, USA, is the 2006 SPIE Educator Award recipient for his substantial and sustained contributions to education in the critical area of radiometry.

Frits Zernike Award

Timothy A. Brunner

The Frits Zernike Award for Microlithography is given for outstanding accomplishments in microlithographic technology, especially those furthering the development of semiconductor lithographic imaging solutions.

Timothy A. Brunner, IBM Thomas J. Watson Research Ctr., USA, is the recipient of the 2006 Frits Zernike Award for Microlithography for significant achievements to the fields of microlithography and optical lithography.

Dennis Gabor Award

Demetri Psaltis

The Dennis Gabor Award is presented annually in recognition of outstanding inventive accomplishments in electro-optical systems, especially those that further the development of holographic imaging and metrology applications.

Demetri Psaltis, California Institute of Technology, USA, is the recipient of the 2006 Dennis Gabor Award for his outstanding contributions and novel applications of holography in information processing.

G. G. Stokes Award

Kazuhiko Oka

The G.G. Stokes Award is given for exceptional contribution to the field of optical polarization. It may be presented for a specific achievement, development, or invention of significant importance to optical science and society, and may be given for lifetime achievement.

Kazuhiko Oka, Hokkaido University, Japan, is the 2006 G. G. Stokes Award recipient for his revolutionary techniques in polarization research and accomplishments in encoding Stokes parameters on spectral and spatial frequencies.

SPIE Technology Achievement Award

Jean-Louis de Bougrenet de la Tocnaye

The SPIE Technology Achievement Award recognizes outstanding accomplishments in optical, electro-optical, or photonic engineering technology. The recipient shall have contributed significantly to the advancement of these technologies with a specific demonstration of optical technology in a new system or application and its reduction to practice.

This year the SPIE Technology Achievement Award is presented to Jean-Louis de Bougrenet de la Tocnaye, GET-Ecole Nationale Supérieure des Télécommunications Bretagne, France, for his pioneering contributions to liquid crystal technology in telecommunications systems and in optics.

Rudolf Kingslake Medal and Prize

The Rudolf Kingslake Medal and Prize is awarded annually by the Kingslake Award Committee to recognize the most noteworthy original paper to appear in SPIE's journal *Optical Engineering* on the theoretical or experimental aspects of optical engineering. The 2005 Rudolf Kinglake Medal and Prize will be announced at the Optics & Photonics symposium and in the October issue of *SPIE Professional.*

President's Award

The President's Award, a discretionary award plaque, may be given to an individual who, in the opinion of the President and the Board of Directors, has rendered a unique and meritorious service of outstanding benefit to the Society. The President's Award will be announced at the Optics & Photonics symposium and in the October issue of *SPIE Professional.*

SPIE Elects 33 New Fellows

SPIE will honor 33 new Fellows of the Society this year. Fellows are members of distinction who have made significant scientific and technical contributions in the multidisciplinary fields of optics, photonics, and imaging. They are honored for their technical achievement, for their service to the general optics community, and to SPIE in particular.

"The annual recognition of Fellows provides an opportunity for us to acknowledge outstanding members for their service to the general optics community," says SPIE President Paul McManamon.

David L. Andrews

University of East Anglia, United Kingdom, for specific achievements in light-harvesting materials.

Maria L. Calvo

Complutense University of Madrid, Spain, for specific achievements in optical waveguide theory, holography, and service to the international optics community.

G. Groot Gregory

Lambda Research Corporation, USA, for specific achievements in optical software design.

John H. Bruning

Corning Tropel Corporation, USA, for specific achievements in phase measuring interferometry and short wavelength technology.

Casimer M. DeCusatis

IBM Corporation, USA, for specific achievements in the design, packaging, testing, and deployment of optical fiber data communication networks.

Kevin G. Harding

GE Global Research Center, USA, for specific achievements in optical metrology and optical inspection.

Arnold Burger

Fisk University, USA, for the development of new photonic devices for detecting and imaging visible light, x-rays, and gamma rays.

Victor L. Gamiz

Air Force Research Laboratory, USA, for specific achievements in unconventional imaging using diversity of light, promoting research in optical polarization for military applications, and promoting international optical research in Russia.

Daniel J. C. Herr

Semiconductor Research Corporation, USA, for the development and commercialization of two early families of chemically amplified resists and critical patterning and control challenges in the deep nanodomain.

Chennupati Jagadish

Australian National University, Australia, for pioneering contributions to semiconductor optoelectronic devices, photonic integrated circuits, and nanophotonics.

Charles Joenathan

Rose-Hulman Institute of Technology, USA, for specific achievements in speckle metrology, unique applications of holographic optical elements, and optics education.

Tribikram Kundu

University of Arizona, USA, for specific achievements in non-destructive evaluation and health monitoring of engineering and biological materials and structures.

Anil K. Jain

Michigan State University, USA, for specific achievements in pattern recognition and biometric authentication.

Eric G. Johnson

University of Central Florida, USA, for specific achievements in micro-optics and nano-optics.

Phillip A. Laplante

The Pennsylvania State University, USA, for specific achievements in real-time image processing.

James R. Janesick

Sarnoff Corporation, USA, for groundbreaking contributions to the development of high-performance scientific charge-coupled devices.

Mahendra P. Kothiyal

Indian Institute of Technology Madras, India, for specific achievements in applied optics.

Cheng-Chung Lee

National Central University, Taiwan, for specific achievements in thin-film coating.

Alex K.-Y. Jen

University of Washington, USA, for specific achievements in organic and polymeric functional materials research and nanotechnology for photonics applications.

Muradin A. Kumakhov

Institute for Roentgen Optics, Russia, for specific achievements in x-ray and neutron capillary and polycapillary optics theory and applications.

Jongmin Lee

Gwangju Institute of Science and Technology, Korea, for specific achievements in laser spectroscopy and high-power lasers.

Now It's Your Turn

Nominate an SPIE member you think deserves the distinction of Fellow. Nominations for the 2007 class of Fellows will be accepted through 1 October 2006. More information and nomination forms are available at spie.org/Fellows.

Longxia Li

Yinnel Tech Inc., USA, for specific achievements in the growth of compound semiconductors, particularly cadmium zinc telluride and mercury cadmium telluride, for infrared, x-ray, and gamma detection applications.

Joanna Schmit

Veeco Instruments Inc., USA, for innovative contributions in the areas of optical metrology and interferometric fringe pattern analysis.

Kurtis J. Thome

University of Arizona, USA, for specific achievements in remote sensing.

Chris A. Mack

KLA-Tencor Corporation, USA, for specific achievements in optical lithography.

Vladimir M. Shalaev

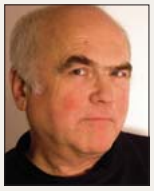
Purdue University, USA, for specific achievements in plasmonic nanophotonics and optical sensors.

Mary G. Turner

Engineering Synthesis Design Inc., USA, for specific achievements in computer-aided optical design training.

Fernando Mendoza Santoyo

Centro de Investigaciones en Óptica, Mexico, for specific achievements in optical metrology.



Tomasz Szoplik

Warsaw University, Poland, for specific achievements in applied optics and optoelectronics, in particular holography, anamorphic Fourier optics, morphological optical-digital processing, photonic crystal fibers, and metamaterials.

James C. Wiltse

Georgia Institute of Technology, USA, for specific achievements in the theory and application of large-aperture Fresnel zone plates at terahertz- and millimeter-wave frequencies.

Dan V. Nicolau

Liverpool University, United Kingdom, and Monash University, Australia, for specific achievements in bionanotechnology.

Hugo Thienpont

Vrije Universiteit Brussel, Belgium, for specific achievements in photonic interconnects, micro-optics, optical fiber sensors, and VCSELs.

Xiaocong Yuan

Nanyang Technological University, Singapore, for specific achievements in the development of micro-optics for discrete and integrated elements.

SPIE 2006 Scholarship and Grant Recipients

Apply for a 2007 Scholarship

For information on how to apply for SPIE's 2007 Educational Scholarships and Grants in Optical Science and Engineering, visit spie.org/scholarships, or contact SPIE by e-mail: scholarships@spie.org, or mail: SPIE Scholarship Committee, PO Box 10, Bellingham WA 98227-0010 USA.

This year SPIE will award 129 SPIE scholarships and grants, for a total of $260,500, to SPIE student members and educational institutions.

The mission of the SPIE Scholarships and Grants Program is to recognize, assist, and encourage SPIE student members and academic organizations with outstanding potential for long-range contribution to the field of optics and photonics.

Award-winning applicants were evaluated and selected by the SPIE Scholarship Committee and approved in April by the SPIE Board of Directors' Executive Committee.

Forty-two of the scholarships will be given to U.S. citizens (39%), and 66 to applicants from other countries (61%), including Afghanistan, Australia, Canada, China, Egypt, France, Germany, Greece, India, Iran, Ireland, Latvia, Mexico, Nigeria, Poland, Russia, Singapore, Thailand, Turkey, and the Ukraine. Of the 108 scholarships awarded, 27 will be given to women (25%).

Twelve grants are to U.S.-based institutions and nine to institutions in other countries, including Ireland, Russia, Ukraine, and the United Kingdom.

"To date, SPIE has distributed nearly $3 million dollars in individual scholarships and institutional grants. This ambitious effort reflects the Society's commitment to education and to the next generation of optical scientists and engineers around the world," says SPIE President Paul McManamon.

A group of scholarship recipients with Malgorzata Kujawinska, SPIE immediate past president (front, second from right).

SPIE 2006 Scholarship Recipients

Recipients of SPIE Scholarships named in honor of meritorious individuals or programs are:

D. J. Lovell Scholarship: **Kenneth J. Chau**, Univ. of Alberta (Canada). The $11,000 D. J. Lovell Scholarship is the Society's most prestigious scholarship. This scholarship is sponsored by SPIE with contributions from Labsphere Inc.

The second largest scholarship given by SPIE, the $10,000 **SPIE Scholarship in Optical Science and Engineering**, was awarded to **Khyati S. Mohanty**, Maharaja Sayajirao Univ. of Baroda (Baroda, India). Read more about Chau and Mohanty on page 29.

Laser Technology, Engineering and Applications Scholarship: **Miguel A. Bandrés**, California Institute of Technology (Pasadena, CA). This $4,000 scholarship is awarded in recognition of the student's scholarly achievement in laser technology, engineering, or applications. This is sponsored by SPIE with contributions from the Forum for Military Applications of Directed Energy (F-MADE).

William H. Price Scholarship in Optical Engineering: **Costin E. Curatu**, Univ. of Central Florida (Orlando, FL). The $3,000 William H. Price Scholarship in Optical Engineering was established in 1985 to honor Bill Price, a well-respected member of the SPIE technical community. This scholarship is awarded to a full-time graduate or undergraduate student in the field of optical design and engineering.

BACUS Photomask Scholarship: **Wojtek J. Poppe**, Univ. of California, Berkeley. The $2,500 BACUS Scholarship is awarded to a full-time undergraduate or graduate student in the field of microlithography with an emphasis on optical tooling and/or semiconductor manufacturing technologies. This scholarship is sponsored by BACUS, SPIE's Photomask International Technical Group.

Excellence in Optics and Photonics

The Society is proud to celebrate the success of those who have made outstanding achievements in the scientific and engineering communities. Their prestigious contributions reflect the importance of optics and photonics in our developing world.

Awards
Celebrating Success

The SPIE Awards Program has honored many individuals and organizations for their significant achievements and contributions in advancing the reach of photonics technologies.

Nomination deadline is **1 October 2006.** Members and nonmembers may participate.

Visit http://spie.org/Awards, for more information or to nominate online.

SPIE Fellows
Pioneers, Visionaries, and Dreamers

SPIE Fellows are members of distinction who have made considerable technical and scientific contribution in optics, photonics, optoelectronics, and imaging.

Nomination deadline is **1 October 2006.** Only SPIE Members may be nominated to the grade of Fellow.

Visit http://spie.org/Fellow, for more iinformation or to nominate online.

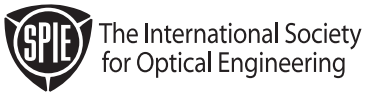
Scholarships and Grants
Growing the Future

SPIE awards over $260,000 in scholarships to student members and grants to institutions with outstanding potential for long-range contributions to the fields of optics and photonics. In 2004, 100 awards were presented, including these prestigious scholarships:

D.J. Lovell Scholarship
William Price Scholarship
F-MADE Scholarship
BACUS Scholarship

Application deadline is **6 January 2007.** Scholarship applicants must be SPIE Members.

Visit http://spie.org/scholarships, for more information or an appplication.



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Light Up the World

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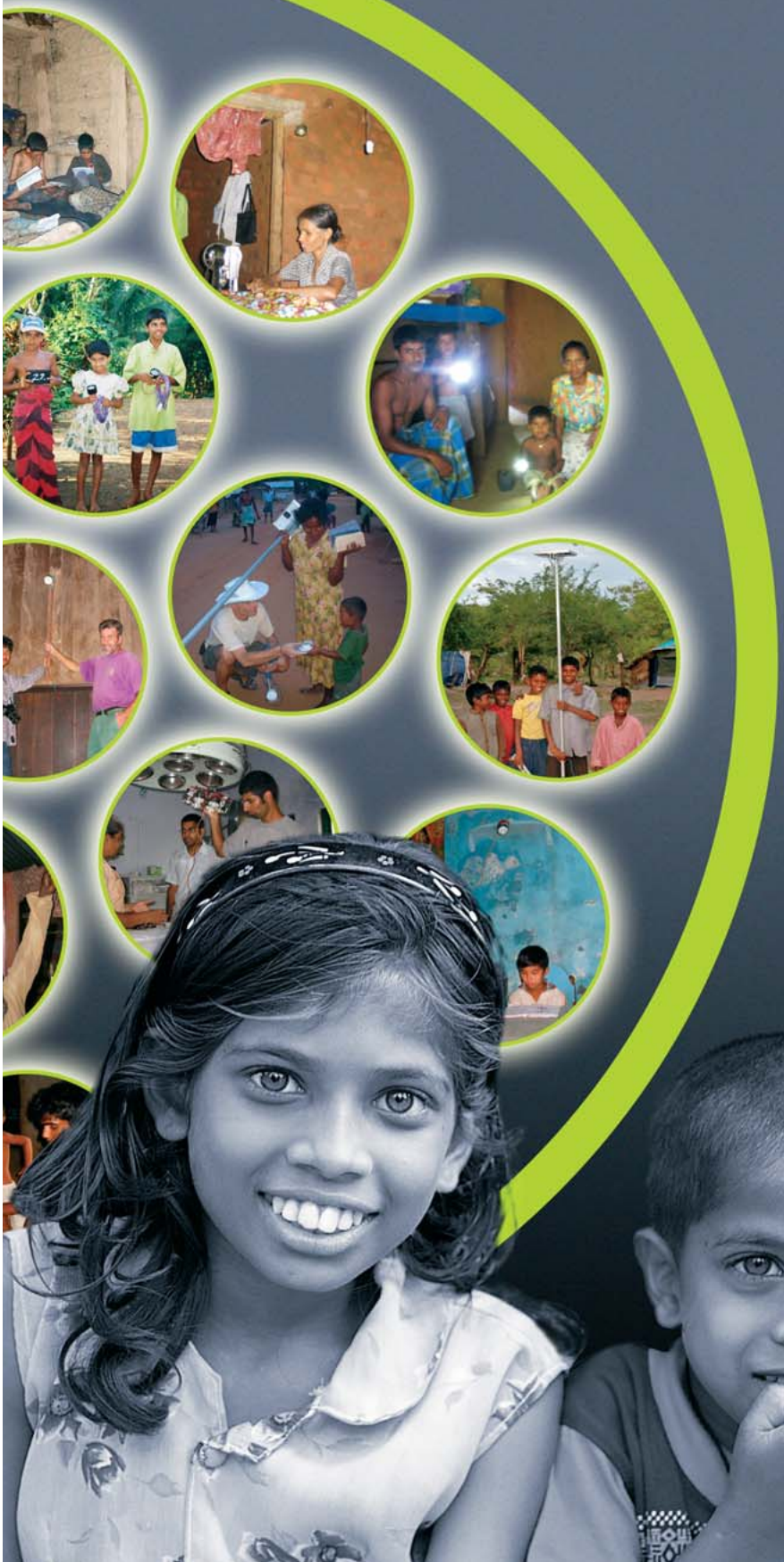

Light Up The World Foundation (LUTW) is a global humanitarian organization utilizing renewable energy and solid-state lighting technologies to bring affordable and environmentally responsible illumination around the world to people in need.

Visit the Marketplace or Exhibition Hall entrance to make your donation, and SPIE will match your donation—dollar for dollar.*

$25 buys five rechargeable batteries which will last five years

$40 buys a solar panel for a lighting system on a house

$100 buys equipment to light one house

$1,000 buys equipment to light an entire community centre

$10,000 lights up the lives of 500 people in 100 homes

SPIE The International Society for Optical Engineering

Building a better future with light

LIGHT UP THE WORLD FOUNDATION

It is only through generous support from donors that LUTW can continue lighting as many of the two billion lives in the world without electricity—one family at a time. Together we can light up lives. For more information visit www.lutw.org.

* SPIE will match up to $10,000 of total donations contributed during the course of Optics and Photonics 2006.

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Optics and Optomechanics

Program on **Optical Components and Systems Engineering** *Program Chair:* **H. Philip Stahl,** NASA Marshall Space Flight Ctr.

6286 **Advances in Thin-Film Coatings for Optical Applications III** *(Ellison)*, p. 44				
	6287 **Optical Technologies for Arming, Safing, Fuzing, and Firing II** *(Thomes/Dickey)*, p. 46			

Program on **Optical and Optomechanical Design** *Program Chair:* **José M. Sasian,** College of Optical Sciences/The Univ. of Arizona

	6288 **Current Developments in Lens Design and Optical Engineering VII** *(Mouroulis/Smith/Johnson)*, p. 48			
6290 **Laser Beam Shaping VII** *(Dickey/Shealy)*, p. 53		6289 **Novel Optical Systems Design and Optimization IX** *(Sasian/Turner)*, p. 50		
	Conference of Related Interest: 6339 **High and Low Concentration for Solar Electric Applications** *(Symko-Davies)*, p. 200	6291A **Optical System Contamination: Effects, Measurements and Control IX** *(Uy)*, p. 56		
			6291B **Stray Light in Optical Systems: Analysis, Measurement and Suppression** *(Fleming/Dittman)*, p. 58	

Metrology

Program on **Advanced Metrology** *Program Chair:* **Katherine Creath,** The Univ. of Arizona

	6292 **Interferometry XIII: Techniques and Analysis** *(Creath/Schmit)*, p. 60			
			6293 **Interferometry XIII: Applications** *(Novak/Osten/Gorecki)*, p. 63	

Detectors and Imaging Devices

Program on **Detectors and Imaging Devices** *Program Chair:* **Eustace L. Dereniak,** College of Optical Sciences/The Univ. of Arizona

6294 **Infrared and Photoelectronic Imagers and Detector Devices II** *(Longshore)*, p. 66		6295 **Infrared Detectors and Focal Plane Arrays VIII** *(Dereniak/ Sampson)*, p. 68		

Optical Instrumentation

Program on **Remote and In Situ Sensing** *Program Chair:* **Wei Gao,** Colorado State Univ.

	6296 **Earth Observing Systems XI** *(Butler)*, p. 71			
		6297 **Infrared Spaceborne Remote Sensing 2006** *(Strojnik)*, p. 74		
	6298 **Remote Sensing and Modeling of Ecosystems for Sustainability III** *(Gao/Ustin)*, p. 77			
6299 **Remote Sensing of Aerosol and Chemical Gases, Model Simulation/Assimilation, and Applications to Air Quality** *(Chu/ Szykman/Kondragunta)*, p. 81			6301 **Atmospheric and Environmental Remote Sensing Data Processing and Utilization II: Perspective on Calibration/ Validation Initiatives and Strategies** *(Huang/Bloom)*, p. 86	
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	6302 **Imaging Spectrometry XI** *(Shen/Lewis)*, p. 88			

Program on **Atmospheric and Space Optical Systems and Instrumentation** *Program Chair:* **Jennifer C. Ricklin,** Defense Advanced Research Projects Agency

6305 **Quantum Communications and Quantum Imaging IV** *(Meyers/Shih/Deacon)*, p. 96		6303 **Atmospheric Optical Modeling, Measurement, and Simulation II** *(Hammel/Kohnle)*, p. 91		
6307 **Unconventional Imaging II** *(Gamiz/Idell)*, p. 100		6304 **Free-Space Laser Communications VI** *(Majumdar/Davis)*, p. 93		
	6306 **Advanced Wavefront Control: Methods, Devices, and Applications IV** *(Giles/Gonglewski/Carreras)*, p. 98			
	6308 **Photonics for Space Environments XI** *(Taylor)*, p. 102			
	6309 **Instruments, Methods, and Missions for Astrobiology IX** *(Hoover/Levin/Rozanov)*, p. 104			

Program on **Algorithms, Architectures, and Devices** *Program Chair:* **Bahram Javidi,** Univ. of Connecticut

	6310 **Photonic Devices and Algorithms for Computing VIII** *(Iftekharuddin/Awwal)*, p. 107		6311 **Optical Information Systems IV** *(Javidi/Psaltis)*, p. 109	
		6312 **Applications of Digital Image Processing XXIX** *(Tescher)*, p. 112		
		6313 **Advanced Signal Processing Algorithms, Architectures, and Implementations XVI** *(Luk)*, p. 115		
			6314 **Photorefractive Fiber and Crystal Devices: Materials, Optical Properties, and Applications XII** *(Yu/Guo/Yin)*, p. 117	

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Program on **Mathematical Methods** *Program Chair:* **Gerhard X. Ritter,** Univ. of Florida

6315 **Mathematics of Data/Image Pattern Recognition, Compression, and Encryption with Applications** *(Ritter/Schmalz/Barrera/Astola)*, p. 121

6316 **Image Reconstruction from Incomplete Data IV** *(Bones/Fiddy/Millane)*, p. 123

Program on **X-Ray, Gamma-Ray, and Particle Technologies** *Program Chair:* **George A. Kyrala,** Los Alamos National Lab.
Program Cochairs: **Sandra G. Biedron,** Argonne National Lab.; **Massimo Altarelli,** European XFEL Project Team/DESY (Germany)

6317 **Advances in X-Ray/EUV Optics, Components, and Applications** *(Khounsary/Morawe)*, p. 126

6318 **Developments in X-Ray Tomography V** *(Bonse)*, p. 129

6319A **Hard X-Ray and Gamma-Ray Detector Physics VIII** *(Franks/Burger/James)*, p. 133

6319B **Penetrating Radiation Systems and Applications VIII** *(Barber/Doty/Roehrig)*, p. 136

Nanophotonics

Program on **Nanotechnology** *Program Chairs:* **David L. Andrews,** Univ. of East Anglia Norwich (United Kingdom); **James G. Grote,** Air Force Research Lab.

6320 **Complex Photonic Media** *(Dewar/McCall/Noginov/Zheludev)*, p. 138

6321 **Nanophotonic Materials III** *(Gaburro/Cabrini)*, p. 142

6322 **Tuning the Optic Response of Photonic Bandgap Structures III** *(Braun/Weiss)*, p. 145

6323 **Plasmonics: Metallic Nanostructures and their Optical Properties IV** *(Stockman)*, p. 147

6324 **Plasmonics: Nanoimaging, Nanofabrication, and their Applications II** *(Kawata/Shalaev/Tsai)*, p. 151

6325 **Physical Chemistry of Interfaces and Nanomaterials V** *(Spitler/Willig)*, p. 154

6326 **Optical Trapping and Optical Micromanipulation III** *(Dholakia/Spalding)*, p. 157

6327 **Nanoengineering: Fabrication, Properties, Optics, and Devices III** *(Dobisz/Eldada)*, p. 163

6328 **Nanomodeling II** *(Lakhtakia/Maksimenko)*, p. 166

6329 **Optofluidics** *(Psaltis/Fainman)*, p. 169

Organic Materials

Program on **Organic Photonics and Electronics** *Program Chair:* **Zakya H. Kafafi,** Naval Research Lab.

6330 **Nonlinear Optical Transmission and Multiphoton Processes in Organics IV** *(Yeates)*, p. 172

6331 **Linear and Nonlinear Optics of Organic Materials VI** *(Norwood)*, p. 174

6332 **Liquid Crystals X** *(Khoo)*, p. 177

6333 **Organic Light Emitting Materials and Devices X** *(Kafafi)*, p. 180

6334 **Organic Photovoltaics VII** *(Kafafi)*, p.184

6335 **Organic Holographic Materials and Applications IV** *(Orlic)*, p.187

6336 **Organic Field-Effect Transistors V** *(Bao/Gundlach)*, p. 189

Illumination Engineering

Program on **Illumination Engineering** *Program Chair:* **Ian T. Ferguson,** Georgia Institute of Technology

6337 **Sixth International Conference on Solid State Lighting** *(Ferguson/Narendran/Taguchi/Ashdown)*, p. 193

6338 **Nonimaging Optics and Efficient Illumination Systems III** *(Winston/Benítez)*, p. 197

Conference of Related Interest:
6339 **High and Low Concentration for Solar Electric Applications** *(Symko-Davies)*, p. 200

Solar Energy

Program on **Solar Energy** *Program Chair:* **Ravi Durvasula,** GE Global Research

6339 **High and Low Concentration for Solar Electric Applications** *(Symko-Davies)*, p. 200

6340 **Solar Hydrogen and Nanotechnology** *(Vayssieres)*, p. 201

Course Daily Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday

Basic Optics and Photonics

Sunday	Monday	Tuesday	Wednesday	Thursday
SC156 **Basic Optics for Engineers** *(Ducharme)* 8:30 am to 5:30 pm, $475 / $555	SC010 **Introduction to Optical Alignment Techniques** *(Ruda)* 8:30 am to 5:30 pm, $845 / $990	WS609 **Basic Optics for Non-Optics Personnel** *(Harding)* 8:30 to 11:00 am, $100 / $150		
SC001 **Optical System Design: Layout Principles and Practice** *(Smith)* 8:30 am to 5:30 pm, $510 / $590	SC793 **Practical Design of Experiments for Scientists and Engineers** *(Uy)* 8:30 am to 5:30 pm, $440 / $520			
SC206 **Polarized Light: A Practical Hands-on Introduction** *(Fisher)* 8:30 am to 5:30 pm, $440 / $520	SC325 **An Introduction to Lasers** *(Fisher)* 8:30 am to 12:30 pm, $270 / $310			

Optical and Infrared Systems

Sunday	Monday	Tuesday	Wednesday	Thursday
SC560 **Exploring Optical Aberrations** *(Mahajan)* 8:30 am to 5:30 pm, $590 / $670	SC010 **Introduction to Optical Alignment Techniques** *(Ruda)* 8:30 am to 5:30 pm, $845 / $990			
SC001 **Optical System Design: Layout Principles and Practice** *(Smith)* 8:30 am to 5:30 pm, $510 / $590	SC006 **Modern Lens Design** *(Smith)* 8:30 am to 5:30 pm, 8:30 am to 12:30 pm, $815 / $935			
SC003 **Practical Optical System Design** *(Fischer)* 8:30 am to 5:30 pm, $515 / $595	SC020 **Optical Scattering: Measurement and Analysis** *(Stover)* 8:30 am to 12:30 pm, $320 / $360	SC134 **Optical Design Fundamentals for Infrared Systems** *(Riedl)* 8:30 am to 5:30 pm, $490 / $560		
SC798 **Practical Radiometry** *(Strojnik)* 8:30 am to 5:30 pm, $440 / $520	SC017 **Principles of Fourier Optics and Diffraction** *(Gaskill)* 8:30 am to 5:30 pm, $560 / $640	SC792 **Polarization in Optical Design** *(Chipman)* 1:30 to 5:30 pm, $270 / $310		
	SC659 **Understanding Reflective Optical Design** *(Contreras)* 8:30 am to 12:30 pm, $270 / $310			
	SC492 **Predicting, Modeling, and Interpreting Light Scattered by Surfaces** *(Germer)* 1:30 to 5:30 pm, $270 / $310			

Optical Components

Sunday	Monday	Tuesday	Wednesday	Thursday
SC384 **The Design of Plastic Optical Systems** *(Schaub)* 1:30 to 5:30 pm, $270 / $310	SC720 **Cost-Conscious Tolerancing of Optical Systems** *(Youngworth)* 8:30 am to 12:30 pm, $270 / $310	SC552 **Aspheric Optics: Design, Fabrication, and Test** *(Fischer)* 8:30 am to 12:30 pm, $345 / $385		
	SC321 **Thin Film Optical Coatings** *(Macleod)* 8:30 am to 5:30 pm, $440 / $520	SC565 **Introduction to Refractive Laser Beam Shaping Optics** *(Hoffnagle)* 8:30 am to 12:30 pm, $270 / $310		

Optomechanics

Register for Courses at the Registration Desk!

Sunday	Monday	Tuesday	Wednesday	Thursday
		SC014 **Introduction to Optomechanical Design** *(Vukobratovich)* 8:30 am to 5:30 pm, $845 / $990		
		SC781 **Optomechanical Analysis** *(Hatheway)* 8:30 am to 5:30 pm, $440 / $520	SC796 **Allowable Stresses in Glass and Engineering Ceramics** *(Pepi)* 8:30 am to 12:30 pm, $270 / $310	SC254 **Integrated Opto-Mechanical Analysis** *(Genberg, Doyle)* 8:30 am to 5:30 pm, $485 / $565
		SC561 **Optomechanics for Space Applications** *(Shipley)* 8:30 am to 5:30 pm, $440 / $520	SC219 **Materials: Properties and Fabrication for Stable Optical Systems** *(Paquin)* 8:30 am to 5:30 pm, $440 / $520	
		SC015 **Structural Adhesives for Optical Bonding** *(Daly)* 8:30 am to 12:30 pm, $270 / $310		
		SC220 **Optical Alignment Mechanisms** *(Guyer)* 1:30 to 5:30 pm, $270 / $310		

Illumination Engineering

Sunday	Monday	Tuesday	Wednesday	Thursday
SC798 **Practical Radiometry** *(Strojnik)* 8:30 am to 5:30 pm, $440 / $520	SC770 **Solid State Lighting II** *(Ferguson)* 8:30 am to 12:30 pm, $270 / $310	SC011 **Design of Efficient Illumination Systems** *(Cassarly)* 8:30 am to 12:30 pm, $270 / $310	SC657 **Accurate Measurement of LED Optical Properties** *(Tirpak)* 1:30 to 5:30 pm, $270 / $310	
	SC799 **Solid State Lighting Phosphors** *(Summers)* 1:30 to 5:30 pm, $270 / $310	SC388 **Non-Imaging Optics** *(Winston)* 1:30 to 5:30 pm, $270 / $310		

Image Sensors

Sunday	Monday	Tuesday	Wednesday	Thursday
SC153 **Imaging Spectrometry** *(Dereniak, Descour)* 1:30 to 5:30 pm, $270 / $310	SC152 **Infrared Focal Plane Arrays** *(Dereniak, Hubbs)* 1:30 to 5:30 pm, $270 / $310	SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** *(Janesick)* 8:30 am to 5:30 pm, $510 / $590		
SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** *(Lomheim)* 1:30 to 5:30 pm, $270 / $310				

Sunday	Monday	Tuesday	Wednesday	Thursday

Atmospheric and Space Optical Systems

SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** *(Phillips, Andrews)* 8:30 am to 5:30 pm, $530 / $610

SC656 **Fundamentals of Free-Space Laser Communications** *(Majumdar)* 1:30 to 5:30 pm, $270 / $310

SC561 **Optomechanics for Space Applications** *(Shipley)* 8:30 am to 5:30 pm, $440 / $520

SC196 **Imaging Through Turbulence** *(Roggemann)* 8:30 am to 5:30 pm, $550 / $630

Remote and In Situ Sensing

SC567 **Introduction to Optical Remote Sensing Systems** *(Shaw)* 8:30 am to 12:30 pm, $270 / $310

SC206 **Polarized Light: A Practical Hands-on Introduction** *(Fisher)* 8:30 am to 5:30 pm, $440 / $520

SC798 **Practical Radiometry** *(Strojnik)* 8:30 am to 5:30 pm, $440 / $520

SC153 **Imaging Spectrometry** *(Dereniak, Descour)* 1:30 to 5:30 pm, $270 / $310

SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** *(Lomheim)* 1:30 to 5:30 pm, $270 / $310

SC152 **Infrared Focal Plane Arrays** *(Dereniak, Hubbs)* 1:30 to 5:30 pm, $270 / $310

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** *(Janesick)* 8:30 am to 5:30 pm, $510 / $590

SC134 **Optical Design Fundamentals for Infrared Systems** *(Riedl)* 8:30 am to 5:30 pm, $490 / $560

SC180 **Imaging Polarimetry** *(Dereniak, Miles, Sabatke)* 8:30 am to 12:30 pm, $270 / $310

SC194 **Multispectral and Hyperspectral Image Sensors** *(Lomheim)* 1:30 to 5:30 pm, $270 / $310

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** *(Abrams)* 8:30 am to 12:30 pm, $350 / $390

Image and Signal Processing

SC017 **Principles of Fourier Optics and Diffraction** *(Gaskill)* 8:30 am to 5:30 pm, $560 / $640

SC661 **Applied Image Processing** *(Iftekharuddin)* 8:30 am to 5:30 pm, $440 / $520

Interferometry and Metrology

SC213 **Introduction to Interferometric Optical Testing** *(Wyant)* 8:30 am to 12:30 pm, $270 / $310

SC020 **Optical Scattering: Measurement and Analysis** *(Stover)* 8:30 am to 12:30 pm, $320 / $360

SC017 **Principles of Fourier Optics and Diffraction** *(Gaskill)* 8:30 am to 5:30 pm, $560 / $640

SC492 **Predicting, Modeling, and Interpreting Light Scattered by Surfaces** *(Germer)* 1:30 to 5:30 pm, $270 / $310

SC795 **Interference Microscopy** *(de Groot)* 1:30 to 5:30 pm, $270 / $310

SC211 **Practical Interferometry and Fringe Analysis** *(Creath)* 8:30 am to 12:30 pm, $270 / $310

X-Ray Systems and Technologies

SC794 **X-ray microCT (Micro Computed Tomography)** *(Stock)* 1:30 to 5:30 pm, $270 / $310

Organic Photonics and Solar Energy

SC798 **Practical Radiometry** *(Strojnik)* 8:30 am to 5:30 pm, $440 / $520

SC797 **The Science and Technology of Organic Solar Cells** *(McGehee)* 1:30 to 5:30 pm, $270 / $310

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** *(Jabbour)* 8:30 am to 5:30 pm, $440 / $520

Nanotechnology

SC497 **Nanophotonics** *(Prasad)* 1:30 to 5:30 pm, $270 / $310

SC496 **Fabrication and Processing of Nanostructures** *(Cao)* 8:30 am to 5:30 pm, $480 / $560

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** *(Johnson)* 1:30 to 5:30 pm, $270 / $310

SC655 **Introduction to Optical Tweezers and Optical Micro-manipulation** *(Dholakia, Spalding)* 6:00 to 10:00 pm, $270 / $310

SC727 **Nanoplasmonics** *(Stockman)* 8:30 am to 5:30 pm, $440 / $520

Business, Patents and IP

WS775 **Book Publishing for Engineers and Scientists** *(Lamkins)* 8:30 to 11:00 am, $100 / $150

WS758 **Intellectual Property: Prior Art Searching** *(Reingand)* 8:30 am to 12:30 pm, $270 / $310

WS756 **How to Start a Small High Tech Business Almost Anywhere** *(Udd)* 8:30 am to 12:30 pm, $270 / $310

Professional Development

WS609 **Basic Optics for Non-Optics Personnel** *(Harding)* 8:30 to 11:00 am, $100 / $150

WS774 **Essential Interpersonal Skills for Technical Professionals** *(Hinkle)* 8:30 am to 5:30 pm, $445 / $525

WS667 **The Craft of Scientific Presentations: A Workshop on Technical Presentations** *(Krages)* 8:30 am to 12:30 pm, $125 / $175

WS668 **The Craft of Scientific Writing: A Workshop on Technical Writing** *(Krages)* 1:30 to 5:30 pm, $125 / $175

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Optics and Optomechanics

Program on **Optical Components and Systems Engineering**

Program Chair: **H. Philip Stahl,** NASA Marshall Space Flight Ctr.

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Conference of Related Interest

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Detectors and Imaging Devices

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Program on **Nanotechnology**

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Technical Conference Index

Organic Materials

Program on **Organic Photonics and Electronics**

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Illumination Engineering

Program on **Illumination Engineering**

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Conference of Related Interest

Solar Energy

Program on **Solar Energy**

Program Chair: **Ravi Durvasula,** GE Global Research

Conferences of Related Interest

A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk

Conference Chair: **H. John Caulfield**, Diversified Research Corp.

Emmett Leith 1927–2005

The field of holography lost one of its most notable figures on 23 December 2005. Emmett Leith—the "reinventor" of the holographic process and co-inventor of the 3-D hologram—may have passed away, but his impact on the field of holography won't soon be forgotten.

Leith was born in 1927 in Detroit, MI, the site of Wayne State University where he would earn a BS in 1950, his MS in physics in 1952, and his PhD in electrical engineering in 1978.

Leith received the National Medal of Science from President Jimmy Carter in 1979, and was a member of the National Academy of Engineering. A Fellow of both SPIE and the OSA, Leith also received the highest distinctions of both societies—the OSA Fredric Ives Medal in 1985 and the SPIE Gold Medal of the Society in 1990.

In addition, he aptly received the inaugural Dennis Gabor Award along with Yuri Denisyuk from SPIE in 1983.

Yuri Denisyuk with a holographic self-portrait.

On May 14, 2006, Yuri Denisyuk died peacefully in St. Petersburg, Russia. The loss to the optics community of this brilliant, humble, and generous man is immeasurable. Coming as it does less than six months after the death of his friend and colleague Emmett Leith, his death marks the end of an era. The two beloved founders of modern holography are gone and somehow the field they created and nurtured for over forty years must determine how it can honor them by continuing to thrive.

Professor, academician, and friend to all in his field, he was best known for the Denisyuk hologram—the holograms that produce the wonderful, often-colored 3D images hovering just behind the plane of the hologram. His other contributions in the field of coherent optics and holography were also of great importance. During the last years of his life, he had turned his attention to optical logic, high density data storage and non-linear optics where he also made significant contributions.

Denisyuk began experiments in interference photography in 1958 and published his work in 1962 in the Soviet Union. But his research was not well received until the work of Leith and Upatnieks began to generate excitement in the late sixties. In 1970 he was awarded the Lenin Prize and was elected a member of the Soviet Academy of Sciences. Denisyuk and Leith received the first Dennis Gabor Award from SPIE in 1983.

Vladimir Markov, MetroLaser
H. John Caulfield, Diversified Research Corporation

Monday 14 August

SESSION 1

Marriott Marina D . . . . . Mon. 8:30 to 10:10 am

Who Was Emmett Leith and Why Do We Celebrate Him?

Chair: **H. John Caulfield**, Diversified Research Corp.

8:00 am: **Reminiscence of Emmett Leith: the inventor and the technical breakthrough,** F. T. S. Yu, The Pennsylvania State Univ. . . . . [6311-46]

8:20 am: **Emmett was a bit different in many ways,** A. W. Lohmann, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) . . . . . [6311-47]

8:40 am: **Miracle of the off-axis interference pattern,** R. F. Wuerker, Univ. of California/Los Angeles . . . . . [6311-48]

9:00 am: **Stories of Emmett,** H. J. Caulfield, Diversified Research Corp. . . . . [6311-49]

Coffee Break . . . . . 10:10 to 10:40 am

SESSION 2

Marriott Marina D . . . . . Mon. 10:40 am to 12:45 pm

Where Did His Ideas Lead?

Chair: **Joseph Shamir**, Technion - Israel Institute of Technology (Israel)

9:20 am: **About diffusers and their importance in diffractive optics,** F. Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); H. Schimmel, LightTrans GmbH (Germany) . . . . . [6311-50]

9:40 am: **Multiwavelength holographic 3D metrology,** C. C. Aleksoff, Environmental Research Institute of Michigan . . . . . [6311-51]

10:00 am: **Leith: Upatnieks holography in computational sensors,** D. J. Brady, B. D. Guenther, Duke Univ. . . . . [6311-52]

10:20 am: **Space-time information processing,** Y. Fainman, Univ. of California/San Diego . . . . . [6311-53]

10:40 am: **Volume holographic storage and beam shaping analyzed by Gaussian beam decomposition,** J. Shamir, Technion - Israel Institute of Technology (Israel) . . . . . [6311-54]

Lunch Break . . . . . 12:45 to 2:10 pm

SESSION 3

Marriott Marina D . . . . . Mon. 2:10 to 5:10 pm

Some New Directions

Chair: **Carl C. Aleksoff**, Environmental Research Institute of Michigan

11:00 am: **Off-axis aberrations and resolution in spherical-aberration-free in-line Fraunhofer holography,** C. S. Vikram, Univ. of Alabama in Huntsville . . . . . [6311-55]

11:20 am: **Holography for information technology,** L. Hesselink, Stanford Univ. . . . . [6311-56]

11:40 am: **Holographic spectral image discrimination and segmentation,** H. J. Caulfield, Diversified Research Corp. and Alabama A&M Univ.; J. Fu, Alabama A&M Univ. . . . . [6311-57]

Coffee Break . . . . . 3:25 to 3:55 pm

12:40 pm: **Femtosecond holography,** Y. Pu, M. Centurion, D. Psaltis, California Institute of Technology . . . . . [6311-60]

12:00 pm: **Slow-down of optical pulses in holographic dynamic double interferometer,** N. V. Kukhtarev, Alabama A&M Univ. . . . . [6311-58]

12:20 pm: **A dramatic link between holography and modern medicinal curative requirements,** N. J. Phillips, De Montfort Univ. (United Kingdom) . . . . . [6311-59]

Discussion Session . . . . . 5:10 to 6:30 pm

Celebrating the Life and Accomplishments of Yuri Denisyuk

Session Chairs: **Nadya Reingand,** Landon IP, Inc.; **H. John Caulfield,** Diversified Research Corp.

Speakers: **H. John Caulfield,** Diversified Research Corp.; **Nadya Reingand,** Landon IP, Inc.; **Malgorzata Kujawinska,** Politechnika Warszawska (Poland); **Sergey Kostyukevich,** Institute of Semiconductor Physics (Ukraine)

Audience participation is invited to share in this informal session celebrating the life and accomplishments of Yuri Denisyuk.

Wednesday 16 August 2006 • Proceedings of SPIE Vol. 6285

The Nature of Light: Light in Nature

Conference Chair: **Katherine Creath**, The Univ. of Arizona

Program Committee: **Douglas S. Goodman**, Corning Tropel Corp.

Wednesday 16 August

Welcome and Introduction

Conv. Ctr. Room 8 . . . . . Wed. 1:30 to 1:40 pm

Chair: **Katherine Creath,** The Univ. of Arizona

SESSION 1

Conv. Ctr. Room 8 . . . . . Wed. 1:40 to 3:30 pm

Fundamental Properties of Light

Chair: **Katherine Creath**, The Univ. of Arizona

1:40 pm: **Do dark fringes contain any energy? *(Invited Paper)*,** C. Roychoudhuri, Univ. of Connecticut . . . . . [6285-01]

2:10 pm: **Coherence current: contrast flow in coherence function,** W. Wang, M. Takeda, The Univ. of Electro-Communications (Japan) [6285-02]

2:30 pm: **Colored reflections from the black-billed magpie feathers,** J. Vigneron, Faultes Univ. Notre Dame de la Paix (Belgium); V. M. P. Lousse, Stanford Univ. . . . . [6285-10]

2:50 pm: **Radiance: the natural parameter for describing diffraction and propagation,** J. E. Harvey, College of Optics and Photonics/Univ. of Central Florida . . . . . [6285-04]

3:10 pm: **Investigation of negative refractive index in reciprocal chiral materials,** M. R. Chatterjee, P. Anugula, P. P. Banerjee, Univ. of Dayton . . . . . [6285-05]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 2

Conv. Ctr. Room 8 . . . . . Wed. 4:00 to 5:10 pm

Light and Biological Systems

Chair: **Chandrasekhar Roychoudhuri**, Univ. of Connecticut

4:00 pm: **Light and biological systems,** K. Creath, Optineering, and The Univ. of Arizona . . . . . [6285-06]

4:20 pm: **Natural layer-by-layer photonic structure in the scales of Hoplia coerulea (Coleoptera) *(Invited Paper)*,** J. Vigneron, Faultes Univ. Notre Dame de la Paix (Belgium); V. M. P. Lousse, Stanford Univ. [6285-07]

4:50 pm: **Roles of the retinal detector array in perceiving the superposition effects of light,** C. Roychoudhuri, Univ. of Connecticut; V. Lakshminarayanan, Univ. of Missouri/St. Louis . . . . . [6285-08]

Program on **Optical Components and Systems Engineering**

Program Chair: **H. Philip Stahl,** NASA Marshall Space Flight Ctr.

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
6286 **Advances in Thin-Film Coatings for Optical Applications III** *(Ellison)*, p. 44	6287 **Optical Technologies for Arming, Safing, Fuzing, and Firing II** *(Thomes/Dickey)*, p. 46			
Course				
	SC321 **Thin Film Optical Coatings** (Macleod), 8:30 am to 5:30 pm		Register for Courses onsites at the SPIE Registration Desk!	
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41 **X-Ray and Algorithms Plenary,** 8:30 to 9:50 am, p. 8 **Lunch with the Experts - A Special Student Event,** 12:30 to 1:30 pm, p. 20 **Solid State Lighting Plenary,** 1:00 to 1:50 pm, p. 8 **Solar Energy Plenary,** 1:30 to 5:30 pm, p. 9 **Poster Session,** 6:00 to 7:30 pm, p. 6 **All-Symposium Welcome Reception,** 7:00 to 8:30 pm, p. 6 *Panel:* **Life in the Cosmos,** 8:00 to 9:30 pm, p.17 **Illumination Technical Group,** 8:00 to 10:00 pm, p. 17 **Adaptive Optics Technical Group,** 8:00 to 10:00 pm, p. 18	10:00 am to 5:00 pm **Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11 *Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14 **SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20 **Fellows Luncheon,** 12:00 to 2:00 pm, p. 5 *Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15 **Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13 **Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4 **SPIE Members Reception,** 7:00 to 8:30 pm, p.5 *Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17 **Poster/Demo Session,** 8:00 to 10:00 pm, p. 6 **Lens Design Technical Group,** 8:00 to 10:00 pm, p. 18 **Nanotechnology Technical Group,** 8:00 to 10:00 pm, p. 18 **Optical Materials and Optics Fabrication Technical Group,** 8:00 to 10:00 pm, p. 19 **Optics in Information Systems Technical Group,** 8:00 to 10:00 pm, p. 19 **Optomechanical/Instrument Technical Group,** 8:00 to 10:00 pm, p. 19 **Penetrating Radiation Technical Group,** 8:00 to 10:00 pm, p. 19	**EXHIBITION,** p. 24 10:00 am to 5:00 pm **Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21 **The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22 **Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21 *Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16 *Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16 *Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15 **SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20 *Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42 **The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23 **Poster Session,** 5:30 to 7:00 pm, p. 6 **SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	10:00 am to 2:00 pm **How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22 *Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19 **SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6

Sunday-Monday 13-14 August 2006 • Proceedings of SPIE Vol. 6286

Advances in Thin-Film Coatings for Optical Applications III

Conference Chair: **Michael J. Ellison**, Alpine Research Optics Corp.

Program Committee: **Stuart T. Allan**, QIOPTIQ (United Kingdom); **Michael L. Fulton**, Ion Beam Optics; **Jennifer D. T. Kruschwitz**, JK Consulting; **Carol L. Martinez**, Ion Beam Optics Inc.; **James B. Oliver**, Univ. of Rochester; **Robert J. Sczupak**, Rockwell Scientific Co., LLC; **Ian C. Stevenson**, Denton Vacuum, LLC

Sunday 13 August

SESSION 1

Conv. Ctr. Room 9 . . . . . Sun. 8:30 to 10:20 am

Ion and Plasma Processing

Chair: **Stuart T. Allan**, QIOPTIQ (United Kingdom)

8:30 am: **Deposition of multilayer optical coatings using closed-field magnetron sputtering *(Invited Paper)*,** D. R. Gibson, I. T. Brinkley, E. M. Waddell, M. J. Walls, Applied Multilayers Ltd. (United Kingdom) [6286-01]

9:00 am: **Characterization of optical thin films obtained by plasma ion-assisted deposition,** F. Placido, D. Gibson, Paisley Univ. (United Kingdom); E. M. Waddell, Thin Film Solutions Ltd. (United Kingdom); E. Crossan, Paisley Univ. (United Kingdom) . . . . . [6286-02]

9:20 am: **Analysis of $(TiO_2)X(Ta_2O_5)1\text{-}X$ composite thin films prepared by radio frequency ion-beam deposition,** C. Tang, Y. Wu, C. Lee, National Central Univ. (Taiwan) . . . . . [6286-03]

9:40 am: **Wavefront control of SiO_2-based UV narrow bandpass filters prepared by plasma ion-assisted deposition,** J. Wang, R. L. Maier, Corning Tropel Corp. . . . . [6286-04]

10:00 am: **High-power DPL thin films prepared by ion-beam sputtering,** H. Liu, S. Xiong, Y. Zhang, Institute of Optics and Electronics (China) . . . . . [6286-05]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 2

Conv. Ctr. Room 9 . . . . . Sun. 10:50 am to 12:20 pm

Novel Thin Film Applications

Chair: **James B. Oliver**, Univ. of Rochester

10:50 am: **Advanced optical coating technology used in the development of concentrator arrays for solar space power applications *(Invited Paper)*,** M. L. Fulton, Ion Beam Optics Inc.; M. J. O'Neill, ENTECH Inc. . . . . [6286-06]

11:20 am: **Spectral shaping filter for broadband amplifiers,** C. G. Durfee III, S. Bera, A. J. Sabbah, J. A. Squier, Colorado School of Mines; M. J. Ellison, Alpine Research Optics Corp. . . . . [6286-07]

11:40 am: **Optimized multilayer dielectric mirror coatings for gravitational wave interferometers,** J. Agresti, California Institute of Technology; G. Castaldi, Univ. degli Studi del Sannio (Italy); R. DeSalvo, California Institute of Technology; V. Galdi, V. Pierro, I. M. Pinto, Univ. degli Studi del Sannio (Italy) . . . . . [6286-08]

12:00 pm: **A new design of thin-film grating optical low-pass filter and its fabrication,** C. Lee, S. Chen, National Central Univ. (Taiwan) [6286-09]

Lunch Break . . . . . 12:20 to 1:30 pm

SESSION 3

Conv. Ctr. Room 9 . . . . . Sun. 1:30 to 3:00 pm

Novel Material Synthesis

Chair: **Michael L. Fulton**, Ion Beam Optics Inc.

1:30 pm: **Cryscade retardation films *(Invited Paper)*,** P. I. Lazarev, S. Remizov, Kontrakt Technology Ltd. (Russia) . . . . . [6286-10]

2:00 pm: **Transparent conducting oxide thin films as electrodes for precision Teng-Man electro-optic measurements: ultra-high near-infrared transparency and great compatibility,** L. Wang, Z. Liu, T. J. Marks, Northwestern Univ. . . . . [6286-12]

2:20 pm: **Investigation of cadmium alternatives in thin-film coatings,** S. J. Wakeham, G. J. Hawkins, Univ. of Reading (United Kingdom) [6286-13]

2:40 pm: **Growth of zinc oxide thin films for optoelectronic application by pulsed-laser deposition,** S. J. Kachirayil, M. Ramachandran, A. R. Sreedharan, J. K. Madambi, Cochin Univ. of Science & Technology (India) . . . . . [6286-14]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 4

Conv. Ctr. Room 9 . . . . . Sun. 3:30 to 5:00 pm

Advanced Deposition Techniques and Modeling

Chair: **Carol L. Martinez**, Ion Beam Optics Inc.

3:30 pm: **Fabrication of dense wavelength division multiplexing filters with large useful area *(Invited Paper)*,** C. Lee, S. Chen, C. Kuo, National Central Univ. (Taiwan) . . . . . [6286-15]

4:00 pm: **Advances in tunable thin films,** L. H. Domash, Aegis Semiconductor, Inc. . . . . [6286-16]

4:20 pm: **Transmission ellipsometry of transparent-film transparent-substrate systems: polynomial inversion for the substrate optical constant,** A. R. M. Zaghloul, M. Elshazly-Zaghloul, Y. A. Zaghloul, Georgia Institute of Technology and ITR Technologies Inc. . . . . [6286-17]

4:40 pm: **In situ reflectivity measurement for antireflection coating on laser diode facet,** C. J. Panchal, V. A. Kheraj, P. K. Patel, K. Pandya, M.S. Univ. of Baroda (India) . . . . . [6286-18]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

Plenary Session on Solar Energy

Conv. Ctr. Room 6A . . . . . Mon. 1:30 to 5:30 pm

Chair: **Ravi Durvasula**, GE Global Research

1:30 pm: **Nanotechnology for Photovoltaics**, Loucas Tsakalakos, GE Global Research . . . . . [6339-101]

2:00 pm: **The Promise of Concentrator Photovoltaics Using High-Efficiency Multijunction Solar Cells**, Raed A. Sherif, Spectrolab, Inc. . . . . [6339-102]

2:30 pm: **High and Medium Concentration Photovoltaics Using III-V Multi-Junctions**, Daniel Aiken, EMCORE Corp. . . . . [6339-103]

3:00 pm: **The Path from Niche to Mainstream Supplier of Clean Energy**, Richard Swanson, Sunpower Corp. . . . . [6339-104]

Coffee Break . . . . . 3:30 to 4:00 pm

4:00 pm: **The Sustainable Hydrogen Economy**, John A. Turner, National Renewable Energy Lab. . . . . [6340-105]

4:45 pm: **Chemical Conversion of Solar Energy and Photocatalysis**, Akira Fujishima, Kanagawa Academy of Science and Technology (Japan) . . . . . [6340-106]

See p. 9 for details.

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Filtering liquid CO_2 for snow cleaning of coated optics,** R. R. Zito, Richard R Zito R&D Corp. . . . . [6286-19]

✔ **Optical response and light scattering measurements from a planar guided wave,** A. S. Ramirez-Duverger, R. Garcia-Llamas, Univ. de Sonora (Mexico); J. A. Gaspar-Armenta, Univ. de Sonora (Mexico); R. Aceves-Torres, Univ. de Sonora (Mexico) . . . . . [6286-20]

✔ **Optical properties of Er3+ + Yb3+ doped gallium nitride layers,** V. Prajzler, Czech Technical Univ. in Prague (Czech Republic); I. Hüttel, Institute of Chemical Technology (Czech Republic); C. Buchal, Forschungszentrum Juelich GmbH (Germany); E. Alves, Instituto Tecnológico e Nuclear (Portugal); J. Oswald, Instytut Fizyki (Czech Republic); J. Spirkova, Institute of Chemical Technology (Czech Republic); H. Boldyryeva, V. Perina, Nuclear Physics Institute (Czech Republic); V. Jerabek, Czech Technical Univ. in Prague (Czech Republic) . . . . . [6286-21]

✔ **Theoretical description and experiment to prove the bistability of the semiconductor laser diode,** V. Jerabek, Czech Technical Univ. in Prague (Czech Republic); I. Hüttel, Institute of Chemical Technology (Czech Republic) . . . . . [6286-22]

✔ **X-measuring ellipsometer (XME): a novel ellipsometric technique to fully characterize film-substrate systems,** A. R. M. Zaghloul, Y. A. Zaghloul, Georgia Institute of Technology and ITR Technologies Inc. . . . . [6286-23]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC321 **Thin Film Optical Coatings** (Macleod) Mon. 14 Aug., 8:30 am to 5:30 pm

Tuesday 15 August 2006 • Proceedings of SPIE Vol. 6287

Optical Technologies for Arming, Safing, Fuzing, and Firing II

Conference Chairs: **William J. Thomes, Jr.**, Sandia National Labs.; **Fred M. Dickey**, Sandia National Labs.

Program Committee: **Michael J. Barglowski**, Ensign-Bickford Aerospace & Defense Co.; **Dennis W. Baum**, Office of the Under Secretary of Defense; **Richard A. Beyer**, U.S. Army Research Lab.; **Kevin R. Cochran**, Naval Surface Warfare Ctr.; **Arthur H. Guenther**, The Univ. of New Mexico; **Lawrence A. Hornak**, West Virginia Univ.; **Ronald S. Lee**, Lawrence Livermore National Lab.; **Stephen R. Lerner**, Laser Diode, Inc.; **Robert V. McDaniel**, Kollsman, Inc.; **Thomas D. Milster**, College of Optical Sciences/The Univ. of Arizona; **Gregg L. Morelli**, National Nuclear Security Administration's Kansas City Plant Operated by Honeywell FM&T, LLC; **Raymond J. Silva**, BAE Systems North America; **Kelly Simmons-Potter**, The Univ. of Arizona; **Gabriel L. Smith**, U.S. Army Research, Development and Engineering Command; **Donald R. Snyder**, Air Force Research Lab.; **John Spencer**, Photodigm Inc.; **Keith A. Thomas**, Los Alamos National Lab.; **Christian M. von der Lippe**, U.S. Army Research, Development and Engineering Command; **Louis S. Weichman**, Sandia National Labs.; **Eric J. Welle**, Sandia National Labs.; **Jan-Gustav Werthen**, JDS Uniphase Corp.; **James A. Wilder, Jr.**, Sandia National Labs.

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 16B . . . . . Tues. 8:30 am to 12:00 pm

Optical Firing and Fuzing Systems and Components

Chair: **Richard A. Beyer**, U.S. Army Research Lab.

8:30 am: **Characterization of novel optical fibers for use in laser detonators *(Invited Paper)*,** M. D. Bowden, R. Drake, L. Whitehorn, AWE plc (United Kingdom) . . . . . [6287-01]

9:00 am: **High-performance optoelectronic sensor based optical fuse,** C. M. von der Lippe, U.S. Army Research, Development and Engineering Command; J. J. Liu, Amy Research Lab. . . . . [6287-02]

9:20 am: **Characterization of optical components for use in harsh environments,** M. R. Bright, G. L. Morelli, Honeywell Technology[6287-03]

9:40 am: **High-power VCSELs for smart munitions,** J. C. Geske, M. H. MacDougal, G. Cole, Aerius Photonics, LLC; D. R. Snyder, Air Force Research Lab. . . . . [6287-04]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Long-wavelength multiwatt 1310 and 1550-nm grating outcoupled surface-emitting semiconductor lasers,** S. McWilliams, V. Amarasinghe, T. Masood, H. Shi, G. A. Evans, Photodigm Inc. . [6287-05]

10:50 am: **Design, testing, and safety considerations of an optically isolated firing set,** M. W. Heyse, Air Force Research Lab.; K. A. Jamison, R. E. Stearns, Science Applications International Corp. . . . . [6287-19]

11:10 am: **Photosensitive polysilane thin films for write-as-needed optical devices *(Invited Paper)*,** B. G. Potter, Jr., K. Simmons-Potter, The Univ. of Arizona; G. M. Jamison, W. J. Thomes, Jr., Sandia National Labs. . . . . [6287-07]

11:40 am: **MEMS-activated mirrors for arming and safing in optical firing sets,** C. L. Davis, B. T. Do, R. L. Schmitt, Sandia National Labs. . . . . [6287-06]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 2

Conv. Ctr. Room 16B . . . . . Tues. 1:30 to 3:00 pm

Explosives

Chair: **Christian M. von der Lippe**, U.S. Army Research, Development and Engineering Command

1:30 pm: **Motivations of laser detonator and firing system developments *(Invited Paper)*,** J. E. Kennedy, Ktech Corp. . . . [6287-08]

2:00 pm: **Optical initiation spot-size effects in low-density PETN,** A. Akinci, A. C. Munger, K. A. Thomas, S. A. Clarke, Los Alamos National Lab. . . . . [6287-09]

2:20 pm: **Initiation characteristics of a laser driven exploding bridgewire detonator,** E. J. Welle, S. K. Marley, K. J. Fleming, Sandia National Labs. . . . . [6287-10]

2:40 pm: **High-energy laser detonation: a comparison of four optical designs,** M. E. Couture, OASYS Technology, LLC . . . . . [6287-11]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 3

Conv. Ctr. Room 16B . . . . . Tues. 3:30 to 5:10 pm

Optical Power and Signal Transfer

Chair: **Kelly Simmons-Potter**, The Univ. of Arizona

3:30 pm: **Compact fiber lasers for efficient high-power generation,** D. A. V. Kliner, Sandia National Labs. . . . . [6287-12]

3:50 pm: **High-voltage with Si series photovoltaics,** D. J. Stein, R. Nasby, R. K. Patel, A. Hsia, R. Bennett, Sandia National Labs. . [6287-13]

4:10 pm: **The effects of illumination on the performance of series connected photovoltaic arrays for power conversion,** J. W. Shelton, F. M. Dickey, Sandia National Labs. . . . . [6287-14]

4:30 pm: **High-brightness 1064-nm grating outcoupled surface-emitting semiconductor lasers,** S. McWilliams, N. V. Amarasinghe, T. Masood, H. Shi, Photodigm Inc.; G. A. Evans, Southern Methodist Univ. . . . . [6287-15]

4:50 pm: **Temporal pulse shaping by chirped pulse stacking in fiber time-delay lines,** J. Wang, H. Lin, Z. Sui, M. Li, Laser Fusion Research Ctr./CAEP (China) . . . . . [6287-16]

SESSION 4

Conv. Ctr. Room 16B . . . . . Tues. 5:10 to 5:30 pm

Sensors and Components

Chair: **William J. Thomes, Jr.**, Sandia National Labs.

5:10 pm: **The influence of ultraviolet light on Pockels cell gas discharging,** W. Dengsheng, X. Zhang, K. Zheng, Laser Fusion Research Ctr./CAEP (China) . . . . . [6287-17]

Optics and Optomechanics

Program on **Optical and Optomechanical Design**

Program Chair: **José M. Sasian,** College of Optical Sciences/The Univ. of Arizona

Conferences

Sunday	Monday	Tuesday	Wednesday	Thursday
6290 **Laser Beam Shaping VII** *(Dickey/Shealy)*, p. 53	6288 **Current Developments in Lens Design and Optical Engineering VII** *(Mouroulis/Smith/Johnson)*, p. 48 *Conference of Related Interest*: 6339 **High and Low Concentration for Solar Electric Applications** *(Symko-Davies)*, p. 200	6289 **Novel Optical Systems Design and Optimization IX** *(Sasian/Turner)*, p. 50 6291A **Optical System Contamination: Effects, Measurements and Control IX** *(Uy)*, p. 56	6291B **Stray Light in Optical Systems: Analysis, Measurement and Suppression** *(Fleming/Dittman)*, p. 58	

Courses

Sunday	Monday	Tuesday	Wednesday	Thursday
SC003 **Practical Optical System Design** (Fischer), 8:30 am to 5:30 pm	SC006 **Modern Lens Design** (Smith), 8:30 am to 5:30 pm / 8:30 am to 12:30 pm	SC014 **Introduction to Optomechanical Design** (Vukobratovich), 8:30 am to 5:30 pm	SC219 **Materials: Properties and Fabrication for Stable Optical Systems** (Paquin), 8:30 am to 5:30 pm	SC254 **Integrated Opto-Mechanical Analysis** (Genberg, Doyle), 8:30 am to 5:30 pm
SC384 **The Design of Plastic Optical Systems** (Schaub), 1:30 to 5:30 pm	SC020 **Optical Scattering: Measurement and Analysis** (Stover), 8:30 am to 12:30 pm	SC015 **Structural Adhesives for Optical Bonding** (Daly), 8:30 am to 12:30 pm	SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi), 8:30 am to 12:30 pm	
SC560 **Exploring Optical Aberrations** (Mahajan), 8:30 am to 5:30 pm	SC492 **Predicting, Modeling, and Interpreting Light Scattered by Surfaces** (Germer), 1:30 to 5:30 pm	SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl), 8:30 am to 5:30 pm		
	SC659 **Understanding Reflective Optical Design** (Contreras), 8:30 am to 12:30 pm, p. 144	SC220 **Optical Alignment Mechanisms** (Guyer), 1:30 to 5:30 pm		
	SC720 **Cost-Conscious Tolerancing of Optical Systems** (Youngworth), 8:30 am to 12:30 pm	SC552 **Aspheric Optics: Design, Fabrication, and Test** (Fischer), 8:30 am to 12:30 pm		
		SC561 **Optomechanics for Space Applications** (Shipley), 8:30 am to 5:30 pm		
		SC565 **Introduction to Refractive Laser Beam Shaping Optics** (Hoffnagle), 8:30 am to 12:30 pm		
		SC781 **Optomechanical Analysis** (Hatheway), 8:30 am to 5:30 pm		
		SC792 **Polarization in Optical Design** (Chipman), 1:30 to 5:30 pm		

Register for Courses onsites at the SPIE Registration Desk!

See full Special Events Daily Schedule on page 4.

Monday-Tuesday 14-15 August 2006 • Proceedings of SPIE Vol. 6288

Current Developments in Lens Design and Optical Engineering VII

Conference Chairs: **Pantazis Z. Mouroulis**, Jet Propulsion Lab.; **Warren J. Smith**, Kaiser Electro-Optics, Inc.; **R. Barry Johnson**, PanTechne Corp.

Program Committee: **Florian Bociort**, Technische Univ. Delft (Netherlands); **Apostolos Deslis**, Ball Aerospace & Technologies Corp.; **Robert E. Fischer**, OPTICS 1 Inc.; **James B. Hadaway**, The Univ. of Alabama in Huntsville; **Yuhong Huang**, GSI Lumonics Inc.; **Andrew E. Lowman**, Jet Propulsion Lab.; **Virendra N. Mahajan**, The Aerospace Corp.; **Simon Thibault**, ImmerVision (Canada); **Andrew P. Wood**, Thales Optics Ltd. (United Kingdom)

Monday 14 August

SESSION 1

Conv. Ctr. Room 6F . . . . . Mon. 8:30 am to 12:10 pm

Optical Design and Optical Designs

Chair: **Pantazis Z. Mouroulis**, Jet Propulsion Lab.

8:30 am: **Fundamental and specific steps in Shack-Hartmann wavefront sensor design *(Invited Paper)*,** C. E. Curatu, College of Optics and Photonics/Univ. of Central Florida; G. C. Curatu, LightPath Technologies, Inc.; J. P. Rolland, College of Optics and Photonics/Univ. of Central Florida . . . . . [6288-01]

9:00 am: **Cemented doublet field compressor/corrector: a new optical component of general utility,** D. F. Schaack, Designs for Systems . . . . . [6288-02]

9:20 am: **Optical design of a warm shield for the 8-12-micron wavelength region,** A. Deslis, Ball Aerospace & Technologies Corp. . . . . [6288-07]

9:40 am: **Design 30X zoom lens,** S. N. Bezdidko, S.I. Vavilov State Optical Institute (Russia); M. Popov, Moscow State Univ. of Geodesy and Cartography (Russia) . . . . . [6288-04]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A hardware-based simulation platform for optical design and engineering,** F. E. Ortiz, Univ. of Delaware; J. P. Durbano, A. S. Sharkawy, EM Photonics, Inc.; S. Shi, Univ. of Delaware; P. F. Curt, EM Photonics, Inc. . . . . [6288-05]

10:50 am: **Looking for order in the optical design landscape,** F. Bociort, M. van Turnhout, Technische Univ. Delft (Netherlands) . . . . . [6288-06]

11:10 am: **Design of miniaturized optoelectronic systems using resonant microscanning mirrors for projection of full-color images,** M. Scholles, Fraunhofer-Institut für Photonische Mikrosysteme (Germany); A. Braeuer, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); K. Frommhagen, C. Gerwig, H. K. Lakner, H. Schenk, Fraunhofer-Institut für Photonische Mikrosysteme (Germany); P. Schreiber, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); M. Schwarzenberg, Fraunhofer-Institut für Photonische Mikrosysteme (Germany) . . . . . [6288-08]

11:30 am: **Low-profile optic design for mobile camera using dual freeform reflective lenses,** H. Jeong, SAMSUNG Electro-Mechanics Co., Ltd. (South Korea) . . . . . [6288-09]

11:50 am: **End-to-end design of digital imaging systems,** M. D. Robinson, D. G. Stork, Ricoh Innovations, Inc. . . . . [6288-31]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 2

Conv. Ctr. Room 6F . . . . . Mon. 1:30 to 3:20 pm

Theory and Simulation

Chair: **Virendra N. Mahajan**, The Aerospace Corp.

1:30 pm: **Extreme wavefront control for broadband high-dynamic-range imaging *(Invited Paper)*,** J. J. Green, S. B. Shaklan, Jet Propulsion Lab.; A. Give'on, California Institute of Technology . . . . . [6288-10]

2:00 pm: **The high-contrast performance of an optical vortex coronagraph,** D. M. Palacios, Jet Propulsion Lab.; G. A. Swartzlander, Jr., College of Optical Sciences/The Univ. of Arizona . . . . . [6288-11]

2:20 pm: **Optical design for the adaptive secondary stimulator and instrument testbed (ASSIST),** P. Hallibert, Leiden Univ. (Netherlands); R. Arsenault, B. Delabre, European Southern Observatory (Germany); S. Esposito, Osservatorio Astrofisico di Arcetri (Italy); N. N. Hubin, European Southern Observatory (Germany); A. Quirrenbach, Leiden Univ. (Netherlands); A. Riccardi, Osservatorio Astrofisico di Arcetri (Italy); S. Stroebele, European Southern Observatory (Germany); R. Stuik, R. Vink, Leiden Univ. (Netherlands) . . . . . [6288-12]

2:40 pm: **Proposing the inclination factor which satisfies the reciprocal theory in scalar imaging theory and confirming the validity by numerical calculations,** M. Shibuya, Tokyo Polytechnic Univ. (Japan); A. Takada, Topcon Corp. (Japan); A. Nishikata, S. Nakadate, Tokyo Polytechnic Univ. (Japan) . . . . . [6288-13]

3:00 pm: **Actual field curvature,** D. Vaughnn, August Technology Corp. . . . . [6288-14]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 3

Conv. Ctr. Room 6F . . . . . Mon. 3:50 to 5:40 pm

Inspection and Optomechanics

Chair: **R. Barry Johnson**, PanTechne Corp.

3:50 pm: **Practical measurement of headlamp beam alignment in vehicle assembly *(Invited Paper)*,** J. J. Lones, Adroit Engineering Inc.; K. Peterson, Ford Motor Co. . . . . [6288-15]

4:20 pm: **Plane development of lateral surfaces for inspection systems,** F. Francini, D. Fontani, D. Jafrancesco, L. Mercatelli, P. Sansoni, Istituto Nazionale di Ottica Applicata (Italy) . . . . . [6288-16]

4:40 pm: **Self-weight distortion of lens elements,** F. A. DeWitt IV, M. Naradikian, G. Nadorff, Melles Griot, Inc. . . . . [6288-17]

5:00 pm: **An easy way to relate optical element motion to system pointing stability,** J. H. Burge, College of Optical Sciences/The Univ. of Arizona . . . . . [6288-18]

5:20 pm: **Techniques for deriving the optimal bond-lines for athermal bonded mounts,** J. J. Herbert, Ball Aerospace & Technologies Corp. . . . . [6288-19]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Analysis and design of an adaptive lens,** A. Santiago-Alvarado, J. González-García, Univ. Tecnologica de la Mixteca (Mexico); S. Vázquez-Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); V. M. García-Luna, A. Fernández-Moreno, Univ. Technologica de la Mixteca (Mexico) . . . . . [6288-28]

✔ **Exact ray tracing for an adaptive liquid lens with elastic surfaces,** J. Gonzalez-Garcia, A. Santiago-Alvarado, Univ. Technologica de la Mixteca (Mexico); S. Vazquez-Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); A. Cordero-Davila, Benemérita Univ. Autónoma de Puebla (Mexico); G. Castro-Gonzalez, E. Vera-Diaz, E. A. Lopez-Lopez, Univ. Technologica de la Mixteca (Mexico) . . . [6288-29]

✔ **Hybrid reflecting objectives for deep-tissue functional two-photon imaging,** D. Vucinic, T. M. Bartol, Jr., T. J. Sejnowski, Salk Institute for Biological Studies . . . . . [6288-30]

✔ **Automatic birefringence characterization of single-mode erbium-doped fibers within the amplification band,** A. Gutiérrez Beltrán, D. Tentori, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6288-32]

✔ **Removal speckle using a computer-generated random-phase hologram plate in green wavelength (532 nm),** S. Shin, S. Lee, LG Electronic Institute of Technology (South Korea) . . . . . [6288-33]

✔ **An optimized design of a scanning confocal probe,** Z. Qiu, Tianjin Univ. (China) . . . . . [6288-36]

✔ **Stabilization of the line of sight of a cryogenic optical system,** Q. Ren, M. Shen, Institute of Optics and Electronics (China) . . . [6288-37]

✔ **Design of a thermal imaging diagnostic using 90-degree off-axis parabolic mirrors,** R. M. Malone, S. A. Becker, Bechtel Nevada; D. H. Dolan, Sandia National Labs.; R. G. Hacking, Bechtel Nevada; R. J. Hickman, Sandia National Labs.; M. I. Kaufman, G. D. Stevens, W. D. Turley, Bechtel Nevada . . . . . [6288-38]

✔ **Novel technique for measurement of centration errors of complex, completely mounted multi-element objective lenses,** J. Heinisch, Trioptics GmbH (Germany) . . . . . [6288-39]

Tuesday 15 August

SESSION 4

Conv. Ctr. Room 6F . . . . . Tues. 8:00 to 11:20 am

Fabrication and Materials: Joint Session with Conference 6289

Chair: **Apostolos Deslis**, Ball Aerospace & Technologies Corp.

8:00 am: **Advances in precision aspheric and metal optics finishing *(Invited Paper)*,** J. M. Kincade, J. Daniel, C. R. Sylvester, M. Morse, T. B. Hull, SSG Precison Optics, Inc. . . . . [6288-20]

8:30 am: **Super-polished aluminum mirrors through the application of chemical mechanical polishing techniques,** S. M. Wilson, M. Desai, K. Moeggenborg, J. Clark, Cabot Microelectronics Corp. . . . . [6288-21]

8:50 am: **Influence of striae on the homogeneity of the linear thermal expansion coefficient of ZERODUR(r),** R. Jedamzik, P. Hartmann, SCHOTT AG (Germany) . . . . . [6288-22]

9:10 am: **A novel resistance iterative algorithm for CCOS,** L. Zheng, X. Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China) . . . . . [6288-23]

9:30 am: **Fabrication technologies for chirped refractive microlens arrays,** F. C. Wippermann, D. Radtke, U. D. Zeitner, J. W. Duparré, A. Tünnermann, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); M. Amberg, S. Sinzinger, Technische Univ. Ilmenau (Germany); C. Reinhardt, A. Ovsianikov, B. N. Chichkov, Laser Zentrum Hannover e.V. (Germany) . . . . . [6288-24]

9:50 am: **Commissioning of the first precessions 1.2-m CNC polishing machine for large optics,** D. D. Walker, Zeeko Ltd. (United Kingdom) and Univ. College London (United Kingdom); A. T. H. Beaucamp, V. Doubrovski, Zeeko Ltd. (United Kingdom); R. Evans, Univ. College London (United Kingdom); R. R. Freeman, G. Hobbs, G. McCavana, R. Morton, D. Riley, J. Simms, X. Wei, Zeeko Ltd. (United Kingdom); G. Yu, Univ. College London (United Kingdom) . . . . . [6288-25]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **Coherences between influence function size, polishing quality, and process time in magnetorheological finishing,** M. Schinhaerl, A. Geiss, Fachhochschule Deggendorf (Germany); R. J. Stamp, Univ. of the West of England (United Kingdom); R. Rascher, P. Sperber, E. G. Pitschke, Fachhochschule Deggendorf (Germany); G. Smith, L. N. Smith, Univ. of the West of England (United Kingdom) . . . . . [6288-26]

11:00 am: **Sedimentations on high-precision surfaces of advanced materials by the magnetorheological finishing,** A. Geiss, M. Schinhaerl, E. G. Pitschke, R. Rascher, P. Sperber, Fachhochschule Deggendorf (Germany); J. Slabeycius, Alexander Dubcek Univ. of Trencin (Slovak Republic) . . . . . [6288-27]

Lens Design Technical Group

Marriott Marina D . . . . . Tues. 8:00 to 10:00 pm

Chairs: **Mary Turner**, Engineering Synthesis Design, Inc.; **Steve Johnston**, Photon Engineering, LLC; **Rich Pfisterer**, Photon Engineering, LLC

This group provides a forum for information exchange on lens design and techniques, materials spanning the spectrum, zoom lenses, diffraction/binary problems and solutions, athermalization, gradient index, microscope optics, mirror systems, illumination systems, geometrical optics, and aberration theory. Participants discuss lens design and analysis programs: how they work, how to use and manage them, their strengths/limitations. Most of all, they learn from one another and share "tricks of the trade."

The subject of this meeting will be "The Myth and Magic of Asphere Tolerances" (After not quite hitting the mark last year, we're going to tackle this one again!) In advance of the meeting, we shall propose an aspheric design to several experienced optical designers who will then share with us their insights on how this design would be toleranced with current, state-of-the-art optical design software. Our goal is to stimulate some informative discussions on how aspherics can be toleranced in a straightforward, unambiguous manner with some connection to the desired performance of the optical system.

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC003 **Practical Optical System Design** (Fischer) Sun. 13 Aug., 8:30 am to 5:30 pm
SC006 **Modern Lens Design** (Smith) Mon.-Tues. 14-15 Aug., 8:30 am to 5:30 pm / 8:30 am to 12:30 pm
SC014 **Introduction to Optomechanical Design** (Vukobratovich) Tues.-Weds. 15-16 Aug., 8:30 am to 5:30 pm
SC015 **Structural Adhesives for Optical Bonding** (Daly) Tues. 15 Aug., 8:30 am to 12:30 pm
SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl) Tues. 15 Aug., 8:30 am to 5:30 pm
SC219 **Materials: Properties and Fabrication for Stable Optical Systems** (Paquin) Weds. 16 Aug., 8:30 am to 5:30 pm
SC220 **Optical Alignment Mechanisms** (Guyer) Tues. 15 Aug., 1:30 to 5:30 pm
SC254 **Integrated Opto-Mechanical Analysis** (Genberg, Doyle) Thurs. 17 Aug., 8:30 am to 5:30 pm
SC384 **The Design of Plastic Optical Systems** (Schaub) Sun. 13 Aug., 1:30 to 5:30 pm
SC552 **Aspheric Optics: Design, Fabrication, and Test** (Fischer) Tues. 15 Aug., 8:30 am to 12:30 pm
SC560 **Exploring Optical Aberrations** (Mahajan) Sun. 13 Aug., 8:30 am to 5:30 pm
SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm
SC659 **Understanding Reflective Optical Design** (Contreras) Mon. 14 Aug., 8:30 am to 12:30 pm
SC720 **Cost-Conscious Tolerancing of Optical Systems** (Youngworth) Mon. 14 Aug., 8:30 am to 12:30 pm
SC781 **Optomechanical Analysis** (Hatheway) Tues. 15 Aug., 8:30 am to 5:30 pm
SC792 **Polarization in Optical Design** (Chipman) Tues. 15 Aug., 1:30 to 5:30 pm
SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi) Weds. 16 Aug., 8:30 am to 12:30 pm

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Novel Optical Systems Design and Optimization IX

Conference Chairs: **José M. Sasian**, College of Optical Sciences/The Univ. of Arizona; **Mary G. Turner**, Engineering Synthesis Design, Inc.

Program Committee: **Groot Gregory**, Lambda Research Corp.; **Joseph M. Howard**, NASA Goddard Space Flight Ctr.; **Richard C. Juergens**, Raytheon Missile Systems; **R. John Koshel**, Lambda Research Corp.; **George N. Lawrence**, Applied Optics Research; **Scott A. Lerner**, Hewlett-Packard Co.; **Andrew B. Locke**, ZEMAX Development Corp.; **Paul K. Manhart**, Consultant; **Richard N. Pfisterer**, Photon Engineering, LLC; **Jannick P. Rolland**, College of Optics and Photonics/Univ. of Central Florida; **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Kevin P. Thompson**, Optical Research Associates

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 6F . . . . . Tues. 8:00 to 11:20 am

Fabrication and Materials: Joint Session with Conference 6288

Chair: **Apostolos Deslis**, Ball Aerospace & Technologies Corp.

8:00 am: **Advances in precision aspheric and metal optics finishing *(Invited Paper)*,** J. M. Kincade, J. Daniel, C. R. Sylvester, M. Morse, T. B. Hull, SSG Precison Optics, Inc. . . . . [6288-20]

8:30 am: **Super-polished aluminum mirrors through the application of chemical mechanical polishing techniques,** S. M. Wilson, M. Desai, K. Moeggenborg, J. Clark, Cabot Microelectronics Corp. . . . . [6288-21]

8:50 am: **Influence of striae on the homogeneity of the linear thermal expansion coefficient of ZERODUR(r),** R. Jedamzik, P. Hartmann, SCHOTT AG (Germany) . . . . . [6288-22]

9:10 am: **A novel resistance iterative algorithm for CCOS,** L. Zheng, X. Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China) . . . . . [6288-23]

9:30 am: **Fabrication technologies for chirped refractive microlens arrays,** F. C. Wippermann, D. Radtke, U. D. Zeitner, J. W. Duparré, A. Tünnermann, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); M. Amberg, S. Sinzinger, Technische Univ. Ilmenau (Germany); C. Reinhardt, A. Ovsianikov, B. N. Chichkov, Laser Zentrum Hannover e.V. (Germany) . . . . . [6288-24]

9:50 am: **Commissioning of the first precessions 1.2-m CNC polishing machine for large optics,** D. D. Walker, Zeeko Ltd. (United Kingdom) and Univ. College London (United Kingdom); A. T. H. Beaucamp, V. Doubrovski, Zeeko Ltd. (United Kingdom); R. Evans, Univ. College London (United Kingdom); R. R. Freeman, G. Hobbs, G. McCavana, R. Morton, D. Riley, J. Simms, X. Wei, Zeeko Ltd. (United Kingdom); G. Yu, Univ. College London (United Kingdom) . . . . . [6288-25]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **Coherences between influence function size, polishing quality, and process time in magnetorheological finishing,** M. Schinhaerl, A. Geiss, Fachhochschule Deggendorf (Germany); R. J. Stamp, Univ. of the West of England (United Kingdom); R. Rascher, P. Sperber, E. G. Pitschke, Fachhochschule Deggendorf (Germany); G. Smith, L. N. Smith, Univ. of the West of England (United Kingdom) . . . . . [6288-26]

11:00 am: **Sedimentations on high-precision surfaces of advanced materials by the magnetorheological finishing,** A. Geiss, M. Schinhaerl, E. G. Pitschke, R. Rascher, P. Sperber, Fachhochschule Deggendorf (Germany); J. Slabeycius, Alexander Dubcek Univ. of Trencin (Slovak Republic) . . . . . [6288-27]

SESSION 2

Conv. Ctr. Room 6F . . . . . Tues. 11:20 to 11:50 am

Special Session: Youth Optics Education

Chair: **José M. Sasian**, College of Optical Sciences/The Univ. of Arizona

11:20 am: **Successfully using optical components and systems in novel ways during educational outreach programs for K-12 grades *(Invited Paper)*,** D. M. Silberman, Optics Institute of Southern California . . . . . [6289-01]

Lunch/Exhibition Break . . . . . 11:50 am to 1:00 pm

SESSION 3

Conv. Ctr. Room 6F . . . . . Tues. 1:00 to 3:10 pm

Materials

Chair: **Joseph M. Howard**, NASA Goddard Space Flight Ctr.

1:00 pm: **The origins of fiber print-through in lightweight composite optics,** J. D. Hochhalter, Cornell Univ.; J. J. Massarello, Air Force Research Lab.; A. K. Maji, The Univ. of New Mexico; P. A. Fuierer, New Mexico Institute of Mining and Technology . . . . . [6289-02]

1:20 pm: **Space qualification of silicon carbide for mirror applications: progress and future objectives *(Invited Paper)*,** I. A. Palusinski, I. Ghozeil, The Aerospace Corp. . . . . [6289-03]

1:50 pm: **The ultra-high precision form measurement of small, steep-sided aspheric moulds, incorporating novel automated hardware and software developments,** M. W. Mills, M. J. Hutchinson, Taylor Hobson Ltd. (United Kingdom) . . . . . [6289-04]

2:10 pm: **Key products development based on cyclo olefin polymer for LCD-TV,** Y. Konishi, Zeon Chemicals L.P.; M. Kobayashi, OPTES Inc. (Japan); K. Arakawa, Zeon Corp. (Japan) . . . . . [6289-05]

2:30 pm: **Optomechanical considerations for the VISAR diagnostic at the National Ignition Facility (NIF),** M. I. Kaufman, R. M. Malone, B. C. Frogget, T. W. Tunnell, Bechtel Nevada; J. R. Celeste, M. Landon, B. J. MacGowan, E. W. Ng, Lawrence Livermore National Lab.; P. W. Watts, Bechtel Nevada . . . . . [6289-06]

2:50 pm: **Space imaging measurement system based on fixed lens and moving detector,** A. Akiyama, Kanazawa Technical College (Japan); M. Doshida, Japan Defense Agency (Japan); E. Mutoh, Kawasaki Heavy Industries Ltd. (Japan); H. Kumagai, Tamagawa Seiki Co., Ltd. (Japan); H. Yamada, Kanazawa Technical College (Japan); H. Ishii, Nihon Univ. (Japan) . . . . . [6289-07]

Coffee Break . . . . . 3:10 to 3:40 pm

SESSION 4

Conv. Ctr. Room 6F . . . . . Tues. 3:40 to 5:50 pm

Structures in Photonics

Chairs: **Mary G. Turner**, Engineering Synthesis Design, Inc.; **José M. Sasian**, College of Optical Sciences/The Univ. of Arizona

3:40 pm: **Liquid crystal based active optics,** D. V. Wick, B. E. Bagwell, Sandia National Labs.; T. Martinez, S. R. Restaino, Naval Research Lab.; D. M. Payne, Narrascape; J. L. Harriman, Boulder Nonlinear Systems, Inc.; S. A. Serati, Boulder Nonlinear Systems Inc. . . . . [6289-55]

4:00 pm: **New approach to image amplification based on an optically-pumped multi-core optical fiber *(Invited Paper)*,** A. Chavez-Pirson, NP Photonics, Inc. . . . . [6289-08]

4:30 pm: **Tilted logpile photonic crystals using the LIGA technique,** J. D. Williams, C. L. Arrington, W. C. Sweatt, D. W. Peters, I. F. El-kady, F. B. Mccormick, Jr., Sandia National Labs. . . . . [6289-09]

4:50 pm: **Design and analysis of coupled-resonator optical waveguides (CROWs) using a hardware-based simulation platform,** S. Shi, Univ. of Delaware; J. P. Durbano, A. S. Sharkawy, EM Photonics, Inc.; F. E. Ortiz, Univ. of Delaware; P. F. Curt, EM Photonics, Inc. . . . [6289-10]

5:10 pm: **The design process for liquid crystal tunable filters,** P. A. Searcy, T. G. Baur, Meadowlark Optics, Inc. . . . . [6289-12]

5:30 pm: **The effect of fabrication parameters on the cleaving of microstructured polymer optical fibers,** S. H. Law, G. W. Barton, M. A. van Eijkelenborg, C. Yan, R. Lwin, J. Gan, The Univ. of Sydney (Australia) . . . . . [6289-14]

Lens Design Technical Group

Marriott Marina D . . . . . Tues. 8:00 to 10:00 pm

Chairs: **Mary Turner**, Engineering Synthesis Design, Inc.; **Steve Johnston**, Photon Engineering, LLC; **Rich Pfisterer**, Photon Engineering, LLC

This group provides a forum for information exchange on lens design and techniques, materials spanning the spectrum, zoom lenses, diffraction/binary problems and solutions, athermalization, gradient index, microscope optics, mirror systems, illumination systems, geometrical optics, and aberration theory. Participants discuss lens design and analysis programs: how they work, how to use and manage them, their strengths/limitations. Most of all, they learn from one another and share "tricks of the trade."

The subject of this meeting will be "The Myth and Magic of Asphere Tolerances" (After not quite hitting the mark last year, we're going to tackle this one again!) In advance of the meeting, we shall propose an aspheric design to several experienced optical designers who will then share with us their insights on how this design would be toleranced with current, state-of-the-art optical design software. Our goal is to stimulate some informative discussions on how aspherics can be toleranced in a straightforward, unambiguous manner with some connection to the desired performance of the optical system.

Wednesday 16 August

SESSION 5

Conv. Ctr. Room 6F . . . . . Wed. 8:20 to 10:30 am

Geometrical Optics and Lens Design

Chair: **Richard C. Juergens**, Raytheon Missile Systems

8:20 am: **More investigations of the skew invariant *(Invited Paper)*,** D. S. Goodman, Corning Tropel Corp. . . . . [6289-15]

8:50 am: **Geometrical optics: some applications of the law of intensities *(Invited Paper)*,** D. L. Shealy, The Univ. of Alabama at Birmingham . . . . . [6289-16]

9:20 am: **Optics to rectify CORONA photographs for map making *(Invited Paper)*,** R. S. Hilbert, Optical Reseach Associates . . . . [6289-17]

9:50 am: **Low-birefringence lens design for polarization sensitive optical systems,** L. Sun, Melles Griot, Inc. . . . . [6289-18]

10:10 am: **Low vision goggle: optical design studies,** O. Levy, Ben-Gurion Univ. of the Negev (Israel); B. Apter, Holon Institute of Technology (Israel); U. Efron, Ben-Gurion Univ. of the Negev (Israel) and Holon Institute of Technology (Israel) . . . . . [6289-19]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 6

Conv. Ctr. Room 6F . . . . . Wed. 11:00 am to 12:10 pm

Alignment

Chair: **David L. Shealy**, The Univ. of Alabama at Birmingham

11:00 am: **Versatile autostigmatic microscope *(Invited Paper)*,** R. E. Parks, William P. Kuhn, Ph.D., LLC . . . . . [6289-20]

11:30 am: **Algorithms for sensor chip alignment to blind datums,** G. B. Hughes, FLIR Systems, Inc. . . . . [6289-21]

11:50 am: **A multidisciplinary design and optimization methodology for the Adaptive Scanning Optical Microscope (ASOM),** B. M. Potsaid, Rensselaer Polytechnic Institute; Y. Bellouard, Technische Univ. Eindhoven (Netherlands); J. T. Wen, Rensselaer Polytechnic Institute . . . . . [6289-22]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 7

Conv. Ctr. Room 6F . . . . . Wed. 1:30 to 3:30 pm

Diffraction and Illumination

Chair: **R. John Koshel**, Lambda Research Corp.

1:30 pm: **Understanding diffraction effects in novel systems containing nanostructures *(Invited Paper)*,** J. E. Harvey, College of Optics and Photonics/Univ. of Central Florida . . . . . [6289-23]

2:00 pm: **Numerical experiments in modeling diffraction phenomena with Monte Carlo ray tracing *(Invited Paper)*,** E. R. Freniere, Lambda Research Corp. . . . . [6289-24]

2:30 pm: **Robust error estimation in optical analysis software using subdivided and recombined ray traces,** D. G. Jenkins, E. C. Fest, Raytheon Missile Systems . . . . . [6289-25]

2:50 pm: **Illumination optimization for optical semiconductor metrology,** B. M. Barnes, National Institute of Standards and Technology; L. P. Howard, Precera, Inc.; Y. Sohn, M. D. Stocker, R. M. Silver, National Institute of Standards and Technology . . . . . [6289-26]

3:10 pm: **Optical illumination and critical dimension analysis using the through-focus focus metric method,** R. Attota, R. M. Silver, National Institute of Standards and Technology . . . . . [6289-27]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 8

Conv. Ctr. Room 6F . . . . . Wed. 4:00 to 5:20 pm

Optical Modeling

Chairs: **Mary G. Turner**, Engineering Synthesis Design, Inc.; **José M. Sasian**, College of Optical Sciences/The Univ. of Arizona

4:00 pm: **Novel realistic image simulation process for optimizing 3- and 5-Mpixels imaging modules,** D. V. Bakin, P. Rao, B. G. Rodricks, K. Venkataraman, Micron Technology, Inc. . . . . [6289-29]

4:20 pm: **Imaging at low Fresnel number: some challenges and applications,** M. J. Ferlet, Rutherford Appleton Lab. (United Kingdom) . . . . . [6289-30]

4:40 pm: **Mechanically assisted liquid lens zoom system for mobile phone cameras,** F. C. Wippermann, P. Schreiber, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); B. Berge, VARIOPTIC (France) . . . . . [6289-31]

5:00 pm: **Adaptive optics for zoom lens applications,** F. P. Shevlin, Dyoptyka Ltd. (Ireland) . . . . . [6289-32]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Optical system for ultrathin projection TV,** S. M. Shamaev, Bauman Moscow State Technical Univ. (Russia) . . . . . [6289-33]

✔ **Stability analysis of optomechanical system in SHENGUANG II Facility,** T. Zeng, J. Zhu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6289-34]

✔ **A novel lens cap for LED and optimization of the optical cavity for large-sized backlight system,** J. Chang, National Ctr. for High Performance Computing (Taiwan); L. Liao, C. Hwang, National Cheng Kung Univ. (Taiwan) . . . . . [6289-35]

✔ **A study on the optimization methods for optomechanical alignment,** M. Yu, Y. Li, P. Shu, National Chiao Tung Univ. (Taiwan); T. Y. Lin, Chung Cheng Institute of Technology (Taiwan) . . . . . [6289-38]

✔ **Optimization design of large octagonal Nd:glass support system,** Z. Liu, W. Shen, J. Zhu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6289-39]

✔ **Compound telescope,** Z. Lu, Changchun Institute of Optics, Fine Mechanics and Physics (China) . . . . . [6289-40]

✔ **Near field analysis of CSG and BSG combined element under high power laser condition,** F. Gao, Sichuan Univ. (China) . . . . . [6289-41]

✔ **Infrared photonic lattice coatings,** C. F. Schmidt, W. C. Sweatt, I. F. El-Kady, F. B. McCormick, Jr., D. W. Peters, S. H. Kravitz, J. C. Verley, U. Krishnamoothy, D. Ingersoll, W. G. Yelton, Sandia National Labs. . . . . [6289-42]

✔ **CCD on-chip imaging for smart micro-object and fluorescence imaging system,** H. Qiu, Y. Liu, L. Sun, Q. Tian, Tsinghua Univ. (China) . . . . . [6289-43]

✔ **Automated zoom lens design and second-order derivative optimization method,** S. G. Menabde, V. M. Klimov, Bauman Moscow State Technical Univ. (Russia) . . . . . [6289-44]

✔ **Applications of chirped micro-lens arrays for aberration compensation and improved system integration,** F. C. Wippermann, J. W. Duparré, P. Schreiber, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) . . . . . [6289-45]

✔ **Design considerations for a time-resolved tomographic diagnostic at DARHT,** M. I. Kaufman, D. K. Frayer, W. Dreesen, D. E. Johnson, A. Meidinger, Bechtel Nevada . . . . . [6289-46]

✔ **Servo-modulator system used in a 2D shearing interferometer,** G. Garcia-Torales, Univ. de Guadalajara (Mexico); M. S. Strojnik, Ctr. de Investigaciones en Óptica A. C. (Mexico); J. L. F. Nuñez, R. X. M. Quirarte, A. G. Alvarez, Univ. de Guadalajara (Mexico) . . . . . [6289-47]

✔ **An experimental instrument of diffraction imaging and its applications,** W. Zhang, C. Huang, T. Li, L. Wan, X. He, Guangxi Univ. (China) . . . . . [6289-48]

✔ **Design and fabrication of dye-doped polymer optical fiber for optical amplification,** M. R. Nair, S. M. Nambiar, K. Geetha, C. P. G. Vallabhan, P. Radhakrishnan, V. P. N. Nampoori, Cochin Univ. of Science & Technology (India) . . . . . [6289-49]

✔ **Fabrication and characterisation of graded index polymer optical fibre preforms,** M. Kailasnath, K. Rajesh, P. Radhakrishnan, V. P. N. Nampoori, C. P. Girijavallabhan, Cochin Univ. of Science & Technology (India) . . . . . [6289-50]

✔ **The fabrication of micro lens controlled by high-voltage,** Y. Liu, F. T. O'Neill, J. P. Ryle, U. Gopinathan, J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland) . . . . . [6289-51]

✔ **Research on the frequency response function and bandwidth of step-index plastic optical fiber,** W. Ge, Xi'an Institute of Optics and Precision Mechanics (China) and Xingjiang Univ. (China); W. Tian, Xi'an Institute of Optics and Precision Mechanics (China) . . . . . [6289-52]

✔ **Novel composite coded pattern for small angle measurement using imaging method,** N. S. Sree, S. S. Gorthi, K. R. Lolla, Indian Institute of Science (India) . . . . . [6289-53]

✔ **Alignment on the LIL laser facility,** M. Mangeant, J. Dubois, R. André, C. Lissayou, C. Lanternier, E. Bar, Commissariat à l'Energie Atomique (France) . . . . . [6289-56]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC003 **Practical Optical System Design** (Fischer) Sun. 13 Aug., 8:30 am to 5:30 pm

SC006 **Modern Lens Design** (Smith) Mon.-Tues. 14-15 Aug., 8:30 am to 5:30 pm / 8:30 am to 12:30 pm

SC014 **Introduction to Optomechanical Design** (Vukobratovich) Tues.-Weds. 15-16 Aug., 8:30 am to 5:30 pm

SC015 **Structural Adhesives for Optical Bonding** (Daly) Tues. 15 Aug., 8:30 am to 12:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl) Tues. 15 Aug., 8:30 am to 5:30 pm

SC219 **Materials: Properties and Fabrication for Stable Optical Systems** (Paquin) Weds. 16 Aug., 8:30 am to 5:30 pm

SC220 **Optical Alignment Mechanisms** (Guyer) Tues. 15 Aug., 1:30 to 5:30 pm

SC254 **Integrated Opto-Mechanical Analysis** (Genberg, Doyle) Thurs. 17 Aug., 8:30 am to 5:30 pm

SC384 **The Design of Plastic Optical Systems** (Schaub) Sun. 13 Aug., 1:30 to 5:30 pm

SC552 **Aspheric Optics: Design, Fabrication, and Test** (Fischer) Tues. 15 Aug., 8:30 am to 12:30 pm

SC560 **Exploring Optical Aberrations** (Mahajan) Sun. 13 Aug., 8:30 am to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC659 **Understanding Reflective Optical Design** (Contreras) Mon. 14 Aug., 8:30 am to 12:30 pm

SC720 **Cost-Conscious Tolerancing of Optical Systems** (Youngworth) Mon. 14 Aug., 8:30 am to 12:30 pm

SC781 **Optomechanical Analysis** (Hatheway) Tues. 15 Aug., 8:30 am to 5:30 pm

SC792 **Polarization in Optical Design** (Chipman) Tues. 15 Aug., 1:30 to 5:30 pm

SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi) Weds. 16 Aug., 8:30 am to 12:30 pm

Sunday-Monday 13-14 August 2006 • Proceedings of SPIE Vol. 6290

Laser Beam Shaping VII

Conference Chairs: **Fred M. Dickey**, Sandia National Labs.; **David L. Shealy**, The Univ. of Alabama at Birmingham

Program Committee: **Daniel M. Brown**, Optosensors Technology, Inc.; **Michael R. Duparré**, Friedrich-Schiller-Univ. Jena (Germany); **Andrew Forbes**, CSIR (South Africa); **Julio C. Gutierrez-Vega**, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); **John A. Hoffnagle**, IBM Almaden Research Ctr.; **Kurt J. Kanzler**, Diffractive Laser Solutions; **R. John Koshel**, Lambda Research Corp.; **Alexis V. Kudryashov**, Adaptive Optics for Industrial and Medical Applications Group Adopt Ltd. (Russia); **Andrew F. Kurtz**, Eastman Kodak Co.; **Zsolt J. Laczik**, Univ. of Oxford (United Kingdom); **William P. Latham**, Air Force Research Lab.; **Scott A. Lerner**, Hewlett-Packard Co.; **Todd E. Lizotte**, Hitachi Via Mechanics USA, Inc.; **Günter Luepke**, College of William and Mary; **Olivier Magnin**, C2 Diagnostics (France); **Paul F. Michaloski**, Corning Tropel Corp.; **Thomas D. Milster**, College of Optical Sciences/The Univ. of Arizona; **Tasso R. M. Sales**, RPC Photonics, Inc.; **José M. Sasian**, College of Optical Sciences/The Univ. of Arizona; **Uwe D. Zeitner**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Shuyan Zhang**, College of William and Mary

Sunday 13 August

SESSION 1

Conv. Ctr. Room 16B . . . . . Sun. 8:30 to 10:00 am

Theory

Chair: **John A. Hoffnagle**, IBM Almaden Research Ctr.

8:30 am: **Smallest 1D flat-top focus by polarization manipulation *(Invited Paper)*,** B. Hao, J. R. Leger, Univ. of Minnesota . . . . . [6290-01]

9:00 am: **How to go about pulse shaping under the constraint that EM fields do not operate on each other?,** C. Roychoudhuri, Univ. of Connecticut . . . . . [6290-02]

9:20 am: **Laser beam propagation in nonlinearly absorbing media,** A. Forbes, Council for Scientific and Industrial Research (South Africa) . . . . . [6290-03]

9:40 am: **Analytic structure and generalized duality relations for a family of hyperboloidal beams and supporting mirrors of potential interest for future gravitational wave detection interferometers,** V. Galdi, G. Castaldi, V. Pierro, I. M. Pinto, Univ. degli Studi del Sannio (Italy); J. Agresti, E. D'Ambrosio, R. DeSalvo, California Institute of Technology . . . . . [6290-04]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 16B . . . . . Sun. 10:30 to 11:50 am

Design

Chair: **Todd E. Lizotte**, Hitachi Via Mechanics USA, Inc.

10:30 am: **Deterministic microlens diffuser for Lambertian scatter,** T. R. M. Sales, RPC Photonics, Inc. . . . . [6290-06]

10:50 am: **Analytic beam shaping for flattened output irradiance profile,** D. L. Shealy, The Univ. of Alabama at Birmingham; J. A. Hoffnagle, IBM Almaden Research Ctr.; K. Brenner, Univ. Mannheim (Germany) . . . . . [6290-07]

11:10 am: **High-effective excitation of graded-index waveguide mode by use of diffractive microrelief on waveguide surface,** V. S. Pavelyev, Image Processing Systems Institute (Russia) . . . . . [6290-08]

11:30 am: **Optical system for variable resizing of round flat-top distributions,** G. Nemes, ASTiGMAT; J. A. Hoffnagle, IBM Almaden Research Ctr. . . . . [6290-09]

Lunch Break . . . . . 11:50 am to 1:30 pm

SESSION 3

Conv. Ctr. Room 16B . . . . . Sun. 1:30 to 3:20 pm

Fabrication and Testing

Chair: **David L. Shealy**, The Univ. of Alabama at Birmingham

1:30 pm: **Advanced lithography for micro-optics *(Invited Paper)*,** U. D. Zeitner, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); E. Kley, Friedrich-Schiller-Univ. Jena (Germany) . . . [6290-10]

2:00 pm: **Multilevel pattern generation by GaN laser lithography: an application to beam shaper fabrication,** G. Lullo, Univ. degli Studi di Palermo (Italy); R. Leto, MICROTECH srl (Italy); M. Oliva, C. Arnone, Univ. degli Studi di Palermo (Italy) . . . . . [6290-11]

2:20 pm: **Synthesis and investigation of diamond diffractive optical elements,** V. S. Pavelyev, V. A. Soifer, N. L. Kazanskiy, D. L. Golovashkin, A. V. Volkov, G. F. Kostyuk, Image Processing Systems Institute (Russia); V. V. Kononenko, V. I. Konov, S. M. Pimenov, M. S. Komlenok, General Physics Institute (Russia); M. R. Duparré, B. Luedge, Friedrich-Schiller-Univ. Jena (Germany) . . . . . [6290-12]

2:40 pm: **Automated optical function testing of diffractive beam shapers,** T. E. Lizotte, O. P. Ohar, Hitachi Via Mechanics USA, Inc. . . . . [6290-13]

3:00 pm: **Fan-out diffractive beam splitter: 5 phase level binary versus 50 phase level grayscale,** T. E. Lizotte, Hitachi Via Mechanics USA, Inc. . . . . [6290-14]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 4

Conv. Ctr. Room 16B . . . . . Sun. 3:50 to 4:30 pm

Short Pulse Applications

Chair: **Uwe D. Zeitner**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)

3:50 pm: **Spatial beam shaping of ultrashort laser pulses: theory and experiment,** S. Zhang, Q. Yang, G. Luepke, The College of William & Mary . . . . . [6290-16]

4:10 pm: **SHG microscopy excited by polarization controlled beam for three-dimensional molecular orientation measurement,** K. Yoshiki, M. Hashimoto, T. Araki, Osaka Univ. (Japan) . . . . . [6290-17]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 16B . . . . . Mon. 8:30 to 10:00 am

Applications I

Chair: **Andrew Forbes**, Council for Scientific and Industrial Research (South Africa)

8:30 am: **Optical micromanipulation takes hold *(Invited Paper)*,** K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6290-18]

9:00 am: **Diffractive optic based pitch, roll, and Z axis displacement sensor,** T. E. Lizotte, O. P. Ohar, T. Tuttle, Hitachi Via Mechanics USA, Inc. . . . . [6290-19]

9:20 am: **High-aspect-ratio line shapes generated with a diffractive/refractive hybrid approach,** K. J. Kanzler, Lambda Research Optics, Inc. . . . . [6290-20]

9:40 am: **Optical trepanning with a refractive axicon lens system,** D. Zeng, College of Optics and Photonics/Univ. of Central Florida; W. P. Latham, Air Force Research Lab.; A. Kar, Univ. of Central Florida [6290-21]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 16B . . . . . Mon. 10:30 to 11:50 am

Applications II

Chair: **Kurt J. Kanzler**, Lambda Research Optics, Inc.

10:30 am: **Beam shaping for relay mirrors,** J. D. Mansell, MZA Associates Corp. . . . . [6290-22]

10:50 am: **Coupling of laser diodes bars for pumping of laser fibers,** V. M. Durán Ramírez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6290-23]

11:10 am: **Modeling laser brightness from cross Porro prism resonators,** A. Forbes, L. Burger, I. A. Litvin, Council for Scientific and Industrial Research (South Africa) . . . . . [6290-25]

11:30 am: **Propagation characteristics of coupled optical waveguide array,** J. Li, S. Shi, Xidian Univ. (China); Y. Ye, Infineon Technologies Xi'an Co., Ltd. (China) . . . . . [6290-26]

Lunch Break . . . . . 11:50 am to 1:30 pm

SESSION 7

Conv. Ctr. Room 16B . . . . . Mon. 1:30 to 2:30 pm

Bessel and Vortex Beams I

Chair: **R. John Koshel**, Lambda Research Corp.

1:30 pm: **Vortex beam shaping,** C. López-Mariscal, J. C. Gutierrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) . . . . . [6290-27]

1:50 pm: **Transverse electric (TE) and transverse magnetic™ vector vortices in free-space: analysis and experimental generation,** K. P. Volke-Sepulveda, A. Flores-Perez, J. Hernández-Hernández, S. Hacyan, R. Jauregui, Univ. Nacional Autónoma de México (Mexico) . . . . . [6290-28]

2:10 pm: **Mode structure analysis of a Bessel-Gauss resonator,** I. A. Litvin, Council for Scientific and Industrial Research (South Africa) . . . . . [6290-30]

SESSION 8

Conv. Ctr. Room 16B . . . . . Mon. 2:30 to 3:10 pm

Bessel and Vortex Beams II

Chair: **Peter E. Latham**, Univ. of Maryland/College Park

2:30 pm: **Generation of helical Ince-Gaussian beams: beamshaping with a liquid crystal display,** J. B. Bentley, J. A. Davis, San Diego State Univ.; M. A. Bandres, J. C. Gutierrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) . . . . . [6290-32]

2:50 pm: **Generalized Ince-Gaussian beams,** M. A. Bandres, California Institute of Technology; J. C. Gutierrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) . . . . . [6290-33]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Study of superresolution with radial birefringent filter,** M. Yun, Qingdao Univ. of Science and Technology (China); L. Liu, Shanghai Institute of Optics and Fine Mechanics (China); M. Wang, Q. Wang, Qingdao Univ. of Science and Technology (China) . . . . . [6290-34]

✔ **Design and optimization of an axicon used for plasma diagnostic system in ICF drivers,** S. Wen, Y. Guo, Sichuan Univ. (China); J. Su, China Academy of Engineering Physics (China); F. Gao, X. Yao, L. Wang, Sichuan Univ. (China) . . . . . [6290-35]

✔ **Ultrashort pulsed beam shaping with volume holographic gratings recorded in anisotropic crystals,** C. Wang, L. Liu, A. Yan, D. Liu, Y. Zhou, Shanghai Institute of Optics and Fine Mechanics (China)[6290-36]

✔ **Superdiffraction emitting in space laser communication,** X. Liu, L. Liu, D. Zhao, J. Wang, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6290-37]

✔ **Bragg diffraction of volume grating under finite Gaussian-profile ultrashort pulse illumination,** A. Yan, L. Liu, D. Liu, C. Wang, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6290-38]

✔ **Error diffusion method applied to design combined CSG-BSG element used in ICF driver,** Y. Zhang, X. Yao, F. Gao, L. Wang, Y. Guo, Sichuan Univ. (China) . . . . . [6290-39]

✔ **CO_2 laser treatment for high-tech ceramic materials production,** A. Casas Bedoya, H. Garcia-Mejia, C. E. Goyes Lopez, E. Solarte, Univ. del Valle (Colombia) . . . . . [6290-40]

✔ **The Goos-Hänchen shift in Helmholtz-Gauss beams,** M. A. Jezzini, J. C. Gutierrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) . . . . . [6290-41]

✔ **Propagation dynamics of vector Mathieu-Gauss beams,** R. I. Hernández-Aranda, M. A. Bandres, J. C. Gutierrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) [6290-42]

✔ **Novel segmented optics to produce x-ray laser line focus with adjustable intensity distribution,** M. Stupka, Institute of Physics (Czech Republic); B. Rus, Institute of Phyiscs (Czech Republic); M. Hudeček, M. Kozlova, J. Polan, Institute of Physics (Czech Republic) . . . . . [6290-43]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC014 **Introduction to Optomechanical Design** (Vukobratovich) Tues.-Weds. 15-16 Aug., 8:30 am to 5:30 pm

SC015 **Structural Adhesives for Optical Bonding** (Daly) Tues. 15 Aug., 8:30 am to 12:30 pm

SC219 **Materials: Properties and Fabrication for Stable Optical Systems** (Paquin) Weds. 16 Aug., 8:30 am to 5:30 pm

SC220 **Optical Alignment Mechanisms** (Guyer) Tues. 15 Aug., 1:30 to 5:30 pm

SC254 **Integrated Opto-Mechanical Analysis** (Genberg, Doyle) Thurs. 17 Aug., 8:30 am to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC565 **Introduction to Refractive Laser Beam Shaping Optics** (Hoffnagle) Tues. 15 Aug., 8:30 am to 12:30 pm

SC781 **Optomechanical Analysis** (Hatheway) Tues. 15 Aug., 8:30 am to 5:30 pm

SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi) Weds. 16 Aug., 8:30 am to 12:30 pm

Tuesday-Wednesday 15-16 August 2006 • Proceedings of SPIE Vol. 6291: Optical Systems Degradation, Contamination, and Stray Light: Effects, Measurements, and Control II

Optical System Contamination: Effects, Measurements and Control IX

Conference Chair: **O. Manuel Uy**, Johns Hopkins Univ.

Cochair: **Sharon A. Straka**, NASA Goddard Space Flight Ctr.

Program Committee: **Mark T. Boies**, Research Support Instruments, Inc.; **H. Dewitt Burns, Jr.**, NASA Marshall Space Flight Ctr.; **Nancy P. Carosso**, Swales Aerospace; **Philip T. C. Chen**, NASA Goddard Space Flight Ctr.; **Joanne Egges**, Ball Aerospace & Technologies Corp.; **Christopher G. Shaw**, Boeing Defense & Space Group; **Carlos E. Soares**, The Boeing Co.; **David P. Taylor**, The Aerospace Corp.; **Gidget K. Ternet**, The Aerospace Corp.; **Denny Wernham**, European Space Agency (Netherlands)

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 17A . . . . . Tues. 8:00 to 10:05 am

Contamination Control Techniques and Methods

Chair: **David P. Taylor**, The Aerospace Corp.

8:00 am: **The instrumentation and the contamination control activity of thermal and near-infrared sensor for carbon observation (TANSO) on GOSAT,** T. Urabe, A. Kuze, T. Hamazaki, N. Baba, S. Minami, H. Saruwatari, Japan Aerospace Exploration Agency (Japan) . . . [6291A-01]

8:25 am: **Use of design of experiments techniques to investigate resistance change of chip resistors in MESSENGER,** O. M. Uy, R. Hardesty, J. Fogle, A. Moor, Johns Hopkins Univ. . . . . [6291A-02]

8:50 am: **Monte Carlo based contamination modeling using GEANT,** D. M. Huber, M. T. Boies, Research Support Instruments, Inc.; G. E. Galica, Physical Sciences Inc. . . . . [6291A-03]

9:15 am: **Contamination control of space-based laser instruments,** P. T. C. Chen, R. J. Hedgeland, L. Ramsey, R. B. Rivera, K. D. Houston, NASA Goddard Space Flight Ctr. . . . . [6291A-04]

9:40 am: **Gas line contamination analysis by solid phase microextraction,** A. Hofstra, P. G. Hogue, Johns Hopkins Univ.[6291A-05]

Coffee Break . . . . . 10:05 to 10:35 am

SESSION 2

Conv. Ctr. Room 17A . . . . . Tues. 10:35 am to 12:15 pm

Cleaning, Monitoring, and Verification

Chair: **Carlos E. Soares**, The Boeing Co.

10:35 am: **In situ calibration of quartz crystal microbalances,** K. C. Albyn, D. Burns, NASA Marshall Space Flight Ctr. . . . . [6291A-06]

11:00 am: **Comparative study of optical cleaning techniques of coated and uncoated reflective surfaces,** K. D. Houston, NASA Goddard Space Flight Ctr. . . . . [6291A-07]

11:25 am: **A comparison of particulate verification techniques on varying surfaces,** R. B. Rivera, NASA Goddard Space Flight Ctr. . . . . [6291A-08]

11:50 am: **Atlas V payload fairing fall-out during ground processing,** P. G. Hogue, Johns Hopkins Univ. . . . . [6291A-09]

Lunch/Exhibition Break . . . . . 12:15 to 1:30 pm

SESSION 3

Conv. Ctr. Room 17A . . . . . Tues. 1:30 to 3:10 pm

Gene Borson Memorial Session: Contamination in Space *(Includes Presentation to the Borson Family)*

Chair: **Nancy P. Carosso**, Swales Aerospace

1:30 pm: **A contamination engineering tribute to Gene Borson *(Invited Paper),*** N. P. Carosso, Swales Aerospace . . . . . [6291A-10]

1:55 pm: **Thruster plume contamination and its effect on ISS optically sensitive surfaces,** W. D. Schmidl, C. E. Soares, R. R. Mikatarian, The Boeing Co. . . . . [6291A-11]

2:20 pm: **Relief of thermal constraints on ISS hardware by reevaluation of optical properties,** C. E. Soares, C. E. Pagan, W. D. Schmidl, R. R. Mikatarian, The Boeing Co. . . . . [6291A-12]

2:45 pm: **Induced contamination onto JAXA's microparticles capturer and space environment exposure device: comparison of predictions and measurements,** C. A. Pankop, R. R. Mikatarian, K. A. Smith, C. E. Soares, The Boeing Co. . . . . [6291A-13]

Coffee Break . . . . . 3:10 to 3:40 pm

SESSION 4

Conv. Ctr. Room 17A . . . . . Tues. 3:40 to 5:20 pm

Molecular Contamination Effects

Chair: **Joanne Egges**, Ball Aerospace & Technologies Corp.

3:40 pm: **Molecular contamination of GOES-12,** J. T. Sanders, Jr., Swales Aerospace . . . . . [6291A-14]

4:05 pm: **Control of molecular contamination and outgassing of the SOFIE instrument,** J. S. Dyer, J. J. Herrick, A. L. Shumway, C. Fish, S. R. Schicker, Utah State Univ.; T. Gordon, Applied Science Technologies . . . . . [6291A-15]

4:30 pm: **Formation of contaminant droplets on surfaces,** K. T. Luey, D. J. Coleman, The Aerospace Corp. . . . . [6291A-16]

4:55 pm: **Interaction of vacuum ultraviolet radiation with molecular deposits,** K. C. Albyn, D. Burns, NASA Marshall Space Flight Ctr. . . . . [6291A-17]

Wednesday 16 August

SESSION 5

Conv. Ctr. Room 17A . . . . . Wed. 8:05 to 10:35 am

Particulate Contamination Effects

Chair: **Mark T. Boies**, Research Support Instruments, Inc.

8:05 am: **Measuring reality, solving the slope dilemma and redefining the particle size distribution model,** K. J. Wilkerson, Raytheon Co.; P. G. Magallanes, Consultant; J. P. Elders, Raytheon Co.; R. V. Peterson, Consultant . . . . . [6291A-35]

8:30 am: **Digital imaging of particulate contamination,** K. T. Luey, D. P. Taylor, D. J. Coleman, K. A. Folgner, The Aerospace Corp. . . . [6291A-18]

8:55 am: **Comparing surface particle coverage predictions with image analysis measurements,** C. W. Chang, Lockheed Martin Space Systems Co. . . . . [6291A-19]

9:20 am: **A numerical evaluation of the correlation of surface cleanliness level and percent area coverage,** R. L. Perry III, Swales Aerospace . . . . . [6291A-20]

9:45 am: **Particle deposition in confined vessels,** T. Lesniewski, Northrop Grumman Space Technology . . . . . [6291A-21]

10:10 am: **Particle contamination by bacterial microorganisms in spacecraft fuel tanks and filtration systems,** J. Hurd, P. G. Hogue, O. M. Uy, Johns Hopkins Univ. . . . . [6291A-22]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC014 **Introduction to Optomechanical Design** (Vukobratovich) Tues.-Weds. 15-16 Aug., 8:30 am to 5:30 pm

SC015 **Structural Adhesives for Optical Bonding** (Daly) Tues. 15 Aug., 8:30 am to 12:30 pm

SC020 **Optical Scattering: Measurement and Analysis** (Stover) Mon. 14 Aug., 8:30 am to 12:30 pm

SC219 **Materials: Properties and Fabrication for Stable Optical Systems** (Paquin) Weds. 16 Aug., 8:30 am to 5:30 pm

SC220 **Optical Alignment Mechanisms** (Guyer) Tues. 15 Aug., 1:30 to 5:30 pm

SC254 **Integrated Opto-Mechanical Analysis** (Genberg, Doyle) Thurs. 17 Aug., 8:30 am to 5:30 pm

SC492 **Predicting, Modeling, and Interpreting Light Scattered by Surfaces** (Germer) Mon. 14 Aug., 1:30 to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC781 **Optomechanical Analysis** (Hatheway) Tues. 15 Aug., 8:30 am to 5:30 pm

SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi) Weds. 16 Aug., 8:30 am to 12:30 pm

Wednesday 16 August 2006 • Proceedings of SPIE Vol. 6291: Optical Systems Degradation, Contamination, and Stray Light: Effects, Measurements, and Control II

Stray Light in Optical Systems: Analysis, Measurement and Suppression

Conference Chairs: **John C. Fleming**, Ball Aerospace & Technologies Corp.; **Michael G. Dittman**, Ball Aerospace & Technologies Corp.

Program Committee: **Steven Miller**, Breault Research Organization, Inc.; **Richard N. Pfisterer**, Photon Engineering, LLC

Wednesday 16 August

SESSION 6

Conv. Ctr. Room 17A . . . . . Wed. 11:00 am to 12:10 pm

Optical Component Scatter Theory and Measurement I

Chairs: **Michael G. Dittman**, Ball Aerospace & Technologies Corp.; **John C. Fleming**, Ball Aerospace & Technologies Corp.

11:00 am: **The art of specifying optics for scatter *(Invited Paper)*,** J. C. Stover, The Scatter Works Inc. . . . . [6291B-36]

11:30 am: **No such thing as sigma: flowdown and measurement of surface roughness requirements,** M. G. Dittman, Ball Aerospace & Technologies Corp. . . . . [6291B-23]

11:50 am: **Improved Mie theory scatter model for particulate contamination that conserves energy and obeys reciprocity,** D. G. Jenkins, E. C. Fest, R. M. Kremer, P. R. Spyak, Raytheon Missile Systems . . . . . [6291B-25]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 7

Conv. Ctr. Room 17A . . . . . Wed. 1:30 to 2:30 pm

Optical Component Scatter Theory and Measurement II

Chairs: **Michael G. Dittman**, Ball Aerospace & Technologies Corp.; **John C. Fleming**, Ball Aerospace & Technologies Corp.

1:30 pm: **K-correlation PSD and surface scatter model,** M. G. Dittman, Ball Aerospace & Technologies Corp. . . . . [6291B-26]

1:50 pm: **Recent developments in the analysis of surface-scatter phenomena,** J. E. Harvey, College of Optics and Photonics/Univ. of Central Florida . . . . . [6291B-27]

2:10 pm: **Modeling particle distributions for stray light analysis,** J. C. Fleming, M. G. Dittman, Ball Aerospace & Technologies Corp. [6291B-28]

SESSION 8

Conv. Ctr. Room 17A . . . . . Wed. 2:30 to 4:40 pm

Subsystem and System Level Scatter Predictions and Results

Chairs: **Michael G. Dittman**, Ball Aerospace & Technologies Corp.; **John C. Fleming**, Ball Aerospace & Technologies Corp.

2:30 pm: **Stray light issues associated with detectors used in the aerospace industry,** D. M. Waters, Ball Aerospace & Technologies Corp. . . . . [6291B-30]

2:50 pm: **Reducing stray light to characterize NIRSpec subsystems: the focal plane array and microshutter array,** J. A. Connelly, NASA Goddard Space Flight Ctr.; T. J. Hadjimichael, Swales Aerospace; J. L. Tveekrem, D. B. Mott, R. A. Boucarut, B. J. Rauscher, NASA Goddard Space Flight Ctr. . . . . [6291B-31]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Dealing with stray light contamination in hyperspectral imaging sensors,** G. R. Scriven, N. Gat, Opto Knowledge Systems, Inc. . . . . [6291B-33]

4:00 pm: **A simple method for stray light correction in optical systems,** Y. Zong, S. W. Brown, C. C. Miller, Y. Ohno, National Institute of Standards and Technology . . . . . [6291B-34]

4:20 pm: **General algorithm for stray light measurements of remote sensing imagery,** M. A. Goforth, Goforth Scientific, Inc. . . . . [6291B-35]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

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SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC781 **Optomechanical Analysis** (Hatheway) Tues. 15 Aug., 8:30 am to 5:30 pm

SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi) Weds. 16 Aug., 8:30 am to 12:30 pm

Metrology

Program on **Advanced Metrology**

Program Chair: **Katherine Creath,** The Univ. of Arizona

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
	6292 **Interferometry XIII: Techniques and Analysis** *(Creath/Schmit)*, p. 60			
			6293 **Interferometry XIII: Applications** *(Novak/Osten/Gorecki)*, p. 63	
Courses				
SC213 **Introduction to Interferometric Optical Testing** (Wyant), 8:30 am to 12:30 pm			SC795 **Interference Microscopy** (de Groot), 1:30 to 5:30 pm	SC211 **Practical Interferometry and Fringe Analysis** (Creath), 8:30 am to 12:30 pm
			Register for Courses onsites at the SPIE Registration Desk!	
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	**SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18		
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

Monday-Wednesday 14-16 August 2006 • Proceedings of SPIE Vol. 6292

Interferometry XIII: Techniques and Analysis

Conference Chairs: **Katherine Creath**, The Univ. of Arizona; **Joanna Schmit**, Veeco Instruments Inc.

Program Committee: **Gordon M. Brown**, Optical Systems Engineering; **Christophe Gorecki**, Univ. de Franche-Comté (France); **Charles Joenathan**, Rose-Hulman Institute of Technology; **Werner P. Jüptner**, Bremer Institut für Angewandte Strahltechnik (Germany); **Guillermo H. Kaufmann**, Univ. Nacional de Rosario (Argentina); **Seung-Woo Kim**, Korea Advanced Institute of Science and Technology (South Korea); **Mahendra P. Kothiyal**, Indian Institute of Technology Madras (India); **Malgorzata Kujawinska**, Warsaw Univ. of Technology (Poland); **James E. Millerd**, 4D Technology Corp.; **Erik L. Novak**, Veeco Instruments Inc.; **Jiri Novák**, Czech Technical Univ. in Prague (Czech Republic); **Bozenko F. Oreb**, Commonwealth Scientific & Industrial Research Organisation (Australia); **Wolfgang Osten**, Univ. Stuttgart (Germany); **Yukitoshi Otani**, Tokyo Univ. of Agriculture and Technology (Japan); **Horst Schreiber**, Corning Tropel Corp.; **Johannes Schwider**, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); **Manuel Servin Guirado**, Ctr. de Investigaciones en Óptica A.C. (Mexico); **H. Philip Stahl**, NASA/Marshall Space Flight Ctr.; **Mitsuo Takeda**, The Univ. of Electro-Communications (Japan); **Catherine E. Towers**, Univ. of Leeds (United Kingdom)

Monday 14 August

Welcome and Introduction

Conv. Ctr. Room 11A . . . . . Mon. 8:30 to 8:40 am

Chairs: **Katherine Creath,** The Univ. of Arizona; **Joanna Schmit,** Veeco Instruments Inc.

SESSION 1

Conv. Ctr. Room 11A . . . . . Mon. 8:40 to 10:00 am

On the Fringe

Chair: **Katherine Creath**, The Univ. of Arizona

8:40 am: **A critical look at the source characteristics used for time varying fringe interferometry *(Invited Paper)*,** C. Roychoudhuri, Univ. of Connecticut . . . . . [6292-01]

9:10 am: **Development of precision double corner cubes for the Space Interferometry Mission *(Invited Paper)*,** B. F. Oreb, J. Burke, R. P. Netterfield, J. A. Seckold, A. J. Leistner, M. Gross, S. Dligatch, Commonwealth Scientific and Industrial Research Organisation (Australia); B. C. Platt, B. Nemati, Jet Propulsion Lab. . . . . [6292-03]

9:40 am: **Measurement of the non-common vertex error of a double corner cube,** A. Azizi, Jet Propulsion Lab. . . . . [6292-67]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 11A . . . . . Mon. 10:30 am to 12:10 pm

Calibration Techniques

Chair: **Yukitoshi Otani**, Tokyo Univ. of Agriculture and Technology (Japan)

10:30 am: **Ray-trace simulation of the random ball test to improve microlens metrology,** N. W. Gardner, A. D. Davies, The Univ. of North Carolina at Charlotte . . . . . [6292-04]

10:50 am: **Self-calibration of wavefront testing interferometers by use of diffractive elements,** S. Reichelt, Albert-Ludwigs-Univ. Freiburg (Germany); H. J. Tiziani, Univ. Stuttgart (Germany); H. Zappe, Albert-Ludwigs-Univ. Freiburg (Germany) . . . . . [6292-05]

11:10 am: **A new traceable method for determination of periodic nonlinearities of interferometers,** I. Schmidt, G. Jäger, T. Hausotte, E. Manske, R. Füßl, Technische Univ. Ilmenau (Germany) . . . . . [6292-06]

11:30 am: **Detection and assessment of the nonuniform phase displacement error in temporal phase-shifting interferometry,** K. Patorski, A. R. Styk, Politechnika Warszawska (Poland); L. Bruno, Univ. degli Studi della Calabria (Italy); P. Szwaykowski, Engineering Synthesis Design, Inc. and Jet Propulsion Lab. . . . . [6292-07]

11:50 am: **Calibration of phase shifter in phase-shifting shearography,** Y. Gan, W. Steinchen, Univ. Kassel (Germany) . . . . . [6292-08]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 3A

Conv. Ctr. Room 11A . . . . . Mon. 1:30 to 2:00 pm

Special NIST Presentation

Chair: **Horst Schreiber**, Corning Tropel Corp.

1:30 pm: **The NIST advance measurement laboratory: at the leading edge of measurement science and technology! *(Invited Paper)*,** C. Londoño, J. R. Lawall, M. T. Postek, J. A. Stone, J. R. Stoup, National Institute of Standards and Technology . . . . . [6292-68]

SESSION 3

Conv. Ctr. Room 11A . . . . . Mon. 2:00 to 3:20 pm

Analytical Techniques

Chair: **Horst Schreiber**, Corning Tropel Corp.

2:00 pm: **Analysis of systematic errors in spatial carrier phase shifting applied to interferogram intensity modulation determination,** A. R. Styk, K. Patorski, Politechnika Warszawska (Poland) . . . . . [6292-09]

2:20 pm: **Single fringe pattern with closed fringes demodulation using row by row scanners,** J. C. Estrada, M. Servin Guirado, Ctr. de Investigaciones en Óptica, A.C. (Mexico); A. Quiroga, Univ. Complutense de Madrid (Spain); J. Marroquin, Ctr. de Investigación en Matemáticas, A.C. (Mexico) . . . . . [6292-10]

2:40 pm: **Phase unwrapping by a noise immune algorithm: fringe estimation, quality segmentation, and sorted extraction,** S. Liu, L. X. Yang, Oakland Univ. . . . . [6292-11]

3:00 pm: **Phase recovery from a single interferogram using multiple Fourier transforms,** J. Muñoz, Univ. de Guadalajara (Mexico) . [6292-13]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 4

Conv. Ctr. Room 11A . . . . . Mon. 3:50 to 5:40 pm

Extended Techniques

Chair: **Manuel Servin Guirado**, Ctr. de Investigaciones en Óptica A.C. (Mexico)

3:50 pm: **Advanced wave-front sensing by quadri-wave lateral shearing interferometry *(Invited Paper)*,** S. Velghe, J. Primot, N. Guerineau, ONERA (France); M. Cohen, B. Wattellier, École Polytechnique (France) . . . . . [6292-14]

4:20 pm: **On-axis vibration insensitive Fizeau interferometer,** B. T. Kimbrough, J. E. Millerd, 4D Technology Corp. . . . . [6292-15]

4:40 pm: **Fringe localization in the Twyman-Green interferometer using extended monochromatic sources,** J. Schwider, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) . . . . . [6292-16]

5:00 pm: **High-accuracy testing of large mirrors with segmented CGHs,** P. C. V. Mallik, J. H. Burge, R. Zehnder, College of Optical Sciences/The Univ. of Arizona . . . . . [6292-17]

5:20 pm: **Experimental investigation of testing large aspheric surfaces with annular subaperture interferometric method,** X. Hou, Q. Chen, Institute of Optics and Electronics (China) . . . . . [6292-18]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Vibration mode shape visualization with dual funciton DSPI system,** B. Bhaduri, M.P. Kothiyal, Indian Institute of Technology Madras (India) . . . . . [6292-35]

Standby Presentation

✔ **Study of a new design of an incremental optical encoder,** A. Lutenberg, M. A. Rebollo, F. L. Perez-Quintian, Univ. de Buenos Aires (Argentina) . . . . . [6292-46]

✔ **A curvature sensor using white-light scanning interferometry,** B. Kim, S. Kim, Y. Kwon, Kyungnam Univ. (South Korea) . . . . . [6292-48]

✔ **High-resolution deformation measurement method using one sheet of specklegram,** Y. Arai, Kansai Univ. (Japan) . . . . . [6292-50]

✔ **Analysis and application for a new type of optical fiber interferometer with three-beam system,** K. Yin, Y. Liao, Tsinghua Univ. (China) . . . . . [6292-51]

✔ **A hybrid phase-unwrapping method for optical interferometry based on new parameter map and local plane approximation,** Y. Zhu, L. Liu, Z. Luan, J. Sun, Y. Guo, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6292-53]

✔ **Comparison of the contrast-phase map reconstruction by Fresnel transform and angular spectrum backward propagation algorithm in RuO_2:$LiNbO_3$ crystal,** W. Qu, Y. Zhi, D. Liu, W. Lu, Z. Hu, C. Wang, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6292-54]

✔ **Fast surface profiling by use of monochromatic phase and fringe order in white-light interferometry,** C. Tung, C. Huang, C. Kao, C. C. Chang, Industrial Technology Research Institute (Taiwan) . . . [6292-57]

✔ **Temporal demodulation of fringe patterns using continuous phase curvature constraint,** J. C. Estrada, A. Sanchez, M. Servin Guirado, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6292-58]

✔ **Describing and measuring the time-frequency parameters of low-power bright picosecond optical pulses using the interferometric technique,** A. S. Shcherbakov, A. L. Munoz Zurita, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); A. Y. Kosarsky, LLC Petro (Russia) . . . . . [6292-59]

✔ **Development and application of Talbot images technique for reconstruction of 3D objects,** D. I. Serrano García, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); A. M. García, Ctr. de Investigaciones en Óptica A.C. (Mexico); A. S. Heredia, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); J. A. Rayas, Ctr. de Investigaciones en Óptica A.C. (Mexico) [6292-60]

✔ **Effects of spatial and temporal coherence of optical fields with wide frequency and angular spectrums in Michelson interferometer,** A. L. Kalyanov, V. P. Ryabukho, D. V. Lyakin, V. V. Lychagov, Saratov State Univ. (Russia) . . . . . [6292-62]

✔ **A comparison between 2D phase unwrapping techniques,** J. Castro-Ramos, J. Sanchez-Paredez, S. Vazquez-Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6292-65]

✔ **Nonlinear interference of two successive coherent anti-Stokes Raman scattering signals for the biological imaging applications,** E. Lee, J. Y. Lee, Y. S. Yoo, Korea Research Institute of Standards and Science (South Korea) . . . . . [6292-66]

Tuesday 15 August

SESSION 5

Conv. Ctr. Room 11A . . . . . Tues. 8:40 to 10:10 am

Measurement of Transparent Media and Flows

Chair: **Johannes Schwider**, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

8:40 am: **Optimized setup for active compensation of distortions for interferometric techniques onboard the International Space Station *(Invited Paper)*,** C. von Kopylow, Bremer Institut für Angewandte Strahltechnik (Germany); V. Kebbel, A&A Technologies GmbH (Germany); J. Becker, European Space Agency (Netherlands); W. P. O. Jüptner, Bremer Institut für angewandte Strahltechnik (Germany) . . . . . [6292-19]

9:10 am: **Wavefront sensing for 3D particle metrology and velocimetry,** N. Angarita, Univ. of Leeds (United Kingdom); H. I. Campbell, Heriot-Watt Univ. (United Kingdom); C. E. Towers, Univ. of Leeds (United Kingdom); A. H. Greenaway, Heriot-Watt Univ. (United Kingdom); D. P. Towers, Univ. of Leeds (United Kingdom) . . . . . [6292-20]

9:30 am: **Application of digital interferometry to study of density field around sphere with flow separation,** I. V. Ershov, Y. D. Babichev, Central Research Institute of Machine Building (Russia) . . . . . [6292-21]

9:50 am: **High-resolution real-time 3D absolute coordinate measurement based on a phase-shifting method,** S. Zhang, S. Yau, Harvard Univ. . . . . [6292-49]

Coffee Break . . . . . 10:10 to 10:40 am

SESSION 6

Conv. Ctr. Room 11A . . . . . Tues. 10:40 am to 12:00 pm

Pulsed and Spectrally Resolved Techniques

Chair: **Werner P. O. Jüptner**, Bremer Institut für Angewandte Strahltechnik (Germany)

10:40 am: **Dispersive interferometry using femtosecond pulse laser for measuring refractive index and physical thickness of test samples,** K. Joo, S. Kim, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6292-24]

11:00 am: **Absolute length calibration of gauge blocks using optical comb of a femtosecond pulse laser,** J. Jin, Y. J. Kim, Y. S. Kim, Korea Advanced Institute of Science and Technology (South Korea); C. Kang, Korea Research Institute of Standards and Science (South Korea); S. Kim, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6292-25]

11:20 am: **Analysis of spectrally resolved white-light interferometry by Hilbert Transform method,** S. K. Debnath, M. P. Kothiyal, Indian Institute of Technology Madras (India) . . . . . [6292-26]

11:40 am: **Absolute interferometry for surface shapes with large steps by wavelength tuning with a mechanical phase shift,** K. Hibino, National Institute of Advanced Industrial Science and Technology (Japan); Y. Tani, The Univ. of Tokyo (Japan); T. Takatsuji, Y. Bitou, National Institute of Advanced Industrial Science and Technology (Japan); S. Warisawa, M. Mitsuishi, The Univ. of Tokyo (Japan) . . . . . [6292-27]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 7

Conv. Ctr. Room 11A . . . . . Tues. 1:30 to 3:10 pm

Fringe Projection and Digital Holography Techniques

Chair: **Catherine E. Towers**, Univ. of Leeds (United Kingdom)

1:30 pm: **Generic phase error reduction for 3D shape measurement using phase-shifting methods,** S. Zhang, S. Yau, Harvard Univ.[6292-28]

1:50 pm: **Color fringe projection system based on optimum frequency selection,** Z. Zhang, Heriot-Watt Univ. (United Kingdom); C. E. Towers, D. P. Towers, Univ. of Leeds (United Kingdom) . . . . . [6292-29]

2:10 pm: **Effect of defocused fringe on measured profile in structured line projection method,** G. Song, M. Jia, Y. Ning, J. Zheng, GE Research & Development Ctr. Co. Ltd. (China); K. G. Harding, GE Global Research . . . . . [6292-30]

2:30 pm: **Transmission digital holography microscopy applied to the study of coal palynofacies,** A. Restrepo, J. Herrera, R. Castañeda, Univ. Nacional de Colombia (Colombia); C. J. Mann, M. K. Kim, Univ. of South Florida . . . . . [6292-31]

2:50 pm: **Surface shape measurement by phase-shifting digital holography with dual wavelengths,** I. Yamaguchi, T. Ida, M. Yokota, Gunma Univ. (Japan) . . . . . [6292-32]

Coffee Break . . . . . 3:10 to 3:40 pm

SESSION 8

Conv. Ctr. Room 11A . . . . . Tues. 3:40 to 4:50 pm

Speckle Techniques

Chair: **James E. Millerd**, 4D Technology Corp.

3:40 pm: **Speckle-based metrology systems and linear canonical transforms photography in mixed domains *(Invited Paper)*,** J. E. Ward, D. P. Kelly, U. Gopinathan, B. M. Hennelly, F. T. O'Neill, J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland) . . . . . [6292-33]

4:10 pm: **Nanometric displacement measurement using phase singularities in Laguerre-Gauss transform of speckle pattern,** W. Wang, T. Yokozeki, R. Ishijima, The Univ. of Electro-Communications (Japan); S. G. Hanson, Risø National Lab. (Denmark); M. Takeda, The Univ. of Electro-Communications (Japan) . . . . . [6292-34]

4:30 pm: **Vibration induced phase-shift interferometer,** R. Doloca, R. Tutsch, Technische Univ. Braunschweig (Germany) . . . . . [6292-64]

Wednesday 16 August

SESSION 9

Conv. Ctr. Room 11A . . . . . Wed. 8:30 to 10:00 am

Novel Techniques

Chair: **Seung-Woo Kim**, Korea Advanced Institute of Science and Technology (South Korea)

8:30 am: **Heterodyne interferometry for high-sensitivity absolute amplitude vibrational measurements *(Invited Paper)*,** H. Martinussen, A. Aksnes, H. E. Engan, Norges Teknisk-Naturvitenskapelige Univ. (Norway) . . . . . [6292-37]

9:00 am: **Real-time measurement of submicrometer-order amplitude transverse vibrations using the photo-EMF effect in photoconductive materials,** J. Silva, Univ. Nacional de Ingenieria (Peru); K. Contreras, G. Baldwin-Olguin, Pontificia Univ. Catolica del Peru (Peru); L. Mosquera, Univ. Nacional de Ingenieria (Peru) . . . . . [6292-38]

9:20 am: **Fast and accurate noncontact in situ optical metrology for end-point detection,** W. J. Walecki, A. Pravdivstev, M. Santos II, A. Koo, Frontier Semiconductor Inc. . . . . [6292-39]

9:40 am: **Novel techniques for random depth access 3D low-coherence optical metrology,** P. Egan, Joint Research Ctr. (Italy) and Univ. of Limerick (Ireland); F. Lakestani, M. P. Whelan, Joint Research Ctr. (Italy); M. J. Connelly, Univ. of Limerick (Ireland) . . . . . [6292-40]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 10

Conv. Ctr. Room 11A . . . . . Wed. 10:30 to 11:50 am

Spectral and White Light Techniques

Chair: **Joanna Schmit**, Veeco Instruments Inc.

10:30 am: **Displacement measurement by spectro-polarization modulator,** Y. Otani, T. Wakayama, N. Umeda, Tokyo Univ. of Agriculture and Technology (Japan) . . . . . [6292-41]

10:50 am: **Thickness-profile measurement of transparent thin-film layers by spectrally resolved phase-shifting interferometry,** S. K. Debnath, M. P. Kothiyal, Indian Institute of Technology Madras (India); J. Schmit, Veeco Instruments Inc.; P. Hariharan, The Univ. of Sydney (Australia) . . . . . [6292-42]

11:10 am: **Chromatic confocal spectral interferometry (CCSI),** E. Papastathopoulos, K. Koerner, W. Osten, Univ. Stuttgart (Germany) . . . . . [6292-43]

11:30 am: **Chromatic confocal phase-stepping interferometer,** J. Cohen-Sabban, Sciences et Techniques Industrielles de la Lumiere (France) . . . . . [6292-44]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC211 **Practical Interferometry and Fringe Analysis** (Creath) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC213 **Introduction to Interferometric Optical Testing** (Wyant) Sun. 13 Aug., 8:30 am to 12:30 pm

SC795 **Interference Microscopy** (de Groot) Weds. 16 Aug., 1:30 to 5:30 pm

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Interferometry XIII: Applications

Conference Chairs: **Erik L. Novak**, Veeco Instruments Inc.; **Wolfgang Osten**, Univ. Stuttgart (Germany); **Christophe Gorecki**, Univ. de Franche-Comté (France)

Program Committee: **Armando Albertazzi Gonçalves, Jr.**, Univ. Florianopolis (Brazil); **Anand K. Asundi**, Nanyang Technological Univ. (Singapore); **Katherine Creath**, The Univ. of Arizona; **Angela D. Davies**, The Univ. of North Carolina at Charlotte; **Peter J. de Groot**, Zygo Corp.; **Pietro Ferraro II**, Istituto Nazionale di Ottica Applicata - CNR (Italy); **Cosme Furlong**, Worcester Polytechnic Institute; **Kay Gastinger**, SINTEF Materials Technology (Norway); **James B. Hadaway**, The Univ. of Alabama in Huntsville; **Tobias Haist**, Univ. Stuttgart (Germany); **Steen G. Hanson**, Risø Roskilde (Denmark); **Pierre M. Jacquot**, École Polytechnique Fédérale de Lausanne (Switzerland); **Werner P. Jüptner**, Bremer Institut für Angewandte Strahltechnik (Germany); **Malgorzata Kujawinska**, Warsaw Univ. of Technology (Poland); **Michael B. North Morris**, 4D Technology Corp.; **Gunther Notni**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Xiang Peng**, Shenzhen Univ. (China); **Leszek A. Salbut**, Warsaw Univ. of Technology (Poland); **Joanna Schmit**, Veeco Instruments Inc.; **Pierre R. Slangen**, Ecole des Mines (France); **Mitsuo Takeda**, The Univ. of Electro-Communications (Japan); **Vivi Tornari**, Foundation for Research and Technology-Hellas (Greece); **Rainer Tutsch**, Technische Univ. Braunschweig (Germany)

Wednesday 16 August

Welcome and Introduction

Conv. Ctr. Room 11A . . . . . Wed. 1:25 to 1:30 pm

Chair: **Erik L. Novak,** Veeco Instruments Inc.

SESSION 1

Conv. Ctr. Room 11A . . . . . Wed. 1:30 to 3:20 pm

Micro- and Nano-Metrology Applications

Chair: **Erik L. Novak**, Veeco Instruments Inc.

1:30 pm: **Nanomirrors: using imaging interferometry to study live cell motion *(Invited Paper)*,** J. Reed, A. Smith, S. Cross, J. Troke, M. A. Teitell, J. K. Gimzewski, Univ. of California/Los Angeles . . . . . [6293-01]

2:00 pm: **Wavefront sensing by an aperiodic diffractive microlens array,** L. Seifert, T. Ruppel, T. Haist, W. Osten, Univ. Stuttgart (Germany) . . . . . [6293-02]

2:20 pm: **Optimization algorithm of LDA signal processing for nanoparticles,** L. Vámos, P. J. Jani, Magyar Tudományos Akadémia Szilárdtestfizikai és Optikai (Hungary) . . . . . [6293-03]

2:40 pm: **Compensation of chromatic aberration in multiwavelength digital holographic investigation of microstructures,** P. Ferraro II, Istituto Nazionale di Ottica Applicata (Italy) . . . . . [6293-04]

3:00 pm: **Interferometric testing through transmissive media,** S. Han, Veeco Tucson Inc. . . . . [6293-05]

Coffee Break . . . . . 3:20 to 3:40 pm

SESSION 2

Conv. Ctr. Room 11A . . . . . Wed. 3:40 to 5:50 pm

Measurements in Presence of Motion and Vibration

Chair: **Cosme Furlong**, Worcester Polytechnic Institute

3:40 pm: **Advance in dynamic metrology using in-line digital holographic interferometry *(Invited Paper)*,** V. R. Singh, A. K. Asundi, Nanyang Technological Univ. (Singapore) . . . . . [6293-06]

4:10 pm: **Dynamic optical coherence tomography for paper wetting measurements,** T. Fabritius, R. Myllylä, Oulun Yliopisto (Finland)[6293-07]

4:30 pm: **Static and dynamic measurements of active MEMS by Twyman-Green interferometry: case of AlN-based microactuators,** A. Andrei, Institut Femto-ST (France); K. Krupa, M. Józwik, C. Gorecki, S. Balandras, K. Dogheche, L. Hirsinger, P. Delobelle, Univ. de Franche-Comté (France) . . . . . [6293-08]

4:50 pm: **Dynamic characterization of AFM probes by laser Doppler vibrometry and stroboscopic holographic methodologies,** J. D. Kuppers, I. M. Gouverneur, M. T. Rodgers, Worcester Polytechnic Institute; J. Wenger, Worcester Polytechnic Institute and Polytec Inc.; C. Furlong, Worcester Polytechnic Institute . . . . . [6293-09]

5:10 pm: **Characterization of acoustic vibrations on micro- and nanostructures with picometer sensitivity,** A. Aksnes, H. Martinussen, H. E. Engan, Norwegian Univ. of Science and Technology (Norway) . . . . . [6293-10]

5:30 pm: **A point-diffraction interferometer with vibration-desensitizing capability,** H. Kihm, J. Park, T. Kwon, J. H. You, S. Kim, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6293-11]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Effect of strong refraction of probing beam accompanying shear holographic interferometry of a bow shock,** G. R. Toker, Univ. Autónoma del Estado de Morelos (Mexico); N. A. Korneev, Instituto Nacional de Astrofisica, Optica y (Mexico) . . . . . [6293-31]

✔ **Current-induced frequency modulation characteristics in semiconductor lasers using a novel and simple method,** J. Zhu, M. Zhang, Y. Liao, Tsinghua Univ. (China); J. Tang, China Oilfield Services Ltd. (China) . . . . . [6293-32]

✔ **Downhole seismic survey system with fiber optic accelerometer sensor array for 3D vertical seismic profile (3D-VSP),** Q. Zou, Y. Liao, M. Zhang, L. Wang, D. Tu, M. Pang, Tsinghua Univ. (China) . [6293-33]

✔ **Phase mapping of the poling process in the RuO_2:$LiNbO_3$ crystal by digital holographic interferometry,** W. Qu, D. Liu, Y. Zhi, Z. Luan, C. Wang, W. Lu, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6293-34]

✔ **Null Ronchi and Foucault tests implemented in an LCD,** J. Castro-Ramos, J. Muñoz-Lopez, S. Vazquez-Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6293-36]

✔ **High-sensitivity heterodyne interferometer as optical readout for LISA inertial sensor,** T. Schuldt, H. Kraus, EADS Astrium (Germany) and Humboldt-Univ. zu Berlin (Germany); C. Braxmaier, EADS Astrium (Germany) and Hochschule Konstanz (Germany); D. Weise, EADS Astrium (Germany); A. Peters, Humboldt-Univ. zu Berlin (Germany); U. A. Johann, EADS Astrium (Germany) . . . . . [6293-37]

✔ **Development of the interferometrical scanning probe microscope,** N. Dorozhovets, T. Hausotte, E. Manske, N. Hofmann, G. Jäger, Technische Univ. Ilmenau (Germany) . . . . . [6293-42]

✔ **Fiber optic hydrophone with increased sensitivity,** K. Guo, Y. Liao, S. Lai, M. Zhang, Z. Wang, Tsinghua Univ. (China); J. Tang, China Oilfield Services Ltd. (China) . . . . . [6293-43]

✔ **Intellectual property in holographic interferometry,** N. O. Reingand, D. Hunt, Landon IP, Inc. . . . . [6293-44]

Thursday 17 August

SESSION 3

Conv. Ctr. Room 11A . . . . . Thurs. 8:30 to 10:20 am

Precision Measurements for Industry

Chair: **Kay Gastinger**, SINTEF ICT (Norway)

8:30 am: **Nondestructive structural homogeneity of MOEMS arrays: applications of a through-transmissive-media interferometer on a digital mirror device spatial light modulator *(Invited Paper)*,** P. I. Oden, L. M. Heine, Texas Instruments Inc. . . . . [6293-12]

9:00 am: **High-speed high-accuracy fiber optic low-coherence interferometry for in situ grinding and etching process monitoring,** W. J. Walecki, A. Pravdivstev, M. Santos II, A. Koo, Frontier Semiconductor Inc. . . . . [6293-13]

9:20 am: **Investigation of wafer's inheritent defects with photoelastic technique,** Y. C. Goh, Infineon Technologies AG (Malaysia); A. K. Asundi, Nanyang Technological Univ. (Singapore); M. T. Ong, S. F. Loo, Infineon Technologies AG (Malaysia); T. Y. Khoo, Nanyang Technological Univ. (Singapore) . . . . . [6293-14]

9:40 am: **A white-light interferometer for inner cylindrical surfaces,** A. Albertazzi Gonçalves, Jr., M. Viotti, J. R. Menezes, Univ. Federal de Santa Catarina (Brazil); A. Dal Pont, Photonita (Brazil) . . . . . [6293-15]

10:00 am: **Novel approach of integrity assessment of thin film of different coatings by shearography,** K. J. Habib, Kuwait Institute for Scientific Research (Kuwait) . . . . . [6293-41]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 4

Conv. Ctr. Room 11A . . . . . Thurs. 10:50 am to 12:10 pm

Precision Optical Measurements

Chair: **Pierre M. Jacquot**, École Polytechnique Fédérale de Lausanne (Switzerland)

10:50 am: **Determination of absolute change in optical power of a reference mirror at cryogenic temperature,** I. B. Murray, D. S. Sabatke, P. C. Quigley, T. Reed, P. T. Spuhler, J. W. Baer, J. M. Oschmann, Ball Aerospace & Technologies Corp. . . . . [6293-17]

11:10 am: **Computer-aided alignment using Zernike coefficient,** H. Yang, Y. Lee, J. Song, H. Rhee, H. Lee, J. Lee, I. Lee, Korea Research Institute of Standards and Science (South Korea); S. Kim, S. Kim, Yonsei Univ. (South Korea) . . . . . [6293-18]

11:30 am: **Subaperture stitching interferometry for testing mild aspheres,** P. E. Murphy, G. W. Forbes, J. F. Fleig, G. M. DeVries, S. D. O'Donohue, QED Technologies Inc. . . . . [6293-20]

11:50 am: **Figure measurement of a large optical flat with a Fizeau interferometer and stitching technique,** C. Zhao, R. Sprowl, J. H. Burge, College of Optical Sciences/The Univ. of Arizona; M. Bray, MP Optique SARL (France) . . . . . [6293-21]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 5

Conv. Ctr. Room 11A . . . . . Thurs. 1:30 to 3:10 pm

Interferometric Sensors

Chair: **Peter J. de Groot**, Zygo Corp.

1:30 pm: **Interferometric sensors for application in the bladder and the lower urinary tract,** A. J. McCartney, M. Bialkowski, Heriot-Watt Univ. (United Kingdom); C. E. Towers, Univ. of Leeds (United Kingdom); J. S. Barton, R. L. Reuben, Heriot-Watt Univ. (United Kingdom); L. Stewart, Western General Hospital (United Kingdom); W. N. MacPherson, Heriot-Watt Univ. (United Kingdom); D. P. Towers, Univ. of Leeds (United Kingdom) . . . . . [6293-22]

1:50 pm: **Whole-field polarization analysis by digital holography,** M. Yokota, I. Yamaguchi, Gunma Univ. (Japan) . . . . . [6293-23]

2:10 pm: **Determination of refractive index by digital holography,** M. Hossain, D. S. Mehta, C. Shakher, Indian Institute of Technology Delhi (India) . . . . . [6293-24]

2:30 pm: **Error minimization in high-accuracy scanning deflectometry,** R. D. Geckeler, Physikalisch-Technische Bundesanstalt (Germany) . . . . . [6293-25]

2:50 pm: **Absolute distance measurements using point-diffracted spherical waves,** J. Chu, S. Kim, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6293-26]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 6

Conv. Ctr. Room 11A . . . . . Thurs. 3:30 to 4:50 pm

Stress, Strain, and Deformation

Chair: **Wolfgang Osten**, Univ. Stuttgart (Germany)

3:30 pm: **Studies of elasto-optic tomography process for 3D birefringence determination in phase micro-objects,** M. Kujawinska, P. Kniazewski, T. Kozacki, Politechnika Warszawska (Poland) . . . . [6293-27]

3:50 pm: **Simultaneous measurement of deformation and thickness variation in polymer films,** J. R. Torga, E. Morel, Univ. Tecnológica Nacional (Argentina) . . . . . [6293-28]

4:10 pm: **Multipoint diffraction strain sensor: an add-on to Moiré interferometer,** S. Iqbal, International I Univ. (Pakistan); S. Mhaisalkar, A. K. Asundi, Nanyang Technological Univ. (Singapore) . . . . . [6293-29]

4:30 pm: **Full-field optical micro-extensometer based on waveguide grating interferometry,** M. Kujawinska, L. A. Salbut, J. M. Krezel, Politechnika Warszawska (Poland) . . . . . [6293-30]

Courses of Related Interest

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SC211 **Practical Interferometry and Fringe Analysis** (Creath) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC213 **Introduction to Interferometric Optical Testing** (Wyant) Sun. 13 Aug., 8:30 am to 12:30 pm

SC795 **Interference Microscopy** (de Groot) Weds. 16 Aug., 1:30 to 5:30 pm

Detectors and Imaging Devices

Program on **Detectors and Imaging Devices**

Program Chair: **Eustace L. Dereniak,** College of Optical Sciences/The Univ. of Arizona

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
6294 **Infrared and Photoelectronic Imagers and Detector Devices II** *(Longshore)*, p. 66		6295 **Infrared Detectors and Focal Plane Arrays VIII** *(Dereniak/Sampson)*, p. 68		
Courses				
SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim), 1:30 to 5:30 pm	SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs), 1:30 to 5:30 pm	SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick), 8:30 am to 5:30 pm	SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim), 1:30 to 5:30 pm	SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams), 8:30 am to 12:30 pm
SC153 **Imaging Spectrometry** (Dereniak, Descour), 1:30 to 5:30 pm			**Register for Courses onsites at the SPIE Registration Desk!**	
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	**SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18		
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

Sunday-Monday 13-14 August 2006 • Proceedings of SPIE Vol. 6294

Infrared and Photoelectronic Imagers and Detector Devices II

Conference Chair: **Randolph E. Longshore**, Raytheon Missile Systems

Cochair: **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

Program Committee: **Raymond S. Balcerak**, Defense Advanced Research Projects Agency; **Latika S. R. Becker**, U.S. Army Space and Missile Defense Command; **Robert A. Bell**, iRobot Corp.; **Alexander C. Childs**, Raytheon Vision Systems; **Nibir K. Dhar**, Army Research Lab.

Sunday 13 August

SESSION 1

Conv. Ctr. Room 33B . . . . . Sun. 8:20 to 10:00 am

Imaging Systems and Cameras

Chair: **Randolph E. Longshore**, Raytheon Missile Systems

8:20 am: **Evaluation of InGaAs camera for scientific imaging and spectroscopy,** R. K. Guntupalli, R. Allen, Princeton Instruments, Inc. . . . . [6294-01]

8:40 am: **Low-light UV imaging with proximity-focused photoelectrons,** T. J. Jones, S. Nikzad, J. Blacksberg, M. E. Hoenk, Jet Propulsion Lab.; P. F. Morrissey, S. M. Kaye, C. Martin, California Institute Of Technology . . . . . [6294-02]

9:00 am: **HgCdTe MWIR back-illuminated electron-initiated avalanche photodiode arrays,** M. B. Reine, J. Marciniec, K. Wong, T. Parodos, J. D. Mullarkey, P. A. Lamarre, S. P. Tobin, K. A. Gustavsen, BAE Systems North America; G. M. Williams, Jr., Voxtel, Inc. . . . . [6294-46]

9:20 am: **Second and third generation thermal imagers based on type-II superlattice photodiodes,** R. H. Rehm, M. Walther, J. Schmitz, J. Fleißner, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany); J. Ziegler, W. A. Cabanski, R. Breiter, AIM Infrarot-Module GmbH (Germany) . . . . . [6294-05]

9:40 am: **Microprocessor-controlled wide-range streak camera,** A. E. Lewis, C. Hollabaugh, Bechtel Nevada . . . . . [6294-06]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 33B . . . . . Sun. 10:30 am to 12:10 pm

Imaging and CCDs

Chair: **Alexander C. Childs**, Raytheon Vision Systems

10:30 am: **Development of infrared thermal imager for dry eye diagnosis,** H. K. Chiang, C. Y. Chen, H. Y. Cheng, National Yang Ming Univ. (Taiwan); K. H. Chen, Taipei Veterans General Hospital (Taiwan); D. Chiang, United Integrated Services Co., Ltd. (Taiwan) . . . . . [6294-07]

10:50 am: **Single-photon-sensitive EBCCD with additional multiplication,** M. Suyama, T. Sato, S. Ema, T. Ohba, K. Inoue, K. Ito, T. Ihara, Hamamatsu Photonics K.K. (Japan); I. Mizuno, Hamamatsu Corp.; T. Maruno, Hamamatsu Photonics K.K. (Japan) . . . . . [6294-08]

11:10 am: **Delta-doped high purity silicon UV-NIR CCDs with high QE and low dark current,** M. E. Hoenk, J. Blacksberg, S. Nikzad, Jet Propulsion Lab.; T. S. Elliott, QinetiQ (United Kingdom); S. E. Holland, C. J. Bebek, Lawrence Berkeley National Lab.; P. A. Scowen, T. Veach, Arizona State Univ. . . . . [6294-09]

11:30 am: **0.18-μm CMOS fully differential CTIA for a 32x16 ROIC for 3D ladar imaging systems,** J. N. Helou, J. A. Garcia, M. S. Sarmiento, F. E. Kiamilev, Univ. of Delaware; B. Lawler, Army Research Lab. . [6294-10]

11:50 am: **Design considerations for ROIC for single color LWIR and multi-color IRFPA's,** A. K. Sood, Magnolia Optical Technologies, Inc.; J. Egerton, iRobot Corp.; Y. R. Puri, Magnolia Optical Technologies, Inc.; L. S. R. Becker, U.S. Army Space and Missile Defense Command; T. A. Cook, Boston Univ.; F. E. Kiamilev, Univ. of Delaware . . . . . [6294-11]

Lunch Break . . . . . 12:10 to 1:40 pm

SESSION 3

Conv. Ctr. Room 33B . . . . . Sun. 1:30 to 3:10 pm

Image Processing and Models

Chair: **Randolph E. Longshore**, Raytheon Missile Systems

1:30 pm: **FPA data rate management with recursive adaptive frame integration limited,** M. K. Rafailov, The Boeing Co. . . . . [6294-12]

1:50 pm: **A crossing path scene-based algorithm for nonuniformity correction in focal-plane array sensors,** L. Dong, W. Jin, J. Sui, X. Zhou, Beijing Institute of Technology (China) . . . . . [6294-13]

2:10 pm: **Image processing in optic damage inspection of dark-field imaging,** Z. Sun, Z. Peng, Y. Xie, F. Jing, W. Dengsheng, Laser Fusion Research Ctr./CAEP (China) . . . . . [6294-14]

2:30 pm: **HgCdTe detector, FPA, and sensor model for performance evaluation limits for SWIR, MWIR and LWIR sensors,** R. Richwine, Magnolia Optical Technologies, Inc.; R. S. Balcerak, Defense Advanced Research Projects Agency; K. S. Freyvogel, The Pennsylvania State Univ. . . . . [6294-15]

2:50 pm: **A comprehensive model for bolometer and uncooled array design and performance prediction,** R. Richwine, Magnolia Optical Technologies, Inc.; R. S. Balcerak, Defense Advanced Research Projects Agency; K. S. Freyvogel, The Pennsylvania State Univ. . . . . [6294-16]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 4

Conv. Ctr. Room 33B . . . . . Sun. 3:30 to 4:50 pm

Non Imaging

Chair: **Alexander C. Childs**, Raytheon Vision Systems

3:30 pm: **Structure characterization of new cyanine dye Langmuir-Blodgett multilayers by polarized UV-vis spectroscopy,** S. Ma, F. Gao, H. Zeng, C. Wang, W. Wang, Fudan Univ. (China); H. Tian, East China Univ. of Science and Technology (China) . . . . . [6294-17]

3:50 pm: **Nanosecond gated PMT for LIDAR-RADAR applications,** P. A. Molchanov, National Technical Univ. of Ukraine; V. M. Contarino, B. M. Concannon, Naval Air Systems Command; O. V. Asmolova, Kiev Polytechnic Univ. (Ukraine) . . . . . [6294-18]

4:10 pm: **FireLidar development: light scattering from wood smoke, experiments, and theory at 1574 nm,** E. T. Dressler, The Pennsylvania State Univ.; R. I. Billmers, E. J. Billmers, M. E. Ludwig, RL Associates Inc. . . . . [6294-19]

4:30 pm: **Ab initio calculated frequency-dependent nonlinear optical properties on $CsGeBr_3$,** L. Tang, Chung Cheng Institute of Technology (Taiwan); C. Chang, J. Huang, National Chiao Tung Univ. (Taiwan)[6294-21]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 33B . . . . . Mon. 8:40 to 11:50 am

Detectors and FPAs

Chair: **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

8:40 am: **Monolithic integration of all dielectric based asymmetric filter stacks on p-i-n photodetector,** V. Shanmugan, Y. Cao, R. Akkipeddi, Institute of Materials Research and Engineering (Singapore) . . . [6294-22]

9:00 am: **AlGaN Schottky barrier UV detectors,** X. Li, J. Fang, Shanghai Institute of Technical Physics (China) . . . . . [6294-23]

9:20 am: **Activation of arsenic in epitaxial $CdxHg_{1-x}Te$ (MCT),** D. Shaw, The Univ. of Hull (United Kingdom); P. Capper, SELEX Sensors and Airborne Systems Ltd. (United Kingdom) . . . . . [6294-25]

9:40 am: **Modeling and characterization of GaN p-i-n photodiodes,** J. Deng, S. Halder, J. C. M. Hwang, Lehigh Univ.; B. Hertog, J. Xie, A. M. Dabiran, A. Osinsky, SVT Associates Inc. . . . . [6294-27]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Curved focal plane arrays,** S. Nikzad, T. J. Jones, M. E. Hoenk, J. Blacksberg, Jet Propulsion Lab. . . . . [6294-28]

10:50 am: **Mid-infrarad quantum cascade detectors on InP,** M. Graf, N. Hoyler, M. Giovannini, J. Faist, D. Hofstetter, Univ. of Neuchâtel (Switzerland) . . . . . [6294-29]

11:10 am: **Triple wavelength monitor PDIC,** D. Park, C. Ha, S. C. Shin, J. Y. Ko, S. Kang, J. C. Gong, K. Kwon, SAMSUNG Electro-Mechanics Co., Ltd. (South Korea) . . . . . [6294-31]

11:30 am: **A review of advances in EO/IR focal plane array technology for space system applications *(Invited Paper)*,** A. K. Sood, Magnolia Optical Technologies, Inc.; L. S. R. Becker, U.S. Army Space and Missile Defense Command . . . . . [6294-32]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Design of coded aperture arrays by means of a global optimization algorithm,** H. Lang, L. Liu, Q. Yang, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6294-36]

✔ **Improvement of pipelines implementations in FPGA design,** N. S. Thirer, Holon Institute of Technology (Israel); U. Efron, Holon Institute of Technology (Israel) and Ben Gurion Univ. (Israel); Y. Davidov, I. Baal Zedaka, A. Axelevitch, Holon Institute of Technology (Israel) . [6294-37]

✔ **Energy structure and micromechanism of photo-EMF effect in adaptive IR-detectors based on CdTe:V crystals,** Y. P. Gnatenko, M. S. Brodyn, P. M. Bukivskij, I. O. Faryna, P. A. Skubenko, O. A. Shigiltchoff, Instytut Fizyki (Ukraine); R. V. Gamernyk, Lviv National Univ. (Ukraine); N. V. Kukhtarev, T. V. Kukhtareva, Alabama A&M Univ. . . . . [6294-38]

✔ **The developing science and technologies list (DSTL),** R. V. Wick, Institute for Defense Analyses . . . . . [6294-39]

✔ **Wavelength-dependent resolution and electron energy distribution measurements of image intensifiers,** R. J. Brooks, J. R. Howorth, M. B. Ingle, Photek Ltd. (United Kingdom) . . . . . [6294-40]

✔ **Technique of imitating computer modeling of the electrooptical devices for supervision,** G. N. Popov, Central Design Bureau Tochpribor (Russia); V. V. Malinin, Siberian State Geodetic Academy (Russia) . . . . . [6294-41]

✔ **Neutron dosimeter using a 52-mm scintillation fiber readout by a 75-mm image intensifier,** H. Mastumoto, H. Kawakami, Japan Aerospace Exploration Agency (Japan); K. Terasawa, Japan Aerospace Exploration Agency (Japan) and Advanced Research Instituie for Science and Engineering (Japan); T. Doke, Japan Aerospace Exploration Agency (Japan) and Advanced Research Instituie for Science and Engineering; T. Goka, Japan Aerospace Exploration Agency (Japan); Z. Zhao, Q. Song, B. Ye, National Astronomical Observatories (China); H. Ni, Nanjing Institute of Astronomical Optics & Technology (China); I. I. Ferguson, J. R. Howorth, Photek Ltd. (United Kingdom); T. Nozaki, Meisei Electric Co., Ltd. (Japan); Y. Uchihori, National Institute of Radiological Sciences (Japan) . . . . . [6294-42]

✔ **Modeling of avalanche photodiodes by crosslight APSYS,** Y. Xiao, Z. Li, Z. Li, Crosslight Software Inc. (Canada) . . . . . [6294-43]

✔ **Design and characterization of a four-quadrant detector and its application to a shape recovering system,** A. Vera, L. A. Gonzalez Lopez, F. Mendoza-Hernandez, J. R. Noriega, Univ. de Sonora (Mexico) . . . . . [6294-44]

✔ **Multiple lenslet infrared imaging,** M. Shankar, Duke Univ.; R. M. Willett, Univ. of Wisconsin/Madison; D. J. Brady, A. D. Portnoy, Duke Univ. . . . . [6294-45]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim) Sun. 13 Aug., 1:30 to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Mon. 14 Aug 1:30 to 5:30 pm

SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

Tuesday-Wednesday 15-16 August 2006 • Proceedings of SPIE Vol. 6295

Infrared Detectors and Focal Plane Arrays VIII

Conference Chairs: **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona; **Robert E. Sampson**, I Technology Applications

Program Committee: **Sarath D. Gunapala**, Jet Propulsion Lab.; **John E. Hubbs**, Air Force Research Lab.; **Paul D. LeVan**, Air Force Research Lab.; **Benjamin Muto**, DRS Technologies, Inc.; **Paul R. Norton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Herbert K. Pollehn**, Army Research Lab.; **James A. Stobie**, BAE Systems; **Bill Weissbard**, Rockwell Scientific Co., LLC; **Marc Wigdor**, SPARTA, Inc.

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 33B . . . . . Tues. 8:30 to 10:00 am

III-V Materials

Chair: **Robert E. Sampson**, I Technology Applications

8:30 am: **640x512 pixels long-wavelength infrared (LWIR) quantum dot infrared photodetector (QDIP) focal plane array *(Invited Paper)*,** S. D. Gunapala, Jet Propulsion Lab. . . . . [6295-01]

9:00 am: **Short-period InAs/GaSb type-II superlattices for mid-infrared detectors,** H. J. Haugan, F. Szmulowicz, K. Mahalingam, G. J. Brown, S. R. Munshi, Air Force Research Lab.; B. Ullrich, Bowling Green State Univ. . . . . [6295-02]

9:20 am: **InGaAsSb/AlGaAsSb heterojunction phototransistors for infrared applications,** T. F. Refaat, M. N. Abedin, NASA Langley Research Ctr.; O. V. Sulima, Univ. of Delaware; S. Ismail, U. N. Singh, NASA Langley Research Ctr. . . . . [6295-03]

9:40 am: **One- and 2D InGaAs focal plane array technologies and applications,** M. H. Ettenberg, J. C. Dries, M. J. Cohen, D. S. Malchow, Sensors Unlimited, Inc. . . . . [6295-04]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 33B . . . . . Tues. 10:30 to 11:40 am

FPA Characteristics

Chair: **Paul D. LeVan**, Air Force Research Lab.

10:30 am: **Large format VOx microbolometer UFPA development at ITC *(Invited Paper)*,** K. A. Hay, LC Com - InfraredVision Technology Corp. . . . . [6295-05]

11:00 am: **Automatic in-unit cell offset subtraction for MWIR and LWIR HgCdTe detectors,** R. W. Tarde, Ball Aerospace & Technologies Corp.; S. Lauxtermann, R. B. Bailey, Rockwell Scientific Co., LLC . . . . . [6295-06]

11:20 am: **Correcting sensor nonuniformities and implementation using adaptive filter in infrared staring system,** A. Kumar, Indian Institute of Technology Roorkee (India); S. Sarkar, Mody Institute of Education and Research (India); R. P. Agarwal, Indian Institute of Technology/Roorkee (India) . . . . . [6295-07]

Lunch/Exhibition Break . . . . . 11:40 am to 1:30 pm

SESSION 3

Conv. Ctr. Room 33B . . . . . Tues. 1:30 to 3:00 pm

IR Systems I

Chair: **Marc Wigdor**, SPARTA, Inc.

1:30 pm: **Snapshot complete imaging polarimeter using Savart plates *(Invited Paper)*,** K. Oka, N. Saito, Hokkaido Univ. (Japan) . . . . [6295-09]

2:00 pm: **Monolithically integrated near-infrared and mid-infrared detector array for spectral imaging,** S. V. Bandara, S. D. Gunapala, J. K. Liu, J. M. Mumolo, S. S. Keo, Jet Propulsion Lab. . . . . [6295-10]

2:20 pm: **Polarization acquisition using a commercial Fourier transform spectrometer in the MWIR,** M. W. Kudenov, N. A. Hagen, H. Luo, College of Optical Sciences/The Univ. of Arizona; G. R. Gerhart, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; E. L. Dereniak, S. Robertson, L. G. Montilla, T. B. Vo, J. Tam, J. D. Nichols, College of Optical Sciences/The Univ. of Arizona . . . . . [6295-11]

2:40 pm: **Performance of image processing techniques for efficient data management on the focal plane,** J. T. Caulfield, Cyan Systems; P. L. McCarley, U.S. Air Force Eglin Sensors Directorate; M. A. Massie, C. R. Baxter, Nova Sensors . . . . . [6295-12]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 4

Conv. Ctr. Room 33B . . . . . Tues. 3:30 to 5:00 pm

IR Systems II

Chair: **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona

3:30 pm: **Measurement of the radiometric and polarization characteristics of a microgrid polarizer in an infrared focal plane array *(Invited Paper)*,** J. E. Hubbs, Ball Aerospace & Technologies Corp. . . . . [6295-13]

4:00 pm: **Non-scanning dual infrared band hyperspectral imaging spectrometer design,** J. P. Hartke, U.S. Military Academy; P. D. LeVan, Air Force Research Lab.; E. L. Dereniak, College of Optical Sciences/The Univ. of Arizona . . . . . [6295-14]

4:20 pm: **Design of an LWIR snapshot imaging spectropolarimeter,** R. W. Aumiller, N. A. Hagen, E. L. Dereniak, College of Optical Sciences/The Univ. of Arizona; R. E. Sampson, I Technology Applications; R. W. McMillan, U.S. Army Space and Missile Defense Command . . . [6295-15]

4:40 pm: **Lobster eye infrared focusing optics,** M. Gertsenshteyn, T. P. Jannson, Physical Optics Corp. . . . . [6295-16]

Wednesday 16 August

SESSION 5

Conv. Ctr. Room 33B . . . . . Wed. 8:30 to 10:00 am

Unique Features

Chair: **John E. Hubbs**, Ball Aerospace & Technologies Corp.

8:30 am: **SWIR hyperspectral detection with integrated HgCdTe detector and tunable MEMS filter *(Invited Paper)*,** P. Mitra, J. D. Beck, M. R. Skokan, J. E. Robinson, DRS Infrared Technologies LP; C. A. Musca, J. M. Dell, L. Faraone, The Univ. of Western Australia (Australia) [6295-17]

9:00 am: **Wavelength-selective lead-salt photodetectors for gas sensing in the mid-infrared,** M. Boeberl, J. Roither, T. Fromherz, G. Springholz, W. Heiss, Johannes Kepler Univ. Linz (Austria) . . . . [6295-18]

9:20 am: **SWIR HgCdTe 256x256 focal plane array technology at BAE Systems,** A. W. Hairston, S. P. Tobin, M. A. Hutchins, J. Marciniec, J. D. Mullarkey, P. W. Norton, M. N. Gurnee, M. B. Reine, BAE Systems North America . . . . . [6295-30]

9:40 am: **A systemic approach of complexity for preliminary design of a measuring instrument observing in infrared,** B. B. Angeli, Consultant . . . . . [6295-19]

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 6

Conv. Ctr. Room 33B . . . . . Wed. 10:20 to 11:40 am

Detector Materials

Chair: **Bill Weissbard**, Rockwell Scientific Co., LLC

10:20 am: **Progress in MCT large staring arrays,** F. P. Pistone, S. Dugalleix, P. M. Tribolet, Sofradir (France); G. L. Destefanis, CEA-LETI (France) . . . . . [6295-21]

10:40 am: **Solution-processible photodetectors operating up to wavelength of 3 microns,** M. Boeberl, M. V. Kovalenko, W. Heiss, Johannes Kepler Univ. Linz (Austria) . . . . . [6295-22]

11:00 am: **Application of amorphous silicon thin films in uncooled infrared detection technology,** A. J. Syllaios, T. R. Schimert, J. F. Brady, J. H. Tregilgas, M. F. Taylor, R. W. Gooch, W. L. McCardel, L-3 Communications Corp. . . . . [6295-23]

11:20 am: **MBE grown type-II superlattice photodiodes,** C. J. Hill, J. Li, J. M. Mumolo, S. V. Bandara, S. D. Gunapala, Jet Propulsion Lab. . . . . [6295-24]

Lunch/Exhibition Break . . . . . 11:40 am to 1:00 pm

SESSION 7

Conv. Ctr. Room 33B . . . . . Wed. 1:00 to 2:30 pm

Application

Chair: **James A. Stobie**, BAE Systems

1:00 pm: **Status of Sarnoff high performance CMOS imagers *(Invited Paper)*,** J. R. Janesick, J. R. Tower, Sarnoff Corp. . . . . [6295-31]

1:30 pm: **Background noise induced by ultrafast laser,** M. K. Rafailov, The Boeing Co. . . . . [6295-25]

1:50 pm: **Computation of current responsivity of a bimorph pyroelectric infrared detector,** P. Guggilla, A. K. Batra, Alabama A&M Univ.; J. R. Currie, Jr., NASA Marshall Space Flight Ctr.; M. D. Aggarwal, R. B. Lal, Alabama A&M Univ. . . . . [6295-26]

2:10 pm: **Design of CMOS-APS smart imagers with mixed signal processing and analysis of their transfer characteristics,** K. Fliegel, J. Svihlik, M. Rerabek, Czech Technical Univ. in Prague (Czech Republic) . . . . . [6295-27]

Courses of Related Interest

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SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim) Sun. 13 Aug., 1:30 to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Mon. 14 Aug 1:30 to 5:30 pm

SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

Optical Instrumentation

Program on **Remote and In Situ Sensing**

Program Chair: **Wei Gao,** Colorado State Univ.

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
	6296 **Earth Observing Systems XI** *(Butler)*, p.71			
		6297 **Infrared Spaceborne Remote Sensing 2006** *(Strojnik)*, p. 74		
	6298 **Remote Sensing and Modeling of Ecosystems for Sustainability III** *(Gao/Ustin)*, p. 77			
6299 **Remote Sensing of Aerosol and Chemical Gases, Model Simulation/ Assimilation, and Applications to Air Quality** *(Chu/Szykman/Kondragunta)*, p. 81			6301 **Atmospheric and Environmental Remote Sensing Data Processing and Utilization II: Perspective on Calibration/Validation Initiatives and Strategies** *(Huang/Bloom)*, p. 86	
6300 **Satellite Data Compression, Communication, and Archiving II** *(Heymann/Wang/Schmit)*, p. 84				
	6302 **Imaging Spectrometry XI** *(Shen/Lewis)*, p. 88			
Courses				
SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim), 1:30 to 5:30 pm	SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs), 1:30 to 5:30 pm	SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl), 8:30 am to 5:30 pm	SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke), 8:30 am to 12:30 pm	SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams), 8:30 am to 12:30 pm
SC153 **Imaging Spectrometry** (Dereniak, Descour), 1:30 to 5:30 pm		SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick), 8:30 am to 5:30 pm	SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim), 1:30 to 5:30 pm	
SC567 **Introduction to Optical Remote Sensing Systems** (Shaw), 8:30 am to 12:30 pm		SC561 **Optomechanics for Space Applications** (Shipley), 8:30 am to 5:30 pm		
SC798 **Practical Radiometry** (Strojnik), 8:30 am to 5:30 pm				

Register for Courses onsites at the SPIE Registration Desk!

See full Special Events Daily Schedule on page 4.

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Earth Observing Systems XI

Conference Chair: **James J. Butler**, NASA Goddard Space Flight Ctr.

Cochair: **Jack Xiong**, NASA Goddard Space Flight Ctr.

Program Committee: **Philip E. Ardanuy**, Raytheon Co.; **Robert A. Barnes**, Science Applications International Corp.; **Stuart F. Biggar**, College of Optical Sciences/The Univ. of Arizona; **Armin W. Doerry**, Sandia National Labs.; **Thomas S. Pagano**, Jet Propulsion Lab.; **Carl F. Schueler**, Raytheon Santa Barbara Remote Sensing

Monday 14 August

SESSION 1

Conv. Ctr. Room 33A . . . . . Mon. 8:30 to 10:30 am

Prelaunch Calibration and Characterization

Chair: **Stuart F. Biggar**, College of Optical Sciences/The Univ. of Arizona

8:30 am: **Application of SSULI ground calibration methods to retrieval of spectral emissions on flight instruments,** P. W. Walker II, Computational Physics, Inc.; A. C. Nicholas, K. F. Dymond, S. A. Budzien, S. E. Thonnard, Naval Research Lab. . . . . [6296-01]

8:50 am: **Hyperspectral image projector for advanced sensor characterization,** S. W. Brown, J. P. Rice, National Institute of Standards and Technology; B. C. Johnson, National Institue of Standards and Technology . . . . . [6296-02]

9:10 am: **Comparison between laboratory and airborne BRDF measurements for remote sensing,** G. T. Georgiev, C. K. Gatebe, J. J. Butler, M. D. King, NASA Goddard Space Flight Ctr. . . . . [6296-03]

9:30 am: **Bandwidth and spectral stray light effects in the NASA GSFC Radiometric Calibration Facility primary transfer radiometer,** R. A. Barnes, Science Applications International Corp.; J. W. Cooper, J. E. Marketon, Science Systems and Applications, Inc.; S. W. Brown, C. Johnson, National Institute of Standards and Technology; J. J. Butler, NASA Goddard Space Flight Ctr. . . . . [6296-04]

9:50 am: **Results and lessons learned from MODIS polarization sensitivity characterization,** J. Sun, Science System and Applications, Inc.; X. Xiong, NASA Goddard Space Flight Ctr.; X. Wang, S. Qiu, New Century Applied Science, Inc.; S. Xiong, Science Systems and Applications, Inc.; E. Waluschka, NASA Goddard Space Flight Ctr. . . . . [6296-06]

10:10 am: **MODIS solar diffuser Earthshine modeling and analysis,** R. E. Wolfe, W. Esaias, A. I. Lyapustin, X. Xiong, NASA Goddard Space Flight Ctr. . . . . [6296-07]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 2

Conv. Ctr. Room 33A . . . . . Mon. 11:00 am to 2:20 pm

MODIS

Chair: **James J. Butler**, NASA Goddard Space Flight Ctr.

11:00 am: **Results and lessons from MODIS reflective solar bands calibration: pre-launch to on-orbit,** X. Xiong, N. Che, NASA Goddard Space Flight Ctr. . . . . [6296-08]

11:20 am: **Improvement of MODIS RSB calibration by minimizing the earthshine impact on solar diffuser observations,** X. Xie, Science Systems and Applications, Inc.; X. Xiong, R. E. Wolfe, NASA Goddard Space Flight Ctr.; A. I. Lyapustin, Univ. of Maryland/Baltimore County . . . . . [6296-09]

11:40 am: **Analysis of image striping due to polarization correction artifacts in remotely sensed ocean scenes,** G. Meister, Futuretech Corp.; E. J. Kwiatkowska, Science Applications International Corp.; C. R. McClain, NASA Goddard Space Flight Ctr. . . . . [6296-10]

Lunch Break . . . . . 12:00 to 1:20 pm

1:20 pm: **Results and lessons learned from MODIS thermal emissive bands calibration: pre-launch to on-orbit,** J. Xiong, NASA Goddard Space Flight Ctr.; K. Chiang, Science Systems and Applications, Inc.; W. L. Barnes, B. W. Guenther, Univ. of Maryland . . . . . [6296-11]

1:40 pm: **Assessing MODIS LWIR band calibration accuracy,** C. C. Moeller, Univ. of Wisconsin/Madison; S. J. Hook, Jet Propulsion Lab.; D. C. Tobin, Univ. of Wisconsin/Madison; V. Walden, Univ. of Idaho . . [6296-12]

2:00 pm: **An overview of inter-comparison methodologies for Terra and Aqua MODIS calibration,** X. Xiong, A. Wu, J. Sun, NASA Goddard Space Flight Ctr. . . . . [6296-13]

SESSION 3

Conv. Ctr. Room 33A . . . . . Mon. 2:20 to 4:30 pm

Landsat and ALI

Chair: **Robert A. Barnes**, Science Applications International Corp.

2:20 pm: **Absolute calibration accuracy of L4 TM and L5 TM sensor image pairs,** G. Chander, E. Micijevic, U.S. Geological Survey . [6296-14]

2:40 pm: **Stability of Landsat-4 thematic mapper outgassing models,** E. Micijevic, G. Chander, U.S. Geological Survey . . . . . [6296-15]

Coffee Break . . . . . 3:00 to 3:30 pm

3:30 pm: **Landsat TM and ETM+ thermal band calibration,** J. A. Barsi, NASA Goddard Space Flight Ctr. and Science Systems and Applications, Inc.; S. J. Hook, F. D. Palluconi, Jet Propulsion Lab.; J. R. Schott, N. G. Raqueno, Rochester Institute of Technology . . . . . [6296-16]

3:50 pm: **Radiometric calibration of Advanced Land Imager using reflectance-based results between 2001 and 2005,** J. T. McCorkel, K. J. Thome, S. F. Biggar, College of Optical Sciences/The Univ. of Arizona . . . . . [6296-17]

4:10 pm: **Cross-calibration of MODIS with TM, ETM+, and ALI sensors for long-term monitoring of land surface processes,** D. Meyer, G. Chander, U.S. Geological Survey . . . . . [6296-19]

Tuesday 15 August

SESSION 4

Conv. Ctr. Room 33A . . . . . Tues. 8:50 to 10:30 am

On-orbit Performance I

Chair: **Jack Xiong**, NASA Goddard Space Flight Ctr.

8:50 am: **The impact of the AIRS spatial response on channel-to-channel and multi-instrument data analyses,** D. A. Elliott, T. S. Pagano, H. H. G. Aumann, Jet Propulsion Lab. . . . . [6296-21]

9:10 am: **Evaluation of AIRS, MODIS, and HIRS 11 micron brightness temperature difference changes from 2002 through 2005,** S. E. Broberg, H. H. G. Aumann, D. T. Gregorich, Jet Propulsion Lab.; X. Xiong, NASA Goddard Space Flight Ctr. . . . . [6296-22]

9:30 am: **Radiometric performance of the CERES Earth Radiation Budget climate record sensors on the EOS Aqua and Terra Spacecraft,** K. J. Priestley, NASA Langley Research Ctr.; S. Thomas, D. L. Cooper, D. R. Walikainen, P. C. Hess, Science Applications International Corp.; G. Matthews, Analytical Services & Materials, Inc.; R. S. Wilson, Science Applications International Corp. . . . . [6296-23]

9:50 am: **Validation studies performed on Clouds and the Earth's Radiant Energy system (CERES) instrument sensors aboard EOS Terra and Aqua spacecraft,** S. Thomas, Science Applications International Corp.; K. J. Priestley, NASA Langley Research Ctr.; R. S. Wilson, D. R. Walikainen, Science Applications International Corp.; G. Matthews, Analytical Services & Materials, Inc. . . . . [6296-24]

10:10 am: **Coloration determination of spectral darkening occurring on a broadband Earth observing radiometer: Application to Clouds and the Earth's Radiant Energy system (CERES),** G. Matthews, Analytical Services & Materials, Inc.; K. J. Priestley, NASA Langley Research Ctr.; D. R. Walikainen, S. Thomas, Science Applications International Corp. . . . . [6296-25]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 5

Conv. Ctr. Room 33A . . . . . Tues. 11:00 am to 12:40 pm

On-orbit Performance II

Chair: **Thomas S. Pagano**, Jet Propulsion Lab.

11:00 am: **In-flight performance of the Japanese Advanced Meteorological Imager,** J. J. Puschell, Raytheon Space and Airborne Systems; M. M. Gunshor, Univ. of Wisconsin/Madison; R. Osgood, J. Auchter, Raytheon Santa Barbara Remote Sensing . . . . . [6296-26]

11:20 am: **Best source for GOES imager scan-mirror reflectance data,** D. Han, ASRC Aerospace Corp.; M. P. Weinreb, National Oceanic and Atmospheric Administration . . . . . [6296-27]

11:40 am: **QuickBird relative radiometric performance and on-orbit long term trending,** K. S. Krause, DigitalGlobe, Inc. . . . . [6296-28]

12:00 pm: **SeaWiFS long-term solar diffuser reflectance trend analysis,** R. E. Eplee, Jr., F. S. Patt, R. A. Barnes, Science Applications International Corp.; C. R. McClain, NASA Goddard Space Flight Ctr. . . . . [6296-29]

12:20 pm: **EOS-Aura ozone monitoring instrument in-flight performance and calibration,** M. R. Dobber, R. J. Dirksen, P. F. Levelt, G. H. J. van den Oord, Q. Kleipool, R. Voors, Koninklijk Nederlands Meteorologisch Instituut (Netherlands); G. Jaross, M. Kowalewski, Science Systems and Applications, Inc. . . . . [6296-30]

Lunch/Exhibition Break . . . . . 12:40 to 1:40 pm

Plenary Presentation

Conv. Ctr. Room 6A . . . . . Tues. 1:40 to 2:20 pm

Remote Sensing in the Coming Decades: The Vision and the Reality

William B. Gail, Director, Virtual Earth, Microsoft Corp.

See p. 13 for additional information.

SESSION 6

Conv. Ctr. Room 33A . . . . . Tues. 2:40 to 5:10 pm

Remote Sensing Data Processing and Exploitation

Chair: **James J. Butler**, NASA Goddard Space Flight Ctr.

2:40 pm: **Data processing and in-flight calibration systems for OMI-EOS-Aura,** G. H. J. van den Oord, M. R. Dobber, J. van de Vegte, I. van der Neut, W. Som de Cerff, Koninklijk Nederlands Meteorologisch Instituut (Netherlands); N. R. Rozemeijer, TriOpSys (Netherlands); V. Schenkelaars, Dutch Space B.V. (Netherlands); M. ter Linden, Dutch Space B.V.[6296-31]

3:00 pm: **The NPOESS data exploitation project and how it will serve the civilian user community,** J. Silva, National Oceanic and Atmospheric Administration; S. Cutler, S. Bunin, Mitretek Systems . . . . . [6296-32]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **A net-centric system of services model for the Integrated Earth Observation System (IEOS) and the Integrated Ocean Observing System (IOOS),** P. E. Ardanuy, E. L. Bensman, W. R. Bergen, Raytheon Co.; R. Chen, Columbia Univ.; F. P. Griffith, C. Sutton, C. A. Hood, A. Ritchie, A. M. Tarro, Raytheon Co.; M. K. Macauley, Resources for the Future . . . . . [6296-33]

4:10 pm: **Enhancing data usability through automatic data transformations,** B. Hay, K. Nance, Univ. of Alaska/Fairbanks . [6296-34]

4:30 pm: **Analysis of the relationship between the precipitation and the SST based on the TRMM data during the Asia monsoon season,** J. Sun, J. He, Nanjing Univ. of Information Science and Technology (China); J. Liu, Yunnan Institute of Meteorology (China); S. Zhong, L. Wang, Nanjing Univ. of Information Science and Technology (China) . . . . . [6296-35]

4:50 pm: **Impact of climate change in the Hengduan Mountains of northwestern Yunnan, China: vegetation distribution change in the past and future,** J. Sun, Nanjing Univ. of Information Science & Technology (China); B. B. Baker, The Nature Conservancy; D. Bachelet, C. Daly, Oregon State Univ.; J. Ma, The Nature Conservancy (China); J. Liu, Yunnan Institute of Meteorology (China) . . . . . [6296-36]

Wednesday 16 August

SESSION 7

Conv. Ctr. Room 33A . . . . . Wed. 8:00 to 10:00 am

Vicarious Calibration

Chair: **Philip E. Ardanuy**, Raytheon Co.

8:00 am: **Use of the Moon to support on-orbit sensor calibration for climate records,** T. C. Stone, U.S. Geological Survey; H. H. Kieffer, Celestial Reasonings . . . . . [6296-37]

8:20 am: **Vicarious calibration of GOES Imager visible channel using the Moon,** X. Wu, National Oceanic and Atmospheric Administration; T. C. Stone, U.S. Geological Survey; D. Han, ASRC Aerospace Corp. [6296-38]

8:40 am: **Comparison of SeaWiFS on-orbit lunar and vicarious calibrations,** R. E. Eplee, Jr., Science Applications International Corp.; S. W. Bailey, Futurtech Corp.; R. A. Barnes, Science Applications International Corp.; H. H. Kieffer, Celestial Reasonings; C. R. McClain, NASA Goddard Space Flight Ctr. . . . . [6296-39]

9:00 am: **Vicarious calibration of ASTER backward-looking telescope,** K. J. Thome, College of Optical Sciences/The Univ. of Arizona . [6296-40]

9:20 am: **Validation of large-footprint, reflectance-based calibration using coincident MODIS and ASTER data,** J. M. D'Amico, K. J. Thome, J. S. Czapla-Myers, College of Optical Sciences/The Univ. of Arizona . . . . . [6296-41]

9:40 am: **Extending the application of a laser-based system for ground measurement of backscatter surface reflectance,** J. H. Buchanan III, J. T. Dobler, K. J. Thome, S. F. Biggar, College of Optical Sciences/The Univ. of Arizona . . . . . [6296-42]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 8

Conv. Ctr. Room 33A . . . . . Wed. 10:30 am to 12:30 pm

New Missions and Instruments

Chair: **Carl F. Schueler**, Raytheon Santa Barbara Remote Sensing

10:30 am: **The Orbital Carbon Observatory,** C. J. Bruegge, C. E. Miller, Jet Propulsion Lab.; R. Pollock, Hamilton Sundstrand . . . . . [6296-43]

10:50 am: **The Global Precipitation Measurement (GPM) mission: an overview,** G. S. Jackson, A. Y. Hou, NASA Goddard Space Flight Ctr. . . . . [6296-44]

11:10 am: **Optical instrumentation heading in a new direction,** J. Leijtens, TNO (Netherlands) . . . . . [6296-45]

11:30 am: **Instrument requirements for a next generation 1km resolution hyperspectral imaging spectrometer,** T. S. Pagano, H. H. G. Aumann, Jet Propulsion Lab. . . . . [6296-46]

11:50 am: **Means of in-flight sensor characterization of the Ozone Mapping Profiling Suite - Limb Profiler,** D. E. Flittner, NASA Langley Research Ctr.; G. Jaross, NASA Goddard Space Flight Ctr. . . . [6296-47]

12:10 pm: **TROPOMI and TROPI: UV/VIS/NIR/SWIR instruments,** P. F. Levelt, G. H. J. van den Oord, M. R. Dobber, H. Eskes, M. van Weele, P. Veefkind, R. van Oss, Koninklijk Nederlands Meteorologisch Instituut (Netherlands); I. Aben, R. T. Jongma, J. Landgraf, SRON Nationaal Instituut voor Ruimteonderzoek (Netherlands); J. de Vries, Dutch Space B.V. (Netherlands); H. Visser, TNO TPD (Netherlands) . . . . . [6296-48]

Lunch/Exhibition Break . . . . . 12:30 to 1:30 pm

SESSION 9

Conv. Ctr. Room 33A . . . . . Wed. 1:30 to 3:10 pm

New Instruments

Chair: **Armin W. Doerry**, Sandia National Labs.

1:30 pm: **Development of a full-disk ratioing radiometer (FDRR) for calibration of the advanced baseline radiometer's reflective spectral channels,** P. R. Silverglate, J. C. Bremer, N. G. Bozzolo, C. Lashley, P. Sohn, Swales Aerospace . . . . . [6296-49]

1:50 pm: **Development of Dual Imaging Optical Sensor (DIOS) for small satellites,** Y. Choi, Satrec Initiative Co., Ltd. (South Korea); M. Kang, Satrec Initiative Co. Ltd (South Korea); S. Jeong, E. D. Kim, J. Yun, S. Yang, J. Kim, E. Kim, Satrec Initiative Co., Ltd. (South Korea) . . [6296-51]

2:10 pm: **MIBS breadboard ready for testing,** J. Leijtens, B. de Goeij, E. C. Boslooper, TNO (Netherlands) . . . . . [6296-52]

2:30 pm: **ALADIN airborne demonstrator: a Doppler wind lidar to prepare ESA's Aeolus Explorer Mission,** R. Meynart, Y. Durand, M. J. Endemann, European Space Research and Technology Ctr. (Netherlands); E. Chinal, EADS Astrium (France); O. Reitebuch, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6296-53]

2:50 pm: **Non-scanning marine active/passive sensor for remote sensing,** P. P. Lin, S. L. Dees, C. P. Warren, J. Naungayan, NovaSol . . . . . [6296-54]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster reception, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Chemical sensing through multiple light taps in plastic optical fiber,** J. Taguenang, A. Sharma, A. Kassu, Alabama A&M Univ.; P. B. Ruffin, C. Brantley, E. Edwards, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6296-57]

✔ **Precise measurement of CO2 from space using Fabry-Perot based optical setup - current status and development,** E. M. Georgieva, Science Systems and Applications, Inc.; E. L. Wilson, NASA Goddard Space Flight Ctr.; M. Miodek, Science Systems and Applications, Inc.; W. S. Heaps, NASA Goddard Space Flight Ctr. . . . . [6296-58]

✔ **Absorptance calibration of the cavity radiometers for the spaceflight solar Total Irradiance Monitor,** K. F. Heuerman, D. Harber, A. Ebbets, G. A. Kopp, L. Logan, Univ. of Colorado/Boulder [6296-59]

✔ **Aperture edge scatter calibration for radiometry from the solar Total Irradiance Monitor,** D. Harber, K. F. Heuerman, G. A. Kopp, G. Lawrence, Univ. of Colorado/Boulder . . . . . [6296-60]

✔ **Seismic wave observing system based on fiber optic sensor,** Y. Zhang, S. Li, J. Ning, Z. Yin, H. Cui, Stevens Institute of Technology . . . . . [6296-61]

✔ **Uncertainty analysis of MODIS on-orbit spectral characterization,** Y. Xie, George Mason Univ.; N. Che, Science Systems and Applications, Inc.; J. Qu, George Mason Univ.; X. Xiong, NASA Goddard Space Flight Ctr. . . . . [6296-62]

✔ **MODIS on-orbit spatial characterization results and potential application,** Y. Xie, George Mason Univ.; X. Xiong, NASA Goddard Space Flight Ctr.; J. Qu, George Mason Univ.; N. Che, Science Systems and Applications, Inc. . . . . [6296-63]

✔ **GeoSTAR: developing a new payload for GOES-R,** B. H. Lambrigtsen, T. C. Gaier, A. B. Tanner, P. Kangaslahti, S. Brown, Jet Propulsion Lab.; C. S. Ruf, Univ. of Michigan; J. Piepmeier, NASA Goddard Space Flight Ctr. . . . . [6296-50]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim) Sun. 13 Aug., 1:30 to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl) Tues. 15 Aug., 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Mon. 14 Aug 1:30 to 5:30 pm

SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Weds. 16 Aug., 8:30 am to 12:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC567 **Introduction to Optical Remote Sensing Systems** (Shaw) Sun. 13 Aug., 8:30 am to 12:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

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Tuesday 15 August

Conv. Ctr. Room 32B . . . . . Tues. 8:25 to 8:30 am

Welcome remarks

Chair: **Marija S. Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

SESSION 1

Conv. Ctr. Room 32B . . . . . Tues. 8:30 to 11:30 am

Recent Advances in Infrared Standards

Chair: **Gerald T. Fraser**, National Institute of Standards and Technology

8:30 am: **Infrared hyperspectral image projectors *(Invited Paper)*,** J. P. Rice, J. E. Neira, S. W. Brown, B. C. Johnson, National Institute of Standards and Technology . . . . . [6297-01]

9:00 am: **The new NIST advanced infrared radiometry and imaging (AIRI) facility *(Invited Paper)*,** S. N. Mekhontsev, L. M. Hanssen, B. K. Tsai, V. B. Khromchenko, G. T. Fraser, National Institute of Standards and Technology . . . . . [6297-02]

9:20 am: **Performance Comparisons of InGaAs, extended InGaAs, and Short-wave,** H. W. Yoon, G. Eppeldauer, National Institute of Standards and Technology . . . . . [6297-03]

9:40 am: **Calibration and environmental characterization of thermal infrared cameras,** B. Tsai, NIST; J. P. Rice, G. T. Fraser, National Institute of Standards and Technology; D. Pflug, J. Burks, J. Sorensen, Wright-Patterson AFB . . . . . [6297-04]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Calibration and characterization of infrared optical materials and components at NIST,** L. M. Hanssen, S. G. Kaplan, S. N. Mekhontsev, E. J. Iglesias, C. P. Cagran, J. Zeng, National Institute of Standards and Technology . . . . . [6297-05]

10:50 am: **Calibration activities and new calibration equipment at the Low Background Infrared Facility,** A. C. Carter, R. U. Datla, National Institute of Standards and Technology; T. Jung, A. Smith, J. Fedchak, Jung Research and Development Corp. . . . . [6297-06]

11:10 am: **Design and development of a cryogenic Michelson interferometer,** P. Lagueux, M. Chamberland, Telops, Inc. (Canada); A. J. Villemaire, Telops Inc (Canada); F. Marcotte, Telops, Inc. (Canada); A. C. Carter, National Institute of Standards and Technology . . . . . [6297-07]

Plenary Presentation

Conv. Ctr. Room 6A . . . . . Tues. 1:40 to 2:20 pm

Remote Sensing in the Coming Decades: The Vision and the Reality

William B. Gail, Director, Virtual Earth, Microsoft Corp.

See p. 13 for additional information.

Wednesday 16 August

SESSION 2

Conv. Ctr. Room 32B . . . . . Wed. 8:30 to 10:30 am

IR Detectors and Focal Plane Technologies

Chair: **Carlo Corsi**, Consorzio C.R.E.O. (Italy)

8:30 am: **Ultrahigh frequency quantum well infrared photodetectors *(Invited Paper)*,** H. C. Liu, P. D. Grant, National Research Council Canada (Canada) . . . . . [6297-08]

9:00 am: **Bias selective operation of Sb-based two-color photodetectors,** M. N. Abedin, NASA Langley Research Ctr.; T. F. Refaat, Science and Technology Corporation; I. B. Bhat, Y. Xiao, Rensselaer Polytechnic Institute . . . . . [6297-09]

9:20 am: **A full-spectrum infrared imaging sensor/scene model for comparative assessments of SWIR, MWIR, and LWIR sensor performance with FPA/sensor data analysis and realistic 3D noise image generation capabilities,** A. K. Sood, R. Richwine, Y. R. Puri, Magnolia Optical Technologies, Inc. . . . . [6297-10]

9:40 am: **Continuous focal plane array for detection of Terahertz radiation,** A. Artamkin, M.V. Lomonosov Moscow State Univ. (Russia); A. V. Nicorici, State Univ. of Moldova (Moldova); L. I. Ryabova, M.V. Lomonosov Moscow State Univ. (Russia); V. Shklover, ETH Zürich (Switzerland); D. R. Khokhlov, M.V. Lomonosov Moscow State Univ. (Russia) . . . . . [6297-11]

10:00 am: **High performance mid-wavelength quantum dot infrared photodetectrors for focal plane arrays *(Invited Paper)*,** M. Razeghi, Northwestern Univ. . . . . [6297-12]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 3

Conv. Ctr. Room 32B . . . . . Wed. 11:00 am to 12:00 pm

Infrared Instruments and Subsystems

Chair: **Jan Williams**, e-Systems Mgmt Consultants

11:00 am: **The orbiting carbon observatory instrument hardware build status,** R. E. Haring, R. Pollock, B. M. Sutin, B. Donaldson, G. Kobayashi, Hamilton Sundstrand; D. Crisp, M. A. Schwochert, Jet Propulsion Lab. . . . . [6297-13]

11:20 am: **ACE-FTS instrument: extending mission lifetime,** M. A. Soucy, F. J. Châteauneuf, H. L. Buijs, ABB Inc. (Canada) . . . . . [6297-14]

11:40 am: **Efficient and versatile internal reference sources for remote sensing space telescopes,** E. C. Kintner, W. K. Wong, E. S. Jacobs, P. J. Cucchiaro, SSG Precision Optronics, Inc.; R. J. Koshel, Lambda Research Corp. . . . . [6297-15]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 4

Conv. Ctr. Room 32B . . . . . Wed. 1:30 to 3:00 pm

SOFIE Mission and Instrument

Chair: **Jan Williams**, e-Systems Mgmt Consultants

1:30 pm: **Sounding the upper mesosphere using broadband solar occultation—the SOFIE experiment *(Invited Paper)*,** L. L. Gordley, M. E. Hervig, G. J. Paxton, J. C. Burton, M. J. McHugh, GATS, Inc.; J. M. Russell III, Hampton Univ.; C. Fish, Utah State Univ. . . . . [6297-16]

2:00 pm: **SOFIE instrument overview,** A. L. Shumway, C. Fish, J. Q. Peterson, P. Mace, J. Cook, J. Nelsen, D. Hooper, Q. Young, S. R. Wassom, S. M. Hansen, J. C. Kemp, Utah State Univ.; L. L. Gordley, M. E. Hervig, GATS, Inc . . . . . [6297-17]

2:20 pm: **SOFIE pointing control system,** S. R. Wassom, C. Fish, M. Whiteley, D. Russak, J. Nelsen, B. Thompson, G. Hansen, J. Wooden, Utah State Univ.; L. L. Gordley, J. C. Burton, M. E. Hervig, GATS, Inc.; P. J. Cucchiaro, D. Hammerle, SSG Precision Optronics, Inc. . . . . [6297-18]

2:40 pm: **SOFIE instrument ground calibration,** S. M. Hansen, C. Fish, D. Romrell, Utah State Univ.; L. L. Gordley, M. E. Hervig, GATS, Inc.[6297-19]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 5

Conv. Ctr. Room 32B . . . . . Wed. 3:30 to 4:50 pm

GOSAT Mission and TANSO Instrument

Chair: **Jan Williams**, e-Systems Mgmt Consultants

3:30 pm: **The instrumentation and the BBM test results of thermal and near-infrared sensor for carbon observation (TANSO) on GOSAT,** A. Kuze, K. Kondo, T. Hamazaki, T. Urabe, Japan Aerospace Exploration Agency (Japan) . . . . . [6297-20]

3:50 pm: **Design, development and performance of the TANSO detector-dewar-preamplifier-cryocooler subassembly,** H. A. Wickman-Boisvert, D. R. Long, P. B. O'Sullivan, G. Robillard, P. H. Zimmermann, J. Kachmarsky, R. Paskowsky, BAE Systems North America; E. Tward, Northrop Grumman Space Technology; E. Okumura, NEC Toshiba Space Systems, Ltd. (Japan) . . . . . [6297-21]

4:10 pm: **Reliability enhancement activities for the TANSO interferometer,** F. J. Châteauneuf, M. A. Soucy, G. Perron, L. E. Lévesque, ABB Inc. (Canada); J. Tanii, NEC Toshiba Space Systems, Ltd. (Japan) . . . . . [6297-22]

4:30 pm: **Development of thermal and near infrared sensor for carbon observation (TANSO) on GOSAT,** T. Kawashima, J. Tanii, T. Okamoto, K. Hamada, E. Okumura, NEC Toshiba Space Systems, Ltd. (Japan); T. Hamazaki, A. Kuze, Y. Kaneko, Japan Aerospace Exploration Agency (Japan); M. A. Soucy, ABB Inc. (Canada) . . . . . [6297-23]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **A 32x32 CTIA readout design for deep cryogenic applications,** J. Farhoomand, L. Yuen, TechnoScience Corp.; A. W. Hoffman, N. A. Lum, L. Lum, Raytheon Vision Systems; E. T. Young, The Univ. of Arizona/ Steward Observatory . . . . . [6297-35]

Thursday 17 August

SESSION 6

Conv. Ctr. Room 32B . . . . . Thurs. 8:50 am to 12:10 pm

IR Instruments: Their Models and Performance

Chair: **Gail E. Bingham**, Utah State Univ.

8:50 am: **Validating instrument models through the calibration process *(Invited Paper)*,** G. E. Bingham, J. J. Tansock, Utah State Univ. [6297-30]

9:20 am: **SOFIE instrument model and performance comparison,** S. M. Hansen, A. L. Shumway, C. Fish, J. Q. Peterson, P. Mace, J. Cook, J. Nelsen, D. Hooper, Q. Young, S. R. Wassom, J. C. Kemp, Utah State Univ.; L. L. Gordley, M. E. Hervig, GATS, Inc. . . . . [6297-37]

9:40 am: **Far infrared spectroscopy of the troposphere (FIRST): flight performance and data processing,** S. J. Wellard, G. E. Bingham, H. M. Latvakoski, Utah State Univ.; M. G. Mlynczak, D. G. Johnson, NASA Langley Research Ctr.; K. W. Jucks, Harvard-Smithsonian Ctr. for Astrophysics . . . . . [6297-25]

10:00 am: **Wide-field infrared survey explorer science payload overview,** S. H. Schick, M. F. Larsen, Utah State Univ. . . . . [6297-26]

Coffee Break . . . . . 10:20 to 10:50 am

10:50 am: **A geosynchronous imaging fourier transform spectrometer (GIFTS) for hyperspectral atmospheric remote sensing: instrument development,** J. D. Elwell, S. M. Jensen, M. Jensen, L. Zollinger, G. E. Bingham, R. J. Huppi, Utah State Univ.; H. E. Revercomb, Univ. of Wisconsin/Madison; W. L. Smith, Sr., Hampton Univ.; R. Reisse, NASA Langley Research Ctr. . . . . [6297-27]

11:10 am: **A geosynchronous imaging fourier transform spectrometer (GIFTS): model and actual performance,** G. W. Cantwell, J. D. Elwell, D. K. Scott, S. M. Jensen, M. Jensen, L. Zollinger, G. E. Bingham, Utah State Univ.; H. E. Revercomb, Univ. of Wisconsin/Madison; W. L. Smith, Sr., Hampton Univ.; R. Reisse, NASA Langley Research Ctr. . . . . [6297-28]

11:30 am: **Sounding of the atmosphere using broadband emission radiometry (SABER): sensor design, performance and lessons learned,** S. B. Brown, M. Jensen, S. M. Jensen, G. Hansen, L. Zollinger, R. W. Esplin, Utah State Univ.; J. B. Miller, NASA Langley Research Ctr. . . . . [6297-29]

11:50 am: **An update of sounding of the atmosphere using broadband emission radiometry (SABER) calibration,** J. J. Tansock, Jr., Utah State Univ.; J. M. Russell III, Hampton Univ.; M. G. Mlynczak, NASA Langley Research Ctr.; L. L. Gordley, C. W. Brown, G. J. Paxton, P. S. McMichaels, GATS, Inc. . . . . [6297-36]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 7

Conv. Ctr. Room 32B . . . . . Thurs. 1:30 to 3:20 pm

Continued on next page

SESSION 7

Conv. Ctr. Room 32B . . . . . Thurs. 1:30 to 3:20 pm

Systems, Calibration, and Remote Sensing

Chair: **Marija S. Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

1:30 pm: **Smart sensors *(Invited Paper)*,** C. Corsi, Consorzio C.R.E.O. (Italy) . . . . . [6297-24]

2:00 pm: **MERTIS: A highly integrated IR imaging spectrometer,** I. Walter, H. Hirsch, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); H. Jahn, Deutsches Zentrum für Luft- Und Raumfahrt e.V. (Germany); J. Knollenberg, H. Venus, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6297-31]

2:20 pm: **Conception and state of the Radiometric Analysis Breadboard (RAB) for the Mercury Radiometer and Thermal Infrared Spectrometer (MERTIS) development,** T. Saeuberlich, W. Skrbek, DLR Berlin-Adlershof (Germany) . . . . . [6297-32]

2:40 pm: **Buried archaeological structures detection using MIVIS hyperspectral airborne data,** P. P. M. Merola, A. Allegrini, Consiglio Nazionale delle Ricerche (Italy) . . . . . [6297-33]

3:00 pm: **Variable and fixed-point blackbody sources developed at VNIIOFI for precision measurements in radiometry and thermometry within 100K-3500K temperature range,** V. I. Sapritsky, B. Khlevnoy, S. A. Ogarev, M. L. Samoylov, M. K. Sakharov, A. A. Bourdakin, All-Russian Research Institute for Optical and Physical Measurement (Russia); A. S. Panfilov, All-Russian Research Institute for Optical and Physical Measurements (Russia) . . . . . [6297-34]

Conv. Ctr. Room 32B . . . . . Thurs. 3:20 to 3:25 pm

Closing remarks

Chair: **Marija S. Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim) Sun. 13 Aug., 1:30 to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl) Tues. 15 Aug., 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Mon. 14 Aug 1:30 to 5:30 pm

SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Weds. 16 Aug., 8:30 am to 12:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC567 **Introduction to Optical Remote Sensing Systems** (Shaw) Sun. 13 Aug., 8:30 am to 12:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

Monday-Wednesday 14-16 August 2006 • Proceedings of SPIE Vol. 6298

Remote Sensing and Modeling of Ecosystems for Sustainability III

Cooperating Organizations: **UV-B Monitoring and Research Program of U.S. Dept. of Agriculture, Natural Resource Ecology Lab., Colorado State Univ.; the Center for Spatial Technologies and Remote Sensing, International Ctr. for Desert Affairs—Research for Sustainable Development in Arid and Semi-Arid Lands; the Institute of Remote Sensing and GIS, Peking Univ.**

Conference Chairs: **Wei Gao**, Colorado State Univ.; **Susan L. Ustin**, Univ. of California/Davis

Program Committee: **Gregory P. Asner**, Stanford Univ.; **Edward M. Barnes**, Cotton Inc.; **Xiuwan Chen**, Peking Univ. (China); **Wenjie Dong**, China Meteorological Administration (China); **John A. Gamon**, California State Univ./Los Angeles; **Jeffrey A. Hicke**, Colorado State Univ.; **Xin-Zhong Liang**, Univ. of Illinois at Urbana-Champaign and Illinois State Water Survey; **John M. Melack**, Univ. of California/Santa Barbara; **Dennis Ojima**, Colorado State Univ.; **Jeffrey L. Privette**, NASA Goddard Space Flight Ctr.; **Jiaguo Qi**, Michigan State Univ.; **John Qu**, George Mason Univ.; **Dar A. Roberts**, Univ. of California/Santa Barbara; **Daniel L. Schmoldt**, U.S. Dept. of Agriculture CSREES; **James R. Slusser**, Colorado State Univ.; **Yegang Wu**, E2 Consulting Engineers, Inc.; **Jack Xiong**, NASA Goddard Space Flight Ctr.; **Xiusheng H. Yang**, Univ. of Connecticut; **Hamid Yimit**, Xinjiang Univ. (China)

Monday 14 August

Conv. Ctr. Room 33C . . . . . Mon. 8:00 to 8:10 am

Welcome and Opening Remarks

Chairs: **Wei Gao**, Colorado State Univ.; **Susan L. Ustin**, Univ. of California/Davis

SESSION 1

Conv. Ctr. Room 33C . . . . . Mon. 8:10 to 10:00 am

Remote Sensing Theory, Techniques, and Applications I

Chairs: **John J. Cipar**, Air Force Research Lab.; **Susan L. Ustin**, Univ. of California/Davis

8:10 am: **Comparison of the hyperspectral signatures from two eastern North American temperate forests *(Invited Paper)*,** J. J. Cipar, T. W. Cooley, R. B. Lockwood, Air Force Research Lab. . . . . [6298-01]

8:40 am: **Comparison of small and large footprint lidar systems in predicting forest structural characteristics,** S. Ogunjemiyo, California State Univ./Fresno; D. A. Roberts, Univ. of California/Santa Barbara; S. L. Ustin, Univ. of California/Davis; G. H. Parker, Smithsonian Institution . . . . . [6298-02]

9:00 am: **Identifying and classifying hyacinth (eichhornia crassipes) using HyMap sensor,** S. S. Rajapakse, Univ. of California/Davis; S. Khanna, M. E. Andrew, S. L. Ustin, Univ. of California/Davis and Consultant; M. C. Lay, Univ. of California/Davis . . . . . [6298-03]

9:20 am: **Estimating fresh grass/herb biomass from HYMAP data using the red edge position,** M. A. Cho, I. Sobhan, A. K. Skidmore, International Institute for Geo-Information Science and Earth Observation (Netherlands) . . . . . [6298-04]

9:40 am: **Image classification approach for automatic identification of grassland weeds,** S. Gebhardt, W. Kuehbauch, Univ. Bonn (Germany) . . . . . [6298-05]

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 2

Conv. Ctr. Room 33C . . . . . Mon. 10:20 to 11:50 am

Remote Sensing Theory, Techniques, and Applications II

Chairs: **Raymond F. Kokaly**, U.S. Geological Survey; **Xinli Wang**, Colorado State Univ.

10:20 am: **Characterization of post-fire surface cover and soils for the Cerro Grande fire, New Mexico, using hyperspectral and multispectral remote sensing *(Invited Paper)*,** R. F. Kokaly, B. W. Rockwell, T. V. V. King, U.S. Geological Survey . . . . . [6298-06]

10:50 am: **Infrared spectrum characteristics of the forest fire from field experiments,** H. Sun, Z. Rong, C. Liu, J. Liu, Y. Zhang, P. Zhang, National Satellite Meteorological Ctr. (China); X. Wang, W. Gao, Colorado State Univ. . . . . [6298-07]

11:10 am: **Canopy water content estimates with AVIRIS imagery and MODIS reflectance products,** Y. Cheng, D. Riano, Univ. of California/Davis; P. J. Zarco-Tejada, Instituto de Agricultura Sostenible (Spain); S. L. Ustin, Univ. of California/Davis . . . . . [6298-09]

11:30 am: **Sustainable management of forest resources in dry tropics using remote sensing data and GIS: a case study from eastern Ghats of Tamil Nadu, India,** N. Nagamurugan, Kurinji Arts and Science College (India); B. Balakrishnan, National Innovation Foundation (India); S. Soosairaj, N. Devaraj, St. Joseph's College of Engineering (India)[6298-10]

Lunch Break . . . . . 11:50 am to 1:30 pm

SESSION 3

Conv. Ctr. Room 33C . . . . . Mon. 1:30 to 4:40 pm

Agricultural Remote Sensing and Data Application

Chairs: **Petya K. E. Campbell**, NASA Goddard Space Flight Ctr.; **Michael L. Whiting**, Univ. of California/Davis

1:30 pm: **Hyperspectral mapping of crop and soils for precision agriculture *(Invited Paper)*,** M. L. Whiting, S. L. Ustin, Univ. of California/Davis . . . . . [6298-11]

2:00 pm: **Detection of fungal infection in wheat with high-resolution multispectral data,** J. Franke, G. Menz, Univ. Bonn (Germany) [6298-13]

2:20 pm: **Scaling up of leaf area index from field hemispherical photos estimation to airborne AVIRIS and satellite MODIS data,** D. Riaño, Y. Cheng, M. Trombetti, S. L. Ustin, Univ. of California/Davis . . . . [6298-14]

2:40 pm: **Site-specific identification of fungal infection in wheat crop using remote sensing,** J. Jacobi, Univ. Bonn (Germany) . . . . . [6298-15]

Coffee Break . . . . . 3:00 to 3:20 pm

3:20 pm: **Biomass production, pasture balance, and their ecologic consequences in NW Namibia,** J. J. Richters, Univ. Bonn (Germany) . . . . . [6298-16]

3:40 pm: **Modis TES algorithm based on corrected alpha difference spectra and its validation,** T. Shihao, China Meteorological Administration (China) . . . . . [6298-17]

4:00 pm: **Assessment and application of potential food provisioning services of ecosystems in Three-Gorge areas,** Y. Tian, Southwest China Normal Univ. (China) and Chongqing Institute of Meteorological Sciences (China); Y. Gao, Institute of Meteorological Science (China); L. Zhu, Institute of Geographical Sciences and Natural Resources Research (China) . . . . . [6298-18]

4:20 pm: **Identification of crop canopy geometry by bidirectional canopy reflected spectrum,** W. Huang, J. Wang, Beijing Academy of Agriculture and Forestry Sciences (China) . . . . . [6298-20]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **The vegetation cover changes of regress analysis on using time-serial images of remote sensing,** S. Qingdong, Xinjiang Univ. (China) and Xinjiang Univ. (China); Q. Jiaguo, Michigan State Univ.; L. Guang Hui, S. Qingsan, C. Shunli, P. Xiaoling, Xinjiang Univ. (China) [6298-54]

✔ **Numerical simulation of terrain effects in a backflow event occurring over North China,** S. Zhang, S. Liu, Nanjing Univ. of Information Science and Technology (China); Z. Gao, Colorado State Univ.; Y. Zhang, HeBei Provincial Meteorological Observatory (China) . . . . . [6298-55]

✔ **Study on the relationship between land use and wind erosion dynamics of the middle part of Mongolia Plateau,** H. Shi, J. Y. Liu, Z. Gao, Institute of Geographical Sciences and Natural Resources Research (China) . . . . . [6298-56]

✔ **Comparison of seasonal and spatial variations of albedos from moderate-resolution imaging spectroradiometer (MODIS) and common land model,** Q. Lu, Institute of Geographical Sciences and Natural Resources Research (China); W. Gao, Z. Gao, Colorado State Univ.; W. Wu, Univ. of Colorado/Boulder; B. Du, Nanjing Univ. of Information Science and Technology (China); J. R. Slusser, Colorado State Univ. . . . . [6298-57]

✔ **Numerical simulation of CLM over Tibet Plateau of China,** Q. Lu, Institute of Geographical Sciences and Natural Resources Research (China); W. Gao, Z. Gao, Colorado State Univ.; W. Wu, Univ. of Colorado/Boulder; B. Du, Nanjing Univ. of Information Science and Technology (China); J. R. Slusser, Colorado State Univ. . . . . [6298-58]

✔ **CWRF simulation of the 1998 severe precipitation event over East Asia,** S. Liu, China Meteorological Adminstration (China); W. Gao, Colorado State Univ.; X. Liang, Univ. of Illinois at Urbana-Champaign; H. Zhang, China Meteorological Administration (China); J. R. Slusser, Colorado State Univ. . . . . [6298-59]

✔ **Multiyear simulation of the East Asian monsoon and precipitaion in China using regional climate model,** S. Liu, China Meteorological Adminstration (China); W. Gao, Colorado State Univ.; X. Liang, Univ. of Illinois at Urbana-Champaign; H. Zhang, China Meteorological Administration (China) . . . . . [6298-60]

✔ **Effects of climate variability and urbanization on terrestrial carbon storage in Yangtze River Delta, China,** J. Shi, Shanghai Meteorological Bureau (China); Z. Gao, Institute of Geographical Science and Natural Resources Research (China); L. Cui, Shanghai Meteorological Bureau (China) . . . . . [6298-61]

✔ **Monitoring and assessment of aeolian desertification in Korqin Sand, Inner Mongolia, China,** L. Cui, Shanghai Meteorological Bureau (China); Z. Gao, Institute of Geographical Science and Natural Resources Research (China); W. Fan, Northeast Forestry Univ. (China); J. Shi, Shanghai Meteorological Bureau (China) . . . . . [6298-62]

✔ **Soil temperature assimilation into one-dimensional vertical model with Kalman filter,** L. Zou, Nanjing Univ. of Information Science and Technology (China); W. Gao, Colorado State Univ.; X. Zhan, NASA Goddard Space Flight Ctr.; Z. Gao, Institute of Geographical Sciences and Natural Resources Research (China); B. Du, Nanjing Univ. of Information Science and Technology (China); J. R. Slusser, Colorado State Univ. . . . . [6298-64]

✔ **Huyang ecosystem fragility and protecting strategy on Tarim Nature Reserve in Xinjiang,** H. Yimit, M. Ayup, Xinjiang Univ. (China); G. Z. Wang, U.S.D.A. Forest Service; Z. Gao, Colorado State Univ. [6298-65]

✔ **Remote sensing based water and heat process modeling for grass ecosystem on regional scale,** W. Zhang, Chinese Academy of Sciences (China) . . . . . [6298-67]

✔ **On the laws of variation in climate yield potentials in Henan Province with their availability,** X. Zhang, Henan Institute of Meteorological Science (China); Z. Ren, China Meteorological Administration (China); H. Chen, Henna Institute of Meteorological Sciences (China); Y. Zheng, Nanjing Univ. of Information Science and Technology (China); G. Zhao, C. Zou, Henna Institute of Meteorological Sciences (China) . . . . . [6298-68]

✔ **Research of variations in 1961-2001 floods and droughts at multiple space and time scales in Fujian Province, China,** G. J. Yun, Nanjing Univ. of Information Science & Technology (China) . . . . . [6298-69]

✔ **Land cover change in Qumar River Valley,** C. Ke, Nanjing Univ. (China) . . . . . [6298-70]

✔ **Use of airborne hyperspectral imagery to investigate the influence of soil nitrogen supplies and variable fertilization to winter wheat growth,** X. Song, J. Wang, X. Xue, L. Liu, W. Huang, Beijing Academy of Agriculture and Forestry Sciences (China) . . . . . [6298-74]

✔ **Determination of regional land surface parameters and components of surface radiation balance over heterogeneous landscape of South Ningxia by using satellite remote sensing data,** J. Guo, Y. Zheng, Nanjing Univ. of Information Science and Technology (China); Q. Yu, Chinese Academy of Sciences (China); L. Wang, Nanjing Univ. of Information Science and Technology (China) . . . . . [6298-76]

✔ **Study on winter wheat drought monitoring by TVDI in Hebei Province,** C. Li, Hebei Provincial Institute of Metrology (China); H. Li, Ctr. for Agricultural Resources Research, Institute of Genetics and Developmental Biology (China) . . . . . [6298-77]

✔ **Zonal calculation of drought inspection using remote sensing in large scale,** H. Li, Institute of Genetics and Developmental Biology (China) . . . . . [6298-78]

✔ **Combining the decision tree and supervised classify techniques to identify the tobacco field in the satellite images: Luxi County of Yunnan Province in China as an example,** X. Zhang, Beijing Forestry Univ. (China) . . . . . [6298-79]

✔ **Research on the method of field data collection and disposal of tobacco remote sensing monitoring,** M. Xin, Institute of Remote Sensing Applications (China) . . . . . [6298-80]

✔ **Effect of water on yield of winter wheat at different development stages,** R. Liu, Z. Zhu, Henan Institute of Meteorological Science (China) . . . . . [6298-81]

✔ **Risk assessment model of drought for winter wheat and its application in North China Plain,** Z. Zhu, R. Liu, W. Fang, Henan Institute of Meteorological Science (China) . . . . . [6298-82]

✔ **Change analysis on land sandy desertification and vegetation cover in Zhengzhou City of China in the past 10 years,** H. Chen, Z. Du, Z. Liu, X. Zhang, Z. Zhu, G. Zhao, Henan Institute of Meteorological Science (China) . . . . . [6298-83]

✔ **Variation of NDVI and the relationship with the change of climate in Zhengzhou of China,** P. Hu, Z. Du, X. Zhang, H. Chen, G. Zhao, Z. Zhu, Henan Institute of Meteorological Science (China) . . . . . [6298-84]

✔ **The relation investigation on climate change and woody plant phenophase in Zhengzhou City of China,** G. Zhao, Henan Institute of Meteorological Science (China); J. Liu, Nanjing Univ. of Information Science and Technology (China); H. Chen, Henan Institute of Meteorological Science (China); Y. Zheng, Nanjing Univ. of Information Science and Technology (China); Z. Zhu, Henan Institute of Meteorological Science (China) . . . . . [6298-85]

✔ **Cold-island effect research: base on Qitai Oasis,** S. Qingsan, Xinjiang Univ. (China); Q. Jiaguo, Michigan State Univ.; S. Qingdong, P. Xiaoling, M. Binfeng, Xinjiang Univ. (China) . . . . . [6298-86]

✔ **Evaluation of ecological security in Xinjiang, China,** L. Guang Hui, Xinjiang Univ. (China) . . . . . [6298-87]

✔ **The analysis for sustainable development situation of Xinjiang in material flow,** L. Guang Hui, X. Chen, Xinjiang Univ. (China) [6298-89]

✔ **Mapping evapotranspiration of wheat and maize using MODIS data with improved resolution,** Y. Lei, L. Zheng, Y. Shu, Institute of Genetics and Developmental Biology (China) . . . . . [6298-90]

✔ **The identification of land-cover based on ETM+ data in low Hai River Plain, China,** R. Mao, Institute of Genetics and Developmental Biology (China) . . . . . [6298-91]

✔ **A GIS-based remote sensing model for computing evapotranspiration distribution in a semi-arid mountain region,** Y. Shu, L. Zheng, Y. Lei, H. Li, Ctr. for Agricultural Resources Research, Institute of Genetics and Developmental Biology (China) . . . [6298-93]

✔ **Using AHP to analyze and ascertain the priority protective order of endangered plants in East Alashan-West Erdos,** G. Z. Wang, U.S.D.A. Forest Service; T. Zhang, Inner Mongolia Agriculture Univ. (China) . . . . . [6298-94]

✔ **Monitoring the rice growth status based on NDVI and LAI,** P. Hu, L. Huapu, Tsinghua Univ. (China); L. Guihua, Chinese Academy of Environmental Planning (China); X. Zhang, Beijing Union Univ. (China) . . . . . [6298-95]

✔ **The analysis and assessment of the climate conditions of China in 1959-1961(the three-year difficult period),** H. Zhang, China Meteorological Administration (China); Z. Sun, Nanjing Univ. of Information Science and Technology (China); Y. Luo, S. Zhang, Q. Li, China Meteorological Administration (China) . . . . . [6298-97]

✔ **GIS spatial analysis of the farmland change in Shiyang river watershed of Hexi Corridor, Gansu Province of China,** L. Yu, S. Dong, X. Qi, Institute of Geographical Sciences and Natural Resources Research (China) . . . . . [6298-98]

✔ **Study on the eco-economic regionalization using GIS in Loess plateau of Dingxi Prefecture，Gansu Province of China,** L. Yu, S. Dong, X. Qi, A. Hua, Institute of Geographical Sciences and Natural Resources Research (China) . . . . . [6298-99]

✔ **Basic scheme of 3-DVar and its single observation tests,** L. Zou, Nanjing Univ. of Information Science and Technology (China); W. Gao, Colorado State Univ.; T. Wu, China Meteorological Administration (China); X. Zhan, NASA Goddard Space Flight Ctr.; B. Du, Nanjing Univ. of Information Science and Technology (China) . . . . . [6298-100]

✔ **Climate Changes in the Recent One Hundred Years and Their Impacts on Vegetation and Ecological Regionalization in China,** W. Gao, Z. Gao, J. R. Slusser, Colorado State Univ. . . . . [6298-101]

✔ **An optimal staggered canopy system for high-yield cultivation of cotton and its canopy light distribution,** Y. Yang, Center for Agricultural Resources Research (China) . . . . . [6298-102]

✔ **Landscape ecological risk assessment study in Bosten Lake,** A. Amut, L. Gong, Xinjiang Univ. (China) and International Ctr. for Desert Affairs (China); X. Xie, Xingjiang Univ. (China) and International Ctr. for Desert Affairs (China); T. Crovello, California State Univ./Los Angeles; Z. Gao, Institute of Geographical Sciences and Natural Resources Research (China) . . . . . [6298-106]

✔ **An integrated hydrological, ecological and economical (HEE) modeling system for assessing water resources and ecosystem production: calibration and application to the upper and middle parts of the Yellow River basin, China *(Invited Paper)*,** X. H. Yang, X. Li, Univ. of Connecticut . . . . . [6298-22]

✔ **Remote sensing monitoring the spatiotemporal changes of alpine grassland coverage in northern Tibet,** Q. Gao, Y. Li, E. Lin, Y. Wan, W. Sheng, K. Yang, Chinese Academy of Agricultural Sciences (China) . . . . . [6298-53]

✔ **Simulation of winter wheat evaporation from soil under different ground coverage with semiemperical models,** S. Chen, Ctr. for Agricultural Resources Research, Institute of Genetics and Developmental Biology (China) and Graduate Univ. of Chinese Academy of Sciences (China); S. Chen, X. Zhang, Ctr. for Agricultural Resources Research, Institute of Genetics and Developmental Biology (China) . . . . . [6298-96]

✔ **The role of China's ecosystem policies and programs on climate change mitigation,** Y. Li, Chinese Academy of Agricultural Sciences (China) . . . . . [6298-29]

✔ **Analysis between the biomass of ecosystem of oasis and the vegetation index: a case study on Fukang of Xinjiang,** W. Liu, Xinjiang Univ. (China); W. Gao, Z. Gao, X. Wang, J.R. Slusser, Colorado State Univ. . . . . [6298-63]

Tuesday 15 August

SESSION 4

Conv. Ctr. Room 33C . . . . . Tues. 8:20 to 11:40 am

Models and Model Applications, Environmental Applications

Chairs: **E. Raymond Hunt, Jr.**, USDA Agricultural Research Service; **Yegang Wu**, E2 Consulting Engineers, Inc.

8:20 am: **Remote sensing and geospatial modeling for monitoring invasive plant species *(Invited Paper)*,** E. R. Hunt, Jr., USDA Agricultural Research Service . . . . . [6298-21]

8:50 am: **A spatial model for restoration of the upper Mississippi river ecosystem,** Y. Wu, S. M. Bartell, S. K. Nair, E2 Consulting Engineers, Inc. . . . . [6298-105]

9:10 am: **Spectral distribution of UV-B irradiance derived by synthetic model compared with simulation results of TUV and TOMRAD and ground measurements,** X. Wang, W. Gao, J. R. Slusser, J. M. Davis, G. R. Scott, B. Olsen, Colorado State Univ.; N. A. Krotkov, University of Maryland; M. Xu, X. Liang, Univ. of Illinois at Urbana-Champaign [6298-23]

9:30 am: **Remote sensing techniques applied to ecosystems evaluation and modeling in mining dismissed areas,** G. Bonifazi, S. Serranti, F. Volpe, Univ. degli Studi di Roma/La Sapienza (Italy) [6298-24]

9:50 am: **Validation of the TUV module in CWRF using USDA-UVB network observations,** M. Xu, X. Liang, Univ. of Illinois at Urbana-Champaign; W. Gao, J. R. Slusser, Colorado State Univ.; K. Kunkel, Univ. of Illinois at Urbana-Champaign . . . . . [6298-25]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **Preliminary results of a UV-B effect incorporated GOSSYM model,** X. Wang, W. Gao, J. R. Slusser, Z. Gao, Colorado State Univ.; K. R. Reddy, Mississippi State Univ.; M. Xu, Univ. of Illinois at Urbana-Champaign . . . . . [6298-26]

11:00 am: **Study on growth simulation for winter wheat based on assimilated remote sensing data in North China,** Y. Ma, Chinese Academy of Meteorological Sciences (China); S. Wang, L. Zhang, China Meteorological Administration (China) . . . . . [6298-27]

11:20 am: **A simulation model of net primary production at watershed scale in hilly area of Loess Plateau, China,** H. Xu, China Meteorological Administration (China); Q. Gao, Chinese Academy of Agricultural Sciences (China); Y. Huang, Beijing Normal Univ. (China) . . . . . [6298-28]

Lunch/Exhibition Break . . . . . 11:40 am to 1:40 pm

Plenary Presentation

Conv. Ctr. Room 6A . . . . . Tues. 1:40 to 2:20 pm

Remote Sensing in the Coming Decades: The Vision and the Reality

William B. Gail, Director, Virtual Earth, Microsoft Corp.

See p. 13 for additional information.

SESSION 5

Conv. Ctr. Room 33C . . . . . Tues. 2:40 to 4:50 pm

Remote Sensing and Land Use/Land Cover

Chairs: **Xinli Wang**, Colorado State Univ.; **Julia Roehrig**, Univ. Bonn (Germany)

2:40 pm: **The marginality index of agricultural land use - an encouraging tool to determine the risk of land degradation in Benin,** J. Roehrig, C. Hiepe, M. Diederich, G. Menz, Univ. Bonn (Germany)[6298-30]

3:00 pm: **The possibility of aerosol correction over land using ADEOS-II GLI 380nm reflectance,** H. Yamamoto, Japan Aerospace Exploration Agency (Japan); H. Yoshioka, The Aichi Prefectural Univ. (Japan); H. Murakami, A. Ono, Japan Aerospace Exploration Agency (Japan); Y. Honda, Chiba Univ. (Japan) . . . . . [6298-31]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Land use dynamic monitoring and assessment of core urban districts in Chongqing,** Z. Lifen, Institute of Geographical Sciences and Natural Resources Research (China); Y. Tian, Southwest China Normal Univ. (China) . . . . . [6298-34]

4:10 pm: **The analysis of land cover change in the Baiyang Lake region based on the multiple temporal Landsat TM image,** R. Mao, Institute of Genetics and Developmental Biology (China) . . . . . [6298-35]

4:30 pm: **Changes in wetland landscape of Wuyuer River Basin in Songnen Plain, China,** F. Huang, Northeast Normal Univ. (China) and International Institute for Geo-Information Science and Earth Observation (Netherlands); S. Zhang, Northeast Institute of Geography and Agricultural Ecology (China); Y. Wang, Qiqihar Univ. (China); Y. Zhang, Northeast Institute of Geography and Agricultural Ecology (China); J. de Leeuw, International Institute for Geo-Information Science and Earth Observation (Netherlands) . . . . . [6298-36]

Wednesday 16 August

SESSION 6

Conv. Ctr. Room 33C . . . . . Wed. 8:00 to 11:30 am

Sensor Systems and Cross-sensor Calibration/Validation

Chairs: **Changyong Cao**, National Oceanic and Atmospheric Administration; **Jack X. Xiong**, NASA Goddard Space Flight Ctr.

8:00 am: **Supporting NPP prelaunch calibration and verification with a band mapping approach *(Invited Paper),*** J. Qu, X. Hao, George Mason Univ.; J. Xiong, NASA Goddard Space Flight Ctr.; B. I. Hauss, C. Wang, Northrop Grumman Space Technology . . . . . [6298-37]

8:30 am: **Analysis of calibration difference between MODIS and MISR *(Invited Paper),*** A. I. Lyapustin, Univ. of Maryland/Baltimore County; Y. Wang, X. Xiong, NASA Goddard Space Flight Ctr.; A. Wu, Science Systems and Applications, Inc.; R. A. Kahn, Jet Propulsion Lab.; R. E. Wolfe, NASA Goddard Space Flight Ctr.; K. J. Thome, College of Optical Sciences/The Univ. of Arizona; C. J. Bruegge, Jet Propulsion Lab. . . . . [6298-38]

9:00 am: **Tracking TRMM/VIRS on-orbit calibration with MODIS,** A. Wu, C. Lyu, Science Systems and Applications, Inc.; X. Xiong, NASA Goddard Space Flight Ctr. . . . . [6298-39]

9:20 am: **Assessment of cross-sensor NDVI-variations caused by spectral band characteristics,** V. Heinzel, J. Franke, G. Menz, Univ. Bonn (Germany) . . . . . [6298-40]

9:40 am: **Consistency assessment of the NOAA/AVHRR measurements for long-term environmental monitoring applications,** P. Ciren, QSS group Inc.; C. Cao, National Oceanic and Atmospheric Administration . . . . . [6298-41]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Multiyear lunar observations from TRMM/VIRS, Terra/MODIS, and Aqua/MODIS,** C. Lyu, Science Systems and Applications, Inc. and NASA/GSFC; J. Sun, Science Systems and Applications, Inc.; X. Xiong, NASA Goddard Space Flight Ctr.; W. L. Barnes, Univ. of Maryland/Baltimore County . . . . . [6298-42]

10:50 am: **Using MODIS to inter-compare AVHRR on NOAA 15-18,** A. Wu, Science Systems and Applications, Inc.; C. Cao, National Oceanic and Atmospheric Administration; X. Xiong, NASA Goddard Space Flight Ctr. . . . . [6298-43]

11:10 am: **Investigation on functional form in cross-calibration of spectral vegetation index,** H. Yoshioka, The Aichi Prefectural Univ. (Japan); T. Miura, Univ. of Hawai'i at Manoa; H. Yamamoto, Japan Aerospace Exploration Agency (Japan) . . . . . [6298-44]

Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

SESSION 7

Conv. Ctr. Room 33C . . . . . Wed. 1:00 to 4:40 pm

Satellite Remote Sensing Measurement Continuity

Chairs: **John J. Qu**, George Mason Univ.; **Jeffrey L. Privette**, NASA Goddard Space Flight Ctr.

1:00 pm: **Assessments of inter-sensor vegetation index variability and dependencies with hyperspectral data *(Invited Paper),*** A. R. Huete, The Univ. of Arizona; T. Miura, Univ. of Hawai'i at Manoa; Y. Kim, K. Didan, The Univ. of Arizona; J. L. Privette, NASA Goddard Space Flight Ctr. [6298-45]

1:30 pm: **Requirements for precision, accuracy, and uniformity for application of imaging spectroscopy to measure and monitor ecosystem parameters *(Invited Paper),*** R. O. Green, Jet Propulsion Lab. . . . . [6298-46]

2:00 pm: **Cross-sensor data continuity of relative greenness,** X. Hao, J. Qu, L. Wang, W. Sommers, George Mason Univ. . . . . [6298-47]

2:20 pm: **Correcting land surface temperature measurements for directional emissivity over 3-D structured vegetation,** Y. Yu, A. C. Pinheiro, J. L. Privette, NASA Goddard Space Flight Ctr. . . . . [6298-48]

2:40 pm: **Impacts of land cover changes on land surface temperature in Huabei Plain of China,** Z. Gao, Institute of Geographical Sciences and Natural Resources Research (China); W. Gao, X. Wang, J. R. Slusser, Colorado State Univ. . . . . [6298-49]

Coffee Break . . . . . 3:00 to 3:20 pm

3:20 pm: **A performance evaluation of vegetation index translation functions for long-term data continuity,** T. Miura, Univ. of Hawai'i at Manoa; H. Yoshioka, The Aichi Prefectural Univ. (Japan); A. R. Huete, The Univ. of Arizona . . . . . [6298-50]

3:40 pm: **A preliminary study of aqua/MODIS snow coverage continuity with simulated band 6,** L. Wang, J. Qu, George Mason Univ.; X. Xiong, NASA Goddard Space Flight Ctr.; X. Hao, Y. Xie, George Mason Univ.; N. Che, Science Systems and Applications, Inc. . . . . [6298-51]

4:00 pm: **Combining MODIS and AMSR-E based vegetation moisture retrievals for improved fire risk monitoring,** S. Dasgupta, J. Qu, George Mason Univ.; J. L. Privette, NASA Goddard Space Flight Ctr.; X. Hao, George Mason Univ. . . . . [6298-52]

4:20 pm: **Multispectral indices and advanced classification techniques to detect percent residue cover over agricultural crops using Landsat data,** A. Pacheco, H. McNairn, A. M. Smith, Agriculture and Agri-Food Canada (Canada) . . . . . [6298-104]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim) Sun. 13 Aug., 1:30 to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl) Tues. 15 Aug., 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Mon. 14 Aug 1:30 to 5:30 pm

SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Weds. 16 Aug., 8:30 am to 12:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC567 **Introduction to Optical Remote Sensing Systems** (Shaw) Sun. 13 Aug., 8:30 am to 12:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

Sunday-Monday 13-14 August 2006 • Proceedings of SPIE Vol. 6299

Remote Sensing of Aerosol and Chemical Gases, Model Simulation/Assimilation, and Applications to Air Quality

Conference Chairs: **Allen Chu**, NASA Goddard Space Flight Ctr.; **James J. Szykman**, U.S. Environmental Protection Agency; **Shobha Kondragunta**, National Environmental Satellite, Data, and Information Service/NOAA

Program Committee: **Gregory R. Carmichael**, The Univ. of Iowa; **Jen-Ping Chen**, National Taiwan Univ. (Taiwan); **Mian Chin**, NASA Goddard Space Flight Ctr.; **Belay B. Demoz**, NASA Goddard Space Flight Ctr.; **David P. Edwards**, National Ctr. for Atmospheric Research; **Jack Fishman**, NASA Langley Research Ctr.; **Qingxian Gao**, Chinese Research Academy of Environmental Science (China); **Raymond M. Hoff**, Univ. of Maryland/Baltimore County; **Carey J. Jang**, U.S. Environmental Protection Agency; **Yutaka Kondo**, The Univ. of Tokyo (Japan); **Gin-Rong Liu**, National Central Univ. (Taiwan); **John G. Lyon**, U.S. Environmental Protection Agency; **Wallace McMillan**, Univ. of Maryland/Baltimore; **Doreen O. Neil**, NASA Langley Research Ctr.; **Gelsomina Pappalardo**, Istituto di Metodologie per l'Analisi Ambientale (Italy); **Robert B. Pierce**, NASA Langley Research Ctr.; **Alan C. Rush**, U.S. Environmental Protection Agency; **Richard D. Scheffe**, U.S. Environmental Protection Agency; **Juying Warner**, Univ. of Maryland/Baltimore County; **David J. Williams**, U.S. Environmental Protection Agency

Sunday 13 August

SESSION 1

Conv. Ctr. Room 32B . . . . . Sun. 8:45 am to 12:35 pm

Air Quality Monitoring

Chairs: **Mian Chin**, NASA Goddard Space Flight Ctr.; **Jen-Ping Chen**, National Taiwan Univ. (Taiwan)

8:45 am: **3D-AQS: a three-dimensional air quality system *(Invited Paper)*,** R. M. Hoff, Univ. of Maryland/Baltimore County; J. A. Engel-Cox, Battelle Memorial Institute; F. Dimmick, J. J. Szykman, B. Johns, U.S. Environmental Protection Agency; S. Kondragunta, National Environmental Satellite, Data, and Information Service; R. Rogers, K. McCann, A. Chu, O. Torres, A. Prado, Univ. of Maryland/Baltimore County; J. A. Al-Saadi, NASA Langley Research Ctr.; C. Kittaka, Science Applications International Corp.; V. Boothe, Ctr for Disease Control and Prevention; A. Wimmers, S. Ackerman, Univ. of Wisconsin/Madison . . . . . [6299-01]

9:15 am: **Air quality products from NOAA's GOES-R advanced baseline imager (ABI) and hyperspectral environmental sounder (HES) *(Invited Paper)*,** S. Kondragunta, National Environmental Satellite, Data, and Information Service . . . . . [6299-02]

9:45 am: **Analysis of the relationship between aerosol optical depth and PM2.5 in the summertime US,** A. Chu, NASA Goddard Space Flight Ctr. . . . . [6299-03]

10:05 am: **Application of satellite data for three-dimensional monitoring of PM2.5 formation and transport in San Joaquin Valley, California,** R. Rosen, U.S. Environmental Protection Agency; A. Chu, NASA Goddard Space Flight Ctr.; J. J. Szykman, U.S. Environmental Protection Agency; R. J. DeYoung, J. A. Al-Saadi, NASA Langley Research Ctr.; A. Kaduwela, California Air Resources Board; C. Bohnenkamp, U.S. Environmental Protection Agency . . . . . [6299-04]

Coffee Break . . . . . 10:25 to 10:55 am

10:55 am: **Aerosol lidar and MODIS satellite comparisons for future aerosol loading forcasting,** R. J. De Young, NASA Langley Research Ctr.; J. J. Szykman, US Environmental Protection Agency; K. Severance, NASA Langley Research Ctr.; A. Chu, NASA Goddard Space Flight Ctr.; R. Rosen, U.S. Environmental Protection Agency; J. A. Al-Saadi, NASA Langley Research Ctr. . . . . [6299-05]

11:15 am: **Synergistic use of tropospheric infrared mapping spectrometers for air quality and global pollution studies,** R. B. Chatfield, NASA Ames Research Ctr.; J. B. Kumer, J. L. Mergenthaler, A. E. Roche, Lockheed Martin Advanced Technology Ctr. . . . . [6299-06]

11:35 am: **Estimating ozone with the GOES sounder and comparable sensors,** C. C. Schmidt, J. Li, J. Li, Univ. of Wisconsin/Madison [6299-07]

11:55 am: **Tropospheric infrared mapping spectrometers (TIMS) for air quality measurements,** J. B. Kumer, J. L. Mergenthaler, A. E. Roche, Lockheed Martin Advanced Technology Ctr.; R. B. Chatfield, NASA Ames Research Ctr. . . . . [6299-40]

12:15 pm: **Aerosol absorption characteristics over 23 AERONET locations,** J. Qiu, Institute of Atmospheric Physics (China); Z. Wang, Beijing Film Academy (China) . . . . . [6299-08]

Lunch Break . . . . . 12:35 to 2:05 pm

SESSION 2

Conv. Ctr. Room 32B . . . . . Sun. 2:05 to 4:55 pm

Improvements of Remote Sensing Retrieval

Chairs: **David J. Williams**, U.S. Environmental Protection Agency; **Rebecca Rosen**, U.S. Environmental Protection Agency

2:05 pm: **Improvement of using high-resolution MODIS AOD products to air quality monitoring,** A. Chu, NASA Goddard Space Flight Ctr. . . . . [6299-09]

2:25 pm: **Quantifying cloud contaminations to tropospheric CO measurements,** J. Warner, Univ. of Maryland/Baltimore County [6299-10]

2:45 pm: **Improvements of the retrievals of carbon monoxide in the planetary boundary layer using combined infrared and solar measurements: a simulation study,** S. Ho, D. P. Edwards, National Ctr. for Atmospheric Research . . . . . [6299-11]

3:05 pm: **Estimation of dust loading and height using MODIS, AIRS, and M-AERI data,** S. G. De Souza-Machado, Univ. of Maryland/Baltimore County; A. Chu, NASA Goddard Space Flight Ctr.; N. R. Nalli, QSS Group, Inc.; L. L. Strow, H. E. Motteler, S. E. Hannon, Univ. of Maryland/Baltimore County . . . . . [6299-12]

Coffee Break . . . . . 3:25 to 3:55 pm

3:55 pm: **Application of lidar in the observation of atmospheric particulate pollutants in Taipei,** T. Chen, H. Anupam, National Taiwan Univ. (Taiwan); C. C. K. Chou, W. Chen, Academia Sinica (Taiwan); M. L. Lin, P. Lin, J. Chen, National Taiwan Univ. (Taiwan) . . . . . [6299-13]

4:15 pm: **Near real-time monitoring of biomass burning particulate emissions (PM2.5) using multiple satellite data,** X. Zhang, S. Kondragunta, F. Kogan, D. Tarpley, W. Guo, National Oceanic and Atmospheric Administration; C. C. Schmidt, Univ. of Wisconsin/Madison . . . . . [6299-14]

4:35 pm: **The WFABBA: global geostationary fire detection and characterization,** C. C. Schmidt, Univ. of Wisconsin/Madison; E. Prins, Univ. of Wisconsin/Madison and Cooperative Institute for Meteorological Satellite Studies . . . . . [6299-15]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 3

Conv. Ctr. Room 32B . . . . . Mon. 8:45 to 11:55 am

Model/Assimilation System Evaluation

Chairs: **Raymond M. Hoff**, Univ. of Maryland/Baltimore County; **Shobha Kondragunta**, National Environmental Satellite, Data, and Information Service

8:45 am: **Integration of satellite and in situ data for air quality studies: a global model approach *(Invited Paper),*** M. Chin, T. Diehl, H. Bian, T. Kucsera, A. Chu, O. Torres, N. A. Krotkov, NASA Goddard Space Flight Ctr. . . . . [6299-17]

9:15 am: **Mineral dust emission estimated from satellite data *(Invited Paper),*** J. Chen, National Taiwan Univ.; M. Lin, Aletheia Univ.; H. Lee, National Taiwan Univ. . . . . [6299-18]

9:45 am: **Regional air quality forecast (RAQAST) system: operational forecast and evaluations with satellite measurements,** Y. Wang, Georiga Institute of Technology . . . . . [6299-19]

10:05 am: **Data assimilation of carbon monoxide in the troposphere,** V. A. Yudin, D. P. Edwards, J. C. Gille, M. N. Deeter, S. Ho, L. K. Emmons, National Ctr. for Atmospheric Research . . . . . [6299-20]

Coffee Break . . . . . 10:25 to 10:55 am

10:55 am: **Dust transport model validation using satellite- and ground-based methods,** A. Mahler, K. J. Thome, College of Optical Sciences/The Univ. of Arizona and College of Optical Sciences; D. Yin, W. Sprigg, The Univ. of Arizona and Department of Atmospheric Sciences . . . . [6299-21]

11:15 am: **Air quality forecast verification using satellite data,** S. Kondragunta, National Environmental Satellite, Data, and Information Service; P. Lee, Science Applications International Corp.; J. McQueen, National Oceanic and Atmospheric Administration; C. Kittaka, NASA Langley Research Ctr.; A. Prados, Univ. of Maryland/Baltimore County; P. Ciren, QSS; I. Laszlo, National Oceanic and Atmospheric Administration; R. B. Pierce, NASA Langley Research Ctr.; R. M. Hoff, Univ. of Maryland/Baltimore County; J. J. Szykman, U.S. Environmental Protection Agency . . . . . [6299-22]

11:35 am: **Factor analysis applied to study MODIS-CMAQ differences in aerosol property,** R. Biswadev, U.S. Environmental Protection Agency . . . . . [6299-24]

Lunch Break . . . . . 11:55 am to 2:00 pm

SESSION 4

Conv. Ctr. Room 32B . . . . . Mon. 2:00 to 4:20 pm

Sensor and retrieval methodology

Chairs: **Juying Warner**, Univ. of Maryland/Baltimore County; **James J. Szykman**, U.S. Environmental Protection Agency

2:00 pm: **A hybrid thermal video and FTIR spectrometer system for rapidly locating and characterizing gas leaks *(Invited Paper),*** D. J. Williams, U.S. Environmental Protection Agency; D. H. Stone, DP Instruments; C. Salvaggio, D. W. Messinger, Rochester Institute of Technology . . . . . [6299-26]

2:30 pm: **Minimum harmonic detection order for Rayleigh resolution in modulation spectroscopy,** K. D. Mohan, M. A. Khan, A. N. Dharamsi, Old Dominion Univ. . . . . [6299-27]

2:50 pm: **Near-infrared fiber optics gas sensor for remote sensing of CH4 gas in coal mines,** S. Li, Y. Zhang, T. Koscica, D. Y. Li, H. Cui, Stevens Institute of Technology . . . . . [6299-28]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Multiplicative decomposition concept for atmospheric lidar assessment,** R. R. Agishev, Kazan State Univ. (Russia) and City College/CUNY; B. M. Gross, City College/CUNY; A. Comeron, Univ. Politecnica de Catalunya (Spain); F. Moshary, A. Gilerson, S. A. Ahmed, City College/CUNY . . . . . [6299-29]

4:00 pm: **Retrieval of physical properties of particulate emission from animal feeding operations using three-wavelength elastic lidar measurements,** V. V. Zavyalov, G. E. Bingham, T. D. Wilkerson, J. Swasey, C. Marchant, C. Rogers, T. Turpin, Space Dynamics Lab. . . . . [6299-31]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Correlations between aerosol optical depths derived from CIMEL sunphotometer and surface PM10 and PM2.5 concentrations in northern and southern Taiwan and their implications,** C. Shiu, National Taiwan Univ. (Taiwan); T. Chen, Acadenia Sinica (Taiwan); J. Chen, National Taiwan Univ. (Taiwan); S. C. Liu, Acadenia Sinica (Taiwan); P. Lin, National Taiwan Univ. (Taiwan); H. Lin, W. Chen, S. Chang, Acadenia Sinica (Taiwan); A. Hazra, National Taiwan Univ. (Taiwan); C. C. K. Chou, S. Lung, S. Hsu, Acadenia Sinica (Taiwan) . . . . . [6299-33]

✔ **The influence evaluation of sand events in Hexi corridor band on the PM10 mass concentrations in LanZhou,** J. Tao, Y. Huang, J. Wang, D. Lu, Nanjing Univ. of Information Science and Technology (China) . . . . . [6299-34]

✔ **Aerosol retrievals from INSAT-3A charged couple device,** J. Zeng, Earth Resources Technology, Inc.; S. Kondragunta, National Environmental Satellite, Data, and Information Service; P. Ciren, QSS Group, Inc.; I. Laszlo, National Oceanic and Atmospheric Administration . . . . . [6299-35]

✔ **GOES-12 retrieval of aerosol optical thickness during INTEX-A,** P. Ciren, QSS GROUP INC.; S. Kondragunta, National Environmental Satellite, Data, and Information Service; A. Prados, Univ. of Maryland/ Baltimore County; I. Laszlo, National Oceanic and Atmospheric Administration . . . . . [6299-36]

✔ **UMBC hyperspectral instrument and its potential applications,** J. Warner, A. Chu, Univ. of Maryland/Baltimore County . . . . . [6299-37]

✔ **Remote sensing damage assessment of chemical plants and refineries following hurricanes Katrina and Rita,** D. J. Williams, U.S. Environmental Protection Agency; H. A. Fry, Los Alamos National Lab.; A. N. Pilant, U.S. Environmental Protection Agency . . . . . [6299-38]

✔ **Hardware and software combined optical Earth observation atmospheric correction,** Z. Zhu, W. Gong, Q. Qin, P. Li, Y. Ma, M. Liu, Z. Hao, Wuhan Univ. (China) . . . . . [6299-32]

Courses of Related Interest

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SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Weds. 16 Aug., 8:30 am to 12:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

SC561 **Optomechanics for Space Applications** (Shipley) Tues. 15 Aug., 8:30 am to 5:30 pm

SC567 **Introduction to Optical Remote Sensing Systems** (Shaw) Sun. 13 Aug., 8:30 am to 12:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

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Satellite Data Compression, Communication, and Archiving II

Conference Chairs: **Roger W. Heymann**, National Oceanic and Atmospheric Administration (NOAA) NESDIS; **Charles C. Wang**, The Aerospace Corp.; **Timothy J. Schmit**, National Oceanic and Atmospheric Administration (NOAA) NESDIS

Program Committee: **Sergio D. Cabrera**, The Univ. of Texas at El Paso; **Dariush Divsalar**, Jet Propulsion Lab.; **Irina Gladkova**, City College/CUNY; **Mitchell D. Goldberg**, NOAA NESDIS ORA; **Michael D. Grossberg**, City College/CUNY; **Allen H. L. Huang**, Univ. of Wisconsin/Madison; **Aaron B. Kiely**, Jet Propulsion Lab.; **Tien M. Nguyen**, Raytheon Co.; **Donald P. Olsen**, The Aerospace Corp.; **Jeffrey J. Puschell**, Raytheon Space and Airborne Systems; **Ana M. C. Ruedin**, Univ. de Buenos Aires (Argentina); **Ryan C. Shoup**, MIT Lincoln Lab.; **Shih-Chieh Wei**, Tamkang Univ. (Taiwan); **Mohammed O. Zaatari**, Mitretek Systems, Inc.

Sunday 13 August

Conv. Ctr. Room 32A . . . . . Sun. 8:30 to 8:45 am

Introductory Comments

SESSION 1

Conv. Ctr. Room 32A . . . . . Sun. 8:45 to 11:45 am

Compression of Hyper/Ultra Spectral Sounder Sensor Data

Chairs: **Michael D. Grossberg**, CCNY/CREST Institute/CUNY; **Aaron B. Kiely**, Jet Propulsion Lab.

8:45 am: **A lossless compression algorithm for hyperspectral data *(Invited Paper)*,** I. Gladkova, City College/CUNY; M. D. Goldberg, National Oceanic and Atmospheric Administration; N. R. Nalli, L. Zhou, W. W. Wolf, QSS Group, Inc.; L. M. Roytman, City College/CUNY . . . . . [6300-01]

9:10 am: **Adaptive linear prediction for compression of ultraspectral sounder data *(Invited Paper)*,** B. Huang, A. Ahuja, Univ. of Wisconsin/Madison; M. D. Goldberg, National Oceanic and Atmospheric Administration . . . . . [6300-02]

Coffee Break . . . . . 9:35 to 10:05 am

10:05 am: **Lossless compression of ultraspectral sounder data using a generalized prediction-based lower triangular transform,** S. Wei, Tamkang Univ. (Taiwan); B. Huang, Univ. of Wisconsin/Madison [6300-03]

10:25 am: **Preliminary lossless compression results with Michelson interferometer data,** T. J. Schmit, National Oceanic and Atmospheric Administration; H. A. Huang, Univ. of Wisconsin-Madison . . . . [6300-04]

10:45 am: **Residual coding with JPEG2000 and outlier support for controlling l-infinity error applied to ultraspectral sounder data,** A. Lucero, S. D. Cabrera, The Univ. of Texas at El Paso; E. Vidal, Jr., Former Army Research Lab . . . . . [6300-05]

11:05 am: **Assessment of inter-slice bit-allocation strategies in the application of JPEG2000 to ultraspectral sounder data,** A. Aguirre, The Univ. of Texas at El Paso; E. Vidal, Jr., Formerly United States Army Research Laboratory; S. D. Cabrera, J. L. Melchor, Jr., The Univ. of Texas at El Paso . . . . . [6300-06]

11:25 am: **Accuracy of AIRS/AMSU version 5 soundings and error estimates,** J. Susskind, NASA Goddard Space Flight Ctr. . . . . [6300-07]

Lunch Break . . . . . 11:45 to 1:15 am

SESSION 2

Conv. Ctr. Room 32A . . . . . Sun. 1:15 to 3:00 pm

Error Containment for Remote Sensor Compression in Satellite Data Streams

Chairs: **Irina Gladkova**, CCNY/CREST Institute/CUNY; **Eugene Grayver**, The Aerospace Corp.

1:15 pm: **Priority-based error correction using turbo codes for compressed AIRS data *(Invited Paper)*,** I. Gladkova, City College/CUNY; E. Grayver, The Aerospace Corp.; M. D. Grossberg, City College/CUNY; N. R. Nalli, QSS Group, Inc.; D. P. Olsen, The Aerospace Corp.; W. W. Wolf, L. Zhou, QSS Group, Inc. . . . . [6300-08]

1:40 pm: **A novel unequal error protection scheme with turbo product codes for wavelet compression of ultraspectral sounder data,** B. Huang, Y. Sriraja, A. Ahuja, Univ. of Wisconsin/Madison; M. D. Goldberg, National Oceanic and Atmospheric Administration . . . . . [6300-09]

2:00 pm: **Providing unequal protection for compressed data using hierarchical modulations,** C. C. Wang, L. Xu, S. Lim, The Aerospace Corp. . . . . [6300-10]

2:20 pm: **Burst error performance of 3DWT-RVLC with low-density parity check codes for ultraspectral sounder data compression,** B. Huang, A. Ahuja, Y. Sriraja, Univ. of Wisconsin/Madison; C. C. Wang, The Aerospace Corp.; M. D. Goldberg, National Oceanic and Atmospheric Administration . . . . . [6300-11]

2:40 pm: **Ultraspectral sounder data compression using a marker-based error-resilient arithmetic coder,** S. Wei, Tamkang Univ. (Taiwan); B. Huang, Univ. of Wisconsin/Madison . . . . . [6300-12]

Coffee Break . . . . . 3:00 to 3:30 pm

Conv. Ctr. Room 32A . . . . . Sun. 3:30 to 3:40 pm

Introductory Comments Session 3

SESSION 3

Conv. Ctr. Room 32A . . . . . Sun. 3:40 to 5:25 pm

Satellite Communications Engineering

Chairs: **Donald P. Olsen**, The Aerospace Corp.; **Peter G. Woolner**, Mitretek Systems, Inc.

3:40 pm: **Future GOES-R global ground receivers,** P. A. Dafesh, E. Grayver, The Aerospace Corp. . . . . [6300-26]

4:00 pm: **Hardware implementation and characterization of a low density parity check (LDPC) decoder,** R. C. Shoup, MIT Lincoln Lab. . . . . [6300-14]

4:20 pm: **Broadcast coding techniques applied to remote sensing spectral data,** P. Masini, Raytheon Co. . . . . [6300-15]

4:40 pm: **Evolution of the NOAA National Weather Service Satellite Broadcast Network to Europe's DVB-S satellite communication's technology standard *(Invited Paper)*,** P. Cragg, National Oceanic and Atmospheric Administration; W. E. Brockman, Short & Associates[6300-16]

5:05 pm: **Autosophy satellite data compression, communication, and archiving,** K. E. Holtz, Autosophy . . . . . [6300-17]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

Conv. Ctr. Room 32A . . . . . Mon. 8:30 to 8:40 am

Introductory Comments Session 4

SESSION 4

Conv. Ctr. Room 32A . . . . . Mon. 8:40 to 10:35 am

Satellite Ground Communications, Archive

Chairs: **Roger W. Heymann**, National Oceanic and Atmospheric Administration (NOAA) NESDIS; **Ryan C. Shoup**, MIT Lincoln Lab.

8:40 am: **Terrestrial communications services for distribution of high-data rate geosynchronous environmental monitoring satellites data *(Invited Paper)*,** M. O. Zaatari, Mitretek Systems, Inc. . . . . [6300-18]

9:05 am: **Upgrading the Wallops command and data acquisition station for the GOES R era,** P. G. Woolner, Mitretek Systems, Inc.; R. N. Tye, G. P. Johnson, P. L. Whaley, National Oceanic and Atmospheric Administration . . . . . [6300-19]

Coffee Break . . . . . 9:25 to 9:55 am

9:55 am: **CLASS plans for providing archive access and distribution services for GOES-R data,** R. H. Rank, A. Kidd, National Oceanic and Atmospheric Administration . . . . . [6300-20]

10:15 am: **DAQ- a complete design,** A. K. Choubey, Jr., R. Raushan, Dr. M.G.R. Educational and Research Institute (India) . . . . . [6300-21]

SESSION 5

Conv. Ctr. Room 32A . . . . . Mon. 10:35 am to 12:05 pm

Compression of Multi-Spectral Imager Sensor Data

Chairs: **Sergio D. Cabrera**, The Univ. of Texas at El Paso; **Shih-Chieh Wei**, Tamkang Univ. (Taiwan)

10:35 am: **An analysis of optimal compression for the advanced baseline imager-based on entropy and noise estimation *(Invited Paper)*,** M. D. Grossberg, M. Nizamuddin, I. Gladkova, City College/CUNY; M. D. Goldberg, National Oceanic and Atmospheric Administration . . . . . [6300-22]

11:00 am: **Low-complexity adaptive lossless compression of hyperspectral imagery *(Invited Paper)*,** M. A. Klimesh, Jet Propulsion Lab. . . . . [6300-23]

11:25 am: **Lossless compression of multispectral images: prediction of wavelet coefficients tuned to landscape,** D. G. Acevedo, A. M. C. Ruedin, Univ. de Buenos Aires (Argentina) . . . . . [6300-24]

11:45 am: **Introducing datasets for next generation geostationary imager compression studies,** T. J. Schmit, National Oceanic and Atmospheric Administration; M. M. Gunshor, J. Li, Univ. of Wisconsin/Madison; T. Renkevens, National Oceanic and Atmospheric Administration . . . . . [6300-25]

Lunch Break . . . . . 12:05 to 1:20 pm

Conv. Ctr. Room 32A . . . . . Mon. 1:20 to 2:00 pm

All Attendees - Conference Ending Open Discussion

Chairs: **Roger W. Heymann**, National Oceanic and Atmospheric Administration (NOAA) NESDIS; **Irina Gladkova**, City College/CUNY; **Eugene Grayver**, The Aerospace Corp.; **Donald P. Olsen**, The Aerospace Corp.

Wednesday-Thursday 16-17 August 2006 • Proceedings of SPIE Vol. 6301

Atmospheric and Environmental Remote Sensing Data Processing and Utilization II: Perspective on Calibration/ Validation Initiatives and Strategies

Conference Chairs: **Allen H. L. Huang**, Univ. of Wisconsin/Madison; **Hal J. Bloom**, National Oceanic and Atmospheric Administration

Program Committee: **James Anderson**, Harvard Univ.; **Philip E. Ardanuy**, Raytheon Co.; **Gail E. Bingham**, Utah State Univ.; **James J. Butler**, NASA Goddard Space Flight Ctr.; **Changyong Cao**, National Oceanic and Atmospheric Administration; **Raju Dalta**, National Institute of Standards and Technology; **Mitchell D. Goldberg**, National Oceanic and Atmospheric Administration; **Stephen A. Mango**, NPOESS Integrated Program Office; **W. Paul Menzel**, Univ. of Wisconsin/Madison; **Henry E. Revercomb**, Univ. of Wisconsin/Madison; **William L. Smith, Jr.**, NASA Langley Research Ctr.; **Karen St. Germain**, National Oceanic and Atmospheric Administration; **Alan Thurgood**, Utah State Univ.

Wednesday 16 August

SESSION 1

Conv. Ctr. Room 32A . . . . . Wed. 8:15 to 10:35 am

Calibration/Validation Across Systems

Chair: **Changyong Cao**, National Oceanic and Atmospheric Administration

8:15 am: **Simultaneous overpass off Nadir (SOON): a method for unified calibration/validation across IEOS and GEOSS system of systems *(Invited Paper)*,** P. E. Ardanuy, W. R. Bergen, Raytheon Co.; M. M. Gunshor, A. Huang, Univ. of Wisconsin/Madison; E. J. Kratz, Raytheon Co.; J. J. Puschell, Raytheon Space and Airborne Systems; C. F. Schueler, J. A. Walker, Raytheon Santa Barbara Remote Sensing . . . . . [6301-01]

8:45 am: **Establishing on-orbit calibration links among operational satellite radiometers for the implementation of GEOSS *(Invited Paper)*,** C. Cao, National Oceanic and Atmospheric Administration . . . . [6301-02]

9:15 am: **System level approach to satellite instrument calibration *(Invited Paper)*,** J. J. Tansock, A. Thurgood, G. E. Bingham, N. S. Pougatchev, R. J. Jost, Utah State Univ.; R. U. Datla, National Institute of Standards and Technology; V. Privalski, VEGA International, Inc.; V. N. Krutikov, Gosstandart of Russia (Russia); V. S. Ivanov, V. I. Sapritsky, A. S. Panfilov, All-Russian Research Institute for Optical and Physical Measurement (Russia) . . . . . [6301-03]

9:45 am: **NPOESS NPP calibration and calidation task network *(Invited Paper)*,** K. St. Germain, National Oceanic and Atmospheric Administration; A. Bleich, E. Ferrara, National Oceanic and Atmospheric Administration and NPOESS Integrated Program Office; P. S. Lee, G. DeAmici, A. Dybdahl, L. Liao, M. Helminger, F. Hsu, C. Wang, Northrop Grumman Space Technology . . . . . [6301-04]

10:15 am: **Proposal for a national microwave brightness-temperature standard,** J. Randa, A. E. Cox, D. K. Walker, National Institute of Standards and Technology . . . . . [6301-05]

Coffee Break . . . . . 10:35 to 11:05 am

SESSION 2

Conv. Ctr. Room 32A . . . . . Wed. 11:05 am to 1:05 pm

Environmental Product Validation I

Chair: **David C. Tobin**, Univ. of Wisconsin/Madison

11:05 am: **Recent ground, aircraft, and intersatellite-based efforts to validate EOS observations *(Invited Paper)*,** D. C. Tobin, H. E. Revercomb, R. O. Knuteson, F. A. Best, C. C. Moeller, M. M. Gunshor, J. K. Taylor, Univ. of Wisconsin/Madison . . . . . [6301-06]

11:35 am: **Generating climate benchmark atmospheric soundings using GPS occultation data *(Invited Paper)*,** A. J. Mannucci, C. O. Ao, G. A. Hajj, B. A. Iijima, D. Kuang, T. K. Meehan, L. E. Young, T. P. Yunck, Jet Propulsion Lab.; S. S. Leroy, Harvard Univ. . . . . [6301-07]

12:05 pm: **Optimal fusion of operational ground truth measurements in atmospheric inversion algorithms *(Invited Paper)*,** S. L. Klempner, B. D. Bartlett, J. R. Schott, Rochester Institute of Technology . . . . . [6301-08]

12:35 pm: **A comprehensive radiometric validation protocol for the CERES Earth radiation budget climate record sensors *(Invited Paper)*,** K. J. Priestley, NASA Langley Research Ctr.; S. Thomas, Science Applications International Corp.; G. Matthews, Analytical Services & Materials, Inc. . . . . [6301-09]

Lunch/Exhibition Break . . . . . 1:05 to 2:05 pm

SESSION 3

Conv. Ctr. Room 32A . . . . . Wed. 2:05 to 3:05 pm

Environmental Product Validation II

Chair: **James Randa**, National Institute of Standards and Technology

2:05 pm: **Global analysis and characterization of AIRS/MODIS cloud clearing,** H. Zhang, A. H. L. Huang, K. Baggett, Univ. of Wisconsin/ Madison . . . . . [6301-43]

2:25 pm: **Geophysical validation of WINDSAT surface wind data and its impact on numerical weather prediction,** R. M. Atlas, National Oceanic and Atmospheric Administration . . . . . [6301-10]

2:45 pm: **Validation of satellite-based soil moisture algorithm,** T. J. Jackson, U.S. Dept. of Agriculture . . . . . [6301-13]

Coffee Break . . . . . 3:05 to 3:35 pm

SESSION 4

Conv. Ctr. Room 32A . . . . . Wed. 3:35 to 4:35 pm

System Improvements

Chair: **Larrabee L. Strow**, Univ. of Maryland/Baltimore County

3:35 pm: **Improvements to NPOESS temperature and moisture sounding by combining sounder and imaging instrument data,** R. J. Lynch, C. Richard, H. E. Snell, D. B. Hogan, AER Inc.; H. A. Huang, Univ. of Wisconsin/Madison; D. E. Hagan, M. S. Mussetto, Northrop Grumman Space Technology . . . . . [6301-14]

3:55 pm: **The climate change and its ecosystem effect in the upper yellow river,** J. Feng, N. Guo, Lanzhou Institute of Arid Meteorology (China) . . . . . [6301-16]

4:15 pm: **An objective nowcasting tool that optimizes the impact of satellite derive sounder products in very-short-range forecasts,** R. A. Petersen, Univ. of Wisconsin/Madison; R. M. Aune, National Oceanic and Atmospheric Administration . . . . . [6301-17]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **The characteristics of surface air temperature change at arid and semi-arid regions in mid-latitude Asia in 20th century,** J. Wang, China Meteorological Administration (China) and Lanzhou Ctr. Meteorological Observation (China) and Shandong Provincial Weather Bureau (China); J. Tao, China Meteorological Administration (China); J. Li, Shandong Provincial Weather Bureau (China) . . . . . [6301-26]

✔ **Climatic features of East Asian subtropical summer monsoon trough and its comparison with South China Sea summer monsoon trough,** L. Wang, Z. Guan, J. He, Nanjing Univ. of Information Science & Technology (China) . . . . . [6301-29]

✔ **Relation of the development of inertia-gravity wave and activities of the rain belt during the period of Meiyu storm rainfall,** Y. Chang, Z. Ding, S. Yang, L. Wang, Nanjing Univ. of Information Science and Technology (China) . . . . . [6301-30]

✔ **Feature of decadal varibility and the possible mechanism of sea-air system in the Pacific,** S. Zhong, L. Wang, J. Sun, J. He, Nanjing Univ. of Information Science and Technology (China) . . . . . [6301-31]

✔ **Period precipitation features during South China pre-flood and its relationship with SCSSM onset,** Y. Chi, J. He, Q. Li, Nanjing Univ. of Information Science and Technology (China); C. Luo, Fujian Meteorological Observatory (China) . . . . . [6301-34]

✔ **Risk assessment model of drought-caused yield loss for winter wheat and its application,** R. Liu, Z. Zhu, W. Fang, Y. Wang, Henan Institute of Meteorological Science (China) . . . . . [6301-35]

✔ **Characteristics of Doppler velocity echoes of large-scale precipitation genesis, development, maintenance, and dissipation,** J. Lv, Nanjing Univ. of Information Science and Technology (China) and Tianjin Municipal Meteorological Bureau (China); F. Zhang, Nanjing Univ. of Information Science and Technology (China) . . . . . [6301-36]

✔ **Cultivated land changes and driving force analysis by satellite remote sensing in the Yellow River Delta, China,** X. Zhang, Taian Meteorological Bureau (China); G. Zhao, Shandong Agricultural Univ. (China); F. Zhang, Nanjing Univ. of Information Science and Technology (China) and Weihai Meteorological Bureau (China); S. Zhong, Nanjing Univ. of Information Science and Technology (China) . . . . . [6301-37]

✔ **Air-sea coupling features from the warm phase to the cold phase of ENSO cycles in the seventies to the eighties,** F. Zhang, J. Lv, L. Wang, J. He, Nanjing Univ. of Information Science and Technology (China) . . . . . [6301-38]

✔ **Reference software implementation for GIFTS ground data processing,** R. K. Garcia, B. Howell, R. O. Knuteson, G. D. Martin, E. R. Olson, M. J. Smuga-Otto, Univ. of Wisconsin/Madison . . . . . [6301-39]

✔ **Tropospheric infrared mapping spectrometers (TIMS) for air quality measurements,** J. B. Kumer, J. L. Mergenthaler, A. E. Roche, Lockheed Martin Advanced Technology Ctr.; R. B. Chatfield, NASA Ames Research Ctr. . . . . [6301-40]

✔ **Initial retrievals inter-comparison of the satellite AIRS/AMSU and aircraft NAST-I/NAST-M soundings using the same retrieval algorithm,** V. V. Zavyalov, G. E. Bingham, M. Smith, Space Dynamics Lab.; D. K. Zhou, NASA Langley Research Ctr.; N. S. Pougatchev, D. W. Sorenson, Space Dynamics Lab. . . . . [6301-12]

Thursday 17 August

SESSION 5

Conv. Ctr. Room 32A . . . . . Thurs. 8:30 am to 12:20 pm

Climate Systems and Results

Chair: **Karen St. Germain**, National Oceanic and Atmospheric Administration

8:30 am: **GOES-R baseline instruments *(Invited Paper)*,** J. J. Gurka, T. J. Schmit, National Oceanic and Atmospheric Administration; M. M. Gunshor, J. Li, Univ. of Wisconsin/Madison . . . . . [6301-18]

9:00 am: **Perspectives on climate observations with AIRS *(Invited Paper)*,** L. L. Strow, S. E. Hannon, Univ. of Maryland/Baltimore County . . . . . [6301-19]

9:30 am: **AIRS observations of deep convective clouds *(Invited Paper)*,** H. H. G. Aumann, D. T. Gregorich, Jet Propulsion Lab.; S. G. De Souza-Machado, Univ. of Maryland/Baltimore County . . . . . [6301-20]

10:00 am: **NPOESS interface data processing segment (IDPS) architecture and software *(Invited Paper)*,** C. Davis, K. Grant, C. Fox, Raytheon Co. . . . . [6301-21]

Coffee Break . . . . . 10:30 to 11:00 am

11:00 am: **Characteristics of convective activities over Sumatra areas and its possible factors *(Invited Paper)*,** L. Wang, J. He, Z. Guan, Nanjing Univ. of Information Science and Technology (China) . . . . . [6301-22]

11:30 am: **Validation assessment model for atmospheric retrievals *(Invited Paper)*,** N. S. Pougatchev, G. E. Bingham, J. G. Cardon, Space Dynamics Lab.; K. St. Germain, S. A. Mango, National Oceanic and Atmospheric Administration; J. J. Tansock, V. Zavjalov, Space Dynamics Lab. . . . . [6301-23]

12:00 pm: **An approach with new techniques on data management,** A. K. Choubey, Jr., R. Raushan, Dr. M.G.R. Educational and Research Institute (India) . . . . . [6301-24]

Lunch/Exhibition Break . . . . . 12:20 to 1:20 pm

Workshop Presentations . . . . . Thurs. 1:20 to 3:20 pm

Coffee Break . . . . . 3:20 to 3:50 pm

Panel Discussion . . . . . Thurs. 3:50 to 4:50 pm

Moderator: **Joe Tansock,** Space Dynamics Labratory, Utah State Univ.

Panelists: **K. St. Germain,** NPOESS-National Oceanic and Atmospheric Administration; **R. U. Datla,** Optical Technology Division-National Institute of Standards and Technology; **M. D. Goldberg,** Office of Research Applications-National Oceanic and Atmospheric Administration; **W. L. Smith, Jr.,** NASA Langley Research Ctr.

Monday-Wednesday 14-16 August 2006 • Proceedings of SPIE Vol. 6302

Imaging Spectrometry XI

Conference Chairs: **Sylvia S. Shen**, The Aerospace Corp.; **Paul E. Lewis**, U.S. Government

Program Committee: **Christoph C. Borel**, Ball Aerospace & Technologies Corp.; **Chein-I Chang**, Univ. of Maryland/Baltimore County; **Thomas W. Cooley**, Air Force Research Lab.; **Michael A. Cutter**, Sira Technology Ltd. (United Kingdom); **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona; **Michael R. Descour**, College of Optical Sciences/The Univ. of Arizona; **David B. Gillis**, Naval Research Lab.; **Terrence S. Lomheim**, The Aerospace Corp.; **Anthony Ratowski**, Air Force Research Lab.; **John R. Schott**, Rochester Institute of Technology; **Winthrop Wadsworth**, DP Instruments

Monday 14 August

Conv. Ctr. Room 31C . . . . . Mon. 8:35 am

Opening Remarks

Chair: **Paul E. Lewis**, U.S. Government

SESSION 1

Conv. Ctr. Room 31C . . . . . Mon. 8:40 to 10:00 am

Fourier Transform Spectrometers

Chair: **Paul E. Lewis**, U.S. Government

8:40 am: **Mobile remote sensing FT-IR for plume detection,** W. Wadsworth, DP Instruments; D. H. Stone, D&P Instruments; D. J. Williams, U.S. Environmental Protection Agency . . . . . [6302-01]

9:00 am: **8x8 element mosaic imaging FT-IR for passive standoff detection,** W. Wadsworth, D. H. Stone, DP Instruments . . . . . [6302-02]

9:20 am: **A Fourier transform spectrometer generic scan mechanism controller: improves instrument utility and flexibility for a variety of applications,** L. Rochette, LR Tech (Canada); T. Bratcher, Ionetrics, Inc.; P. E. Lewis, National Geospatial-Intelligence Agency; M. J. Thomas, U.S. Environmental Protection Agency Region VII; G. St-Pierre, Gentec Electro-Optics Inc. (Canada) . . . . . [6302-03]

9:40 am: **Raman spectroscopy with a Fizeau interferometer,** J. D. Mudge, T. S. Kubo, Lockheed Martin Advanced Technology Ctr. [6302-04]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 31C . . . . . Mon. 10:30 am to 12:10 pm

Spectral System Development

Chair: **Luc Rochette**, LR Tech (Canada)

10:30 am: **Broadband advanced spectral system (BRASS),** D. M. Even, C. P. Warren, NovaSol; P. K. Shu, NASA Goddard Space Flight Ctr. . . . . [6302-05]

10:50 am: **AIRIS wide-area detector overview and characterization,** W. J. Marinelli, M. L. Finson, J. K. Hagge, C. M. Gittins, T. E. Ustun, Physical Sciences Inc.; S. D. Chang, Physical Sciences Inc; H. S. Kindle, T. E. Janov, D. C. Rossi, Physical Sciences Inc.; J. O. Jensen, U.S. Army Armament Research, Development and Engineering Ctr.; P. J. Cobler, S. A. Rhodes, M. J. Levrault, P. Butler, Vtech Engineering Corp. . . . . [6302-06]

11:10 am: **Simplified spectropolarimetry using reactive mesogen polarization gratings,** M. J. Escuti, C. Oh, North Carolina State Univ.; C. C. Sanchez, Univ. de Zaragoza (Spain); C. W. M. Bastiaansen, D. J. Broer, Technische Univ. Eindhoven (Netherlands) . . . . . [6302-07]

11:30 am: **Design of imaging spectrograph for improving spectral and spatial resolutions,** K. Chuang, H. Wang, F. Yang, Industrial Technology Research Institute (Taiwan) . . . . . [6302-08]

11:50 am: **A novel multichannel nonintensified ultrahigh-speed camera using multiwavelength illumination,** A. Hijazi, The Hashemite Univ. (Jordan); V. Madhavan, Wichita State Univ. . . . . [6302-09]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 3

Conv. Ctr. Room 31C . . . . . Mon. 1:30 to 2:50 pm

Modeling and Simulation

Chair: **John R. Schott**, Rochester Institute of Technology

1:30 pm: **Statistical models for physically derived target sub-spaces,** E. J. Ientilucci, P. Bajorski, Rochester Institute of Technology . . [6302-10]

1:50 pm: **Parametric prediction of the probability-of-detection and probability-of-false alarm for reflective hyperspectral imaging systems: dependencies on target, scene and sensor design characteristics, and detection algorithms,** E. M. Bassett III, T. S. Lomheim, J. A. Lang, T. L. Hayhurst, The Aerospace Corp. . . . . [6302-11]

2:10 pm: **Incorporation of atmospheric variability in hyperspectral synthetic scene simulation,** B. M. Dobbs, N. Sanders, J. R. Schott, Rochester Institute of Technology . . . . . [6302-12]

2:30 pm: **The estimation of noise covariance matrix in hyperspectral remotely sensed images,** H. Ren, C. Chen, National Central Univ. (Taiwan) . . . . . [6302-13]

Coffee Break . . . . . 2:50 to 3:20 pm

SESSION 4

Conv. Ctr. Room 31C . . . . . Mon. 3:20 to 5:20 pm

Feature Extraction and Dimensionality Reduction

Chair: **David B. Gillis**, Naval Research Lab.

3:20 pm: **Automatic algorithms for endmember extraction,** C. Wu, C. Chang, Univ. of Maryland/Baltimore County . . . . . [6302-14]

3:40 pm: **Spectral derivative feature coding for hyperspectral signature analysis,** S. Chakravarty, C. Chang, Univ. of Maryland/Baltimore County . . . . . [6302-15]

4:00 pm: **Application of nonnegative principal component analysis in hyperspectral imaging,** P. Bajorski, Rochester Institute of Technology . . . . . [6302-16]

4:20 pm: **Effects of dimensionality reduction on the statistical distribution of hyperspectral backgrounds,** D. G. Manolakis, M. Rossacci, MIT Lincoln Lab. . . . . [6302-17]

4:40 pm: **Band prioritization for hyperspectral imagery,** S. Wang, C. Chang, Univ. of Maryland/Baltimore County . . . . . [6302-18]

5:00 pm: **Kalman filter-based approaches to hyperspectral signal similarity and discrimination,** S. Wang, C. Chang, Univ. of Maryland/Baltimore County . . . . . [6302-19]

Tuesday 15 August

SESSION 5

Conv. Ctr. Room 31C . . . . . Tues. 8:40 to 10:00 am

Spectrometer Design and Development

Chair: **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona

8:40 am: **MEMS integration with an all-reflective SWIR snapshot hyperspectral imager,** W. R. Johnson, D. W. Wilson, G. H. Bearman, Jet Propulaion Lab. . . . . [6302-20]

9:00 am: **Maximizing the resolution of a CTIS instrument: new grating design techniques,** N. A. Hagen, E. L. Dereniak, College of Optical Sciences/The Univ. of Arizona . . . . . [6302-21]

9:20 am: **Development of four-dimensional imaging spectrometers (4D-IS),** N. Gat, J. Garman, M. D. Li, G. R. Scriven, J. Zhang, Opto Knowledge Systems, Inc. . . . . [6302-22]

9:40 am: **Miniaturization of a visible hyperspectral imager,** C. P. Warren, M. Friend, NovaSol . . . . . [6302-23]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 31C . . . . . Tues. 10:30 to 11:50 am

Sensor Performance Characterization and Analysis

Chair: **Winthrop Wadsworth**, DP Instruments

10:30 am: **Figures-of-merit for hyperspectral interferometric sensors,** E. Y. Tsiang, Acies Hawaii, Inc. . . . . [6302-24]

10:50 am: **Characterization of an acousto-optic tunable filter imaging system,** D. G. Voelz, S. Reynolds, N. J. Chanover, B. Kodali, New Mexico State Univ. . . . . [6302-25]

11:10 am: **Sensitivity and dynamic range specification of visible and infrared focal planes used in scanning dispersive hyperspectral systems: impact of scene spectral radiance assumptions and instrument design parameters,** T. S. Lomheim, J. Geis, J. A. Lang, S. E. Kohn, The Aerospace Corp. . . . . [6302-26]

11:30 am: **Effects of nonrandom and nonstationary noise on hyperspectral imaging sensor performance,** T. L. Hayhurst, E. M. Bassett III, T. S. Lomheim, The Aerospace Corp. . . . . [6302-27]

Wednesday 16 August

SESSION 7

Conv. Ctr. Room 31C . . . . . Wed. 8:00 to 10:00 am

Spectral Methodologies and Applications

Chair: **Christoph C. Borel**, Ball Aerospace & Technologies Corp.

8:00 am: **Sub-pixel registration assessment of multispectral imagery,** M. A. Goforth, Goforth Scientific, Inc. . . . . [6302-43]

8:20 am: **Atmospheric correction of airborne POLDER polarimetric imagery using vectorized 6S,** C. C. Borel, C. H. Spencer, Ball Aerospace & Technologies Corp. . . . . [6302-28]

8:40 am: **Error analysis for a temperature and emissivity retrieval algorithm for hyperspectral imaging data,** C. C. Borel, Ball Aerospace & Technologies Corp. . . . . [6302-29]

9:00 am: **Exploiting nonlinear structure in hyperspectral coastal data,** D. B. Gillis, J. H. Bowles, D. R. Korwan, G. Lamela, M. J. Montes, W. J. Rhea, Naval Research Lab. . . . . [6302-30]

9:20 am: **Hyperspectral imaging spectrometry applied to ornamental stone aesthetic quality assessment: procedures and analytical strategies,** G. Bonifazi, S. Serranti, A. Gargiulo, Univ. degli Studi di Roma/ La Sapienza (Italy) . . . . . [6302-31]

9:40 am: **Hyperspectral imaging spectrometry applied to soils and granular materials characterization currently utilized in waste disposal sites: procedures and analytical strategies,** G. Bonifazi, S. Serranti, Univ. degli Studi di Roma/La Sapienza (Italy) . . . . . [6302-32]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 8

Conv. Ctr. Room 31C . . . . . Wed. 10:30 to 11:50 am

Target Detection

Chair: **Sylvia S. Shen**, The Aerospace Corp.

10:30 am: **Extending classification approaches to object detection in hyperspectral imagery,** R. R. Mayer, BAE Systems Advanced Information Technologies; J. A. Antoniades, BAE Systems North America; M. M. Baumback, D. Chester, BAE Systems Advanced Information Technologies; J. Edwards, BAE Systems North America; A. Goldstein, D. Haas, S. Henderson, BAE Systems Advanced Information Technologies [6302-34]

10:50 am: **Matched filters for multispectral point target detection,** S. Buganim, S. R. Rotman, Ben-Gurion Univ. of the Negev (Israel) [6302-35]

11:10 am: **Signal processing algorithms for staring single pixel hyperspectral sensors,** D. G. Manolakis, MIT Lincoln Lab.; F. M. D' Amico, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6302-36]

11:30 am: **Performance analysis for RX algorithm in hyperspectral remotely sensed images,** H. Ren, H. Chen, National Central Univ. (Taiwan) . . . . . [6302-37]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Effects of groundwater overdraft on sustainable agricultural development in arid area,** X. Zhou, Z. Liu, Xinjiang Univ. (China); W. Gao, Colorado State Univ.; W. DAI, Xinjiang Univ. (China) . . . [6302-38]

✔ **Analysis of snow distribution change in Emin river basin based on RS and GIS,** H. Pei, Z. Liu, H. Jiang, Xinjiang Univ. (China) . . [6302-40]

✔ **Sensitivity analysis of a new SWIR-channel measuring,** R. T. Jongma, A. M. S. Gloudemans, R. W. M. Hoogeveen, I. Aben, SRON Nationaal Instituut voor Ruimteonderzoek (Netherlands); J. de Vries, Dutch Space B.V. (Netherlands); I. Escudero-Sanz, TNO (Netherlands); G. H. J. van den Oord, P. F. Levelt, Koninklijk Nederlands Meteorologisch Instituut (Netherlands) . . . . . [6302-41]

✔ **Remote pulsed laser raman spectroscopy system for detecting water, ice, and hydrous minerals,** C. S. Garcia, Old Dominion Univ.; M. N. Abedin, NASA Langley Research Ctr.; A. K. Misra, Univ. of Hawai'i/ West O'ahu; T. F. Refaat, Science and Technology Corp.; S. Ismail, NASA Langley Research Ctr.; S. K. Sharma, Univ. of Hawai'i at Manoa; U. N. Singh, NASA Langley Research Ctr.; H. E. Elsayed-Ali, Old Dominion Univ. . . . . [6302-42]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** (Lomheim) Sun. 13 Aug., 1:30 to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (Riedl) Tues. 15 Aug., 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Mon. 14 Aug 1:30 am 5:30 pm

SC153 **Imaging Spectrometry** (Dereniak, Descour) Sun. 13 Aug., 1:30 to 5:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Weds. 16 Aug., 8:30 am to 12:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors** (Lomheim) Weds. 16 Aug., 1:30 to 5:30 pm

SC410 **Fourier Transform Spectrometry: Theory, Methods, and New Applications** (Abrams) Thurs. 17 Aug., 8:30 am to 12:30 pm

SC504 **Introduction to CCD and CMOS Imaging Sensors and Applications** (Janesick) Tues. 15 Aug., 8:30 am to 5:30 pm

SC567 **Introduction to Optical Remote Sensing Systems** (Shaw) Sun. 13 Aug., 8:30 am to 12:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

Optical Instrumentation

Program on Atmospheric and Space Optical Systems and Instrumentation

Program Chair: **Jennifer C. Ricklin,** Defense Advanced Research Projects Agency

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
6305 **Quantum Communications and Quantum Imaging IV** *(Meyers/Shih/Deacon)*, p. 96		6303 **Atmospheric Optical Modeling, Measurement, and Simulation II** *(Hammel/Kohnle)*, p.91		
6307 **Unconventional Imaging II** *(Gamiz/Idell/Strojnik)*, p. 100		6304 **Free-Space Laser Communications VI** *(Majumdar/Davis)*, p. 93		
	6306 **Advanced Wavefront Control: Methods, Devices, and Applications IV** *(Giles/Gonglewski/Carreras)*, p. 98			
	6308 **Photonics for Space Environments XI** *(Taylor)*, p. 102			
	6309 **Instruments, Methods, and Missions for Astrobiology IX** *(Hoover/Levin/Rozanov)*, p. 104			
Courses				
	SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (Phillips, Andrews), 8:30 am to 5:30 pm		SC196 **Imaging Through Turbulence** (Roggemann), 8:30 am to 5:30 pm	
	SC656 **Fundamentals of Free-Space Laser Communications** (Majumdar), 1:30 to 5:30 pm		**Register for Courses onsites at the SPIE Registration Desk!**	
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	**SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18		
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

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Atmospheric Optical Modeling, Measurement, and Simulation II

Conference Chairs: **Stephen M. Hammel**, Space and Naval Warfare Systems Ctr., San Diego; **Anton Kohnle**, FGAN-FOM (Germany)

Program Committee: **Gail P. Anderson**, Air Force Research Lab.; **Luc R. Bissonnette**, Defence R&D Canada/Suffield (Canada); **Matthew M. Bold**, Defense Strategies and Systems, Inc.; **Frank D. Eaton**, Air Force Research Lab.; **Vincent Michau**, ONERA (France); **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Janet E. Shields**, Univ. of California/San Diego; **Alexander M. van Eijk**, TNO-FEL (Netherlands)

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 7B . . . . . Tues. 8:30 to 10:10 am

Turbulence Modeling

Chair: **Frank D. Eaton**, Air Force Research Lab.

8:30 am: **Comparison of phase screen generation techniques,** R. J. Eckert, M. E. Goda, Air Force Institute of Technology . . . . . [6303-01]

8:50 am: **A geometrical optics approach for modeling aperture averaging in free-space optical communication applications,** H. Yuksel, C. C. Davis, Univ. of Maryland/College Park . . . . . [6303-02]

9:10 am: **Turbulence strength estimation from an arbitrary set of atmospherically degraded images,** S. Zamek, Y. Yitzhaky, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6303-03]

9:30 am: **Using historic models of Cn2 to predict r0 and regimes affected by atmospheric turbulence for horizontal, slant, and topological paths,** J. K. Lawson, C. J. Carrano, Lawrence Livermore National Lab. . . . . [6303-04]

9:50 am: **Modeling microphysical influences on optical turbulence,** A. Tunick, U.S. Army Research Lab. . . . . [6303-05]

Coffee Break . . . . . 10:10 to 10:40 am

SESSION 2

Conv. Ctr. Room 7B . . . . . Tues. 10:40 am to 11:40 pm

Turbulence Measurements and Modeling

Chair: **Alexander M. van Eijk**, TNO (Netherlands)

10:40 am: **Beam wander experiments: terrestrial path,** R. L. Phillips, L. C. Andrews, Univ. of Central Florida; J. S. Stryjewski, W. B. Griffis, Computer Sciences Corp.; M. R. Borbath, D. J. Galus, G. R. Burdge, Harris Corp.; D. Wayne, D. Hand, Univ. of Central Florida; J. J. Kiriazes, NASA Kennedy Space Ctr. . . . . [6303-06]

11:00 am: **Measurements and modeling of optical turbulence in a maritime environment,** P. A. Frederickson, Naval Postgraduate School; S. M. Hammel, D. Tsintikidis, Space and Naval Warfare Systems Ctr., San Diego . . . . . [6303-07]

11:20 am: **Intensity fluctuations for source arrays in turbulent atmosphere,** Y. K. Baykal, Cankaya Univ. (Turkey) . . . . . [6303-08]

Lunch Break . . . . . 11:40 to 1:30 pm

SESSION 3

Conv. Ctr. Room 7B . . . . . Tues. 1:30 to 2:50 pm

Compensation and Correction of Atmospheric Effects

Chair: **Matthew M. Bold**, Defense Strategies and Systems, Inc.

1:30 pm: **Special-purpose hardware for real-time compensation of atmospheric effects in long-range imaging,** F. E. Ortiz, Univ. of Delaware; J. P. Durbano, E. J. Kelmelis, EM Photonics, Inc.; D. Price, M. Bodnar, Univ. of Delaware . . . . . [6303-10]

1:50 pm: **Shack-Hartmann wavefront sensing with extended sources,** V. Michau, T. Fusco, C. Robert, J. Conan, ONERA (France) . . . . [6303-11]

2:10 pm: **Improvements in Cn2 profile monitoring with a Shack Hartmann Wavefront sensor,** N. Vedrenne, V. Michau, C. Robert, J. Conan, ONERA (France) . . . . . [6303-12]

2:30 pm: **Controlling the filamentation by initial intensity ellipticity,** V. P. Kandidov, V. U. Fedorov, M.V. Lomonosov Moscow State Univ. (Russia) . . . . . [6303-30]

Coffee Break . . . . . 2:50 to 3:20 pm

SESSION 4

Conv. Ctr. Room 7B . . . . . Tues. 3:20 to 4:40 pm

Atmospheric Effects on Imaging Systems

Chair: **Vincent Michau**, ONERA (France)

3:20 pm: **Multispectral scattering measurements along extended paths over the ocean surface using an imaging system,** J. E. Shields, R. W. Johnson, J. G. Baker, M. E. Karr, A. R. Burden, Univ. of California/ San Diego . . . . . [6303-14]

3:40 pm: **New weather depiction technology for night vision goggle (NVG) training,** J. W. Schroeder, S. Theleman, J. D. Hegarty, C. Scott, R. Vollmerhausen, ONTAR Corp.; F. P. Colby, Univ. of Massachusetts/Lowell; S. Napier, U.S. Navy . . . . . [6303-15]

4:00 pm: **The introduction of horizontal inhomogeneity of meteorological conditions in the EOSTAR propagation model,** A. M. van Eijk, TNO (Netherlands) . . . . . [6303-16]

4:20 pm: **A model and simulation to predict 3D imaging LADAR sensor systems performance in real-World type environments,** R. J. Grasso, G. F. Dippel, L. E. Russo, BAE Systems . . . . . [6303-17]

Wednesday 16 August

SESSION 5

Conv. Ctr. Room 7B . . . . . Wed. 8:40 to 10:00 am

Aerosol Modeling and Particle Size Distribution

Chair: **Stephen M. Hammel**, Space and Naval Warfare Systems Ctr., San Diego

8:40 am: **Comparison of aerosol size distribution in coastal and oceanic environments,** J. Kusmierczyk-Michulec, A. M. van Eijk, TNO (Netherlands) . . . . . [6303-18]

9:00 am: **Aerosol particle concentration and size distribution measurements and modeling in the urban environment for semi-arid and rainy atmospheric conditions,** S. Bendersky, N. S. Kopeika, N. S. Blaunstein, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6303-19]

9:20 am: **Influence of the larger aerosol particles on the infrared propagation in coastal areas,** G. A. Kaloshin, Institute of Atmospheric Optics (Russia); J. J. Piazzola, Univ. de Toulon et du var (France) [6303-20]

9:40 am: **Investigation of aerosol particle size distributions in the San Diego Bay area by means of multiband transmissometry,** A. N. de Jong, TNO (Netherlands) . . . . . [6303-21]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 7B . . . . . Wed. 10:30 am to 12:10 pm

Aerosol Modeling

Chair: **Janet E. Shields**, Univ. of California/San Diego

10:30 am: **Improvements in the advanced Navy aerosol model (ANAM),** A. M. van Eijk, TNO (Netherlands) . . . . . [6303-22]

10:50 am: **Extension of the Mediterranean extinction code (MEDEX) to a regional coverage,** J. J. Piazzola, Univ. de Toulon et du var (France) . . . . . [6303-23]

11:10 am: **Modeling the effects of aerosols on transmission measurements at Zuniga Shoal, California,** D. Tsintikidis, S. M. Hammel, D. Kichura, Space and Naval Warfare Systems Ctr., San Diego [6303-24]

11:30 am: **Results of attenuation-measurements for optical wireless channels under dense fog conditions regarding different wavelengths,** B. Flecker, C. Chlestil, E. Leitgeb, S. Sheikh Muhammad, M. Gebhart, Technische Univ. Graz (Austria) . . . . . [6303-25]

11:50 am: **Influence of temperature fluctuations on infrared limb radiance: a new simulation code,** V. Outters Rialland, P. Chervet, ONERA (France) . . . . . [6303-26]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Estimation of FSO link availability in central European localities,** O. Wilfert, Z. Kolka, Brno Univ. of Technology (Czech Republic); J. Nemecek, Univ. Obrany (Czech Republic); V. Biolkova, Brno Univ. of Technology (Czech Republic) . . . . . [6303-27]

✔ **Method of determination of aerozol microparticles' size distribution by iteration process,** A. I. Bilyi, Ivan Franko National Univ. of L'viv (Ukraine); R. O. Bilyy, National Academy of Sciences of Ukraine (Ukraine); V. B. Getman, Ivan Franko National Univ. of L'viv (Ukraine) . . . . . [6303-28]

✔ **Stepped spatial heterodyne spectroscopy: an innovative concept for measuring winds in planetary atmospheres,** C. R. Englert, Naval Research Lab.; J. M. Harlander, St. Cloud State Univ.; M. H. Stevens, D. E. Siskind, Naval Research Lab. . . . . [6303-29]

✔ **A mobile lidar for Earth observation application,** W. Gong, Z. Zhu, P. Li, Q. Qin, Z. Hao, M. Liu, Y. Ma, Wuhan Univ. (China) . . . . . [6303-13]

✔ **Effective transport of femtosecond laser filaments through the atmosphere,** N. A. Panov, I. N. Murtazin, O. G. Kosareva, V. P. Kandidov, M.V. Lomonosov Moscow State Univ. (Russia); S. L. Chin, Univ. Laval (Canada) . . . . . [6303-31]

✔ **Light scattering by hexagonal ice cystals of cirrus clouds with preferred orientations,** A. V. Burnashov, Institute of Atmospheric Optics (Russia) . . . . . [6303-32]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (Phillips, Andrews) Mon. 14 Aug., 8:30 am to 5:30 pm

SC196 **Imaging Through Turbulence** (Roggemann) Weds. 16 Aug., 8:30 am to 5:30 pm

SC656 **Fundamentals of Free-Space Laser Communications** (Majumdar) Mon. 14 Aug., 1:30 to 5:30 pm

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Free-Space Laser Communications VI

Conference Chairs: **Arun K. Majumdar**, LCResearch, Inc.; **Christopher C. Davis**, Univ. of Maryland/College Park

Program Committee: **Larry C. Andrews**, Univ. of Central Florida; **Shlomi Arnon**, Ben-Gurion Univ. of the Negev (Israel); **Mikhail S. Belen'kii**, Trex Enterprises; **Naresh Chand**, BAE Systems North America; **Frank D. Eaton**, Air Force Research Lab.; **G. Charmaine Gilbreath**, Naval Research Lab.; **Andrew S. Keys**, NASA Marshall Space Flight Ctr.; **Anton Kohnle**, FGAN-FOM (Germany); **Dominic C. O'Brien**, Univ. of Oxford (United Kingdom); **William S. Rabinovich**, Naval Research Lab.; **Marcos Reyes**, Instituto de Astrofísica de Canarias (Spain); **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Thomas M. Shay**, Air Force Research Lab.; **Neil J. Vallestero**, U.S. Army Communications-Electronics Command; **Deepak Varshneya**, Cubic Defense Applications Group

Tuesday 15 August

SESSION A

Conv. Ctr. Room 15A . . . . . Tues. 8:25 am

Welcome and Opening Remarks

Chair: **Arun K. Majumdar**, LCResearch, Inc.

SESSION 1

Conv. Ctr. Room 15A . . . . . Tues. 8:30 am to 12:20 pm

Components and Systems Design and Analysis I

Chairs: **Arun K. Majumdar**, LCResearch, Inc.; **Christopher C. Davis**, Univ. of Maryland/College Park

Keynote

8:30 am: **Optical space communications and networks *(Invited Paper)*,** V. W. S. Chan, Massachusetts Institute of Technology [6304-01]

9:00 am: **DARPA's ORCLE program: a status update *(Invited Paper) (Presentation Only)*,** G. Duchak, Defense Advanced Research Projects Agency . . . . . [6304-02]

9:30 am: **Control laws for a 3-element Risley prism optical beam pointer,** M. D. Sanchez, D. A. Gutow, Ball Aerospace & Technologies Corp. . . . . [6304-03]

9:50 am: **Coherent duobinary systems for high-speed optical satellite networks,** I. Lyubomirsky, Univ. of California/Riverside . . . . . [6304-04]

10:10 am: **Demodulation of analog data in free-space optical communication systems using discrete wavelet transformation,** N. M. Namazi, The Catholic Univ. of America; K. J. Grant, Defence Science and Technology Organisation (Australia); R. Burris, Research Support Instruments, Inc.; C. I. Moore, Naval Research Lab.; R. Mahone, Titan Corp.; W. S. Rabinovich, G. C. Gilbreath, Naval Research Lab. . [6304-05]

Coffee Break . . . . . 10:30 to 11:00 am

11:00 am: **Risley prism beam pointer,** M. A. Ostaszewski, N. P. Doughty, S. T. Harford, M. D. Sanchez, C. N. Hoffman, D. A. Gutow, Ball Aerospace & Technologies Corp. . . . . [6304-06]

11:20 am: **Hybrid ARQ receiver for packet communications over free-space optical channels,** K. Kiasaleh, The Univ. of Texas at Dallas . . . . . [6304-07]

11:40 am: **Experimental and field data collection and implications for fast-tracking, FSO systems and their extension to air and space communications,** C. A. Bjork, Jr., N. Prasad, B. Corcoran, Coherent Technologies, Inc. . . . . [6304-08]

12:00 pm: **A feasibility study for the deployment of free-space optical communication systems in Brazil,** J. R. Souza, Univ. do Estado do Rio de Janeiro (Brazil); P. B. Harboe, Univ. Federal Fluminense (Brazil)[6304-09]

Lunch Break . . . . . 12:20 to 2:10 pm

SESSION 2

Conv. Ctr. Room 15A . . . . . Tues. 2:10 to 5:40 pm

Components and Systems Design and Analysis II

Chair: **Dominic C. O'Brien**, Univ. of Oxford (United Kingdom)

2:10 pm: **Concepts for rapid acquisition and laser beam pointing in aeronautical optical communications systems,** B. L. Wilkerson, DLR Standort Oberpfaffenhofen (Germany) and US Air Force; D. Giggenbach, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6304-11]

2:30 pm: **Ground-to-OICETS laser communication experiments,** M. Toyoshima, K. Takizawa, T. Kuri, W. Klaus, M. Toyoda, H. Kunimori, National Institute of Information and Communications Technology (Japan); T. Jono, Y. Takayama, N. Kura, K. Ohinata, K. Arai, Japan Aerospace Exploration Agency (Japan); K. Shiratama, NEC TOSHIBA Space Systems, Ltd. (Japan) . . . . . [6304-75]

2:50 pm: **Physical basis and corresponding instrument for PAT performance testing of inter-satellite laser communication terminals,** L. Liu, L. Wang, Z. Luan, J. Sun, D. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-13]

3:10 pm: **A novel communications telescope combining optical and radio frequency communications capability,** R. S. Winsor, M. Braunstein, ITT Industries . . . . . [6304-14]

Coffee Break . . . . . 3:30 to 4:00 pm

4:00 pm: **Passive long-range acousto optic sensor,** D. Slater, Nearfield Systems Inc. . . . . [6304-15]

4:20 pm: **Broad L-band operation from resonantly pumped Er:YOS laser,** K. Spariosu, M. Cashen, V. Leyva, R. A. Reeder, Raytheon Space and Airborne Systems; R. W. Equall, Scientific Materials Corp. . [6304-16]

4:40 pm: **Airborne laser communications with impulse response shortening and equalization,** S. Lee, M. Kavehrad, The Pennsylvania State Univ. . . . . [6304-17]

5:00 pm: **An end-to-end demonstration of a receiver array based free-space photon counting communications link,** P. Hopman, P. W. Boettcher, L. M. Candell, J. B. Glettler, R. C. Shoup, MIT Lincoln Lab. . . . . [6304-18]

5:20 pm: **Performance and evaluation of a coherent optical communications receiver for deep-space applications,** M. Muñoz-Fernández, California Institute of Technology . . . . . [6304-19]

Wednesday 16 August

SESSION 3

Conv. Ctr. Room 15A . . . . . Wed. 8:30 am to 12:10 pm

Optical Turbulence and Scintillation

Chairs: **Arun K. Majumdar**, LCResearch, Inc.; **Frank D. Eaton**, Air Force Research Lab.

8:30 am: **Physics of fluctuations of waves in turbulent medium *(Invited Paper)*,** V. I. Tatarskii, National Oceanic and Atmospheric Administration . . . . . [6304-21]

9:00 am: **Laser wavefront propagation through turbulent separated shear layers: laboratory experiments, computations, and physical modeling,** F. Zubair, P. J. Garcia, J. C. Nathman, H. J. Catrakis, Univ. of California/Irvine . . . . . [6304-23]

9:20 am: **Wave optics simulation of partially coherent beam propagation through turbulence: application to laser communications,** X. Xiao, D. G. Voelz, New Mexico State Univ. . . . . [6304-24]

9:40 am: **Reconstruction of probability density function of intensity fluctuations relevant to free-space laser communications through atmospheric turbulence,** A. K. Majumdar, LCResearch, Inc.; C. E. Luna, P. S. Idell, The Boeing Co. . . . . [6304-25]

10:00 am: **Capacity of a lognormal optical link,** S. M. Navidpour, The Pennsylvania State Univ.; M. Uysal, Univ. of Waterloo (Canada); M. Kavehrad, The Pennsylvania State Univ. . . . . [6304-26]

Coffee Break . . . . . 10:20 to 10:40 am

10:40 am: **Propagation through non-Kolmogorov turbulence,** A. Zilberman, N. S. Kopeika, E. Golbraikh, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6304-22]

11:00 am: **Free-space optical communication links in a marine environment,** V. M. Gadwal, S. M. Hammel, Space and Naval Warfare Systems Command . . . . . [6304-27]

11:20 am: **45 Mbps cat's eye modulating retro-reflector link over 7 Km,** W. S. Rabinovich, R. Mahon, P. G. Goetz, L. A. Swingen, J. L. Murphy, M. Ferraro, R. Burris, M. R. Suite, C. I. Moore, G. C. Gilbreath, S. C. Binari, Naval Research Lab. . . . . [6304-29]

11:40 am: **Low-cost large aperture telescopes for optical communications *(Invited Paper)*,** H. Hemmati, Jet Propulsion Lab. . . . . [6304-30]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 4

Conv. Ctr. Room 15A . . . . . Wed. 1:30 to 5:30 pm

Experimental Measurements, Concepts, and Performance

Chairs: **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Thomas M. Shay**, Air Force Research Lab.

1:30 pm: **Theoretical model for the first electronically phase-locked optical array without a reference beam,** T. M. Shay, Air Force Research Lab. . . . . [6304-31]

1:50 pm: **Advances in optical phased array technology,** S. A. Serati, A. M. Linnenberger, J. E. Stockley, Boulder Nonlinear Systems Inc. [6304-32]

2:10 pm: **Experimental study of spatial structure of turbulence at Maui Space Surveillance Site (MSSS),** M. S. Belen'kii, E. L. Cuellar, K. A. Hughes, V. A. Rye, Trex Enterprises . . . . . [6304-33]

2:30 pm: **Experimental performance of free-space optical communications using polarization shift keyed modulation,** S. Trisno, C. C. Davis, Univ. of Maryland/College Park . . . . . [6304-34]

2:50 pm: **First experimental demonstration of self-synchronous locking of optical coherence by single-detector electronic-frequency tagging of fiber amplifiers,** T. M. Shay, V. N. Benham, Air Force Research Lab.; J. T. Baker, Boeing LTS, Inc.; D. E. Pilkington, B. G. Ward, M. A. Culpepper, A. D. Sanchez, J. B. Spring, Air Force Research Lab.; D. H. Nelson, The Boeing Co.; R. W. Berdine, Air Force Research Lab. [6304-35]

Coffee Break . . . . . 3:10 to 3:30 pm

3:30 pm: **Atmospheric turbulence measurements over desert site using ground-based instruments, kite/tethered-blimp platform, and aircraft relevant to optical communications and imaging systems: preliminary results,** A. K. Majumdar, LCResearch, Inc.; F. D. Eaton, Air Force Research Lab.; M. Jensen, QEI Technologies, Inc.; D. T. Kyrazis, R-Cubed, Inc.; B. Schumm, M. Dierking, Air Force Research Lab.; M. Shoemake, D. N. Dexheimer, Boeing LTS, Inc.; J. C. Ricklin, Defense Advanced Research Projects Agency . . . . . [6304-36]

3:50 pm: **Hawaii 128-km FSO communication link demonstration,** J. E. Graves, AOptix Technologies, Inc.; J. J. Foshee, Air Force Research Lab. . . . . [6304-37]

4:10 pm: **Field demonstration of a 52-km free-space link at WSMR,** S. Pixton, R. S. Winsor, P. Freeland, ITT Industries . . . . . [6304-38]

4:30 pm: **Optical wireless indoor systems: how to improve data rate,** O. Bouchet II, France Télécom (France) . . . . . [6304-39]

4:50 pm: **Orbital angular momentum (OAM) multiplexing in free-space optical data transfer,** J. Lin, X. Yuan, S. Tao, Nanyang Technological Univ. (Singapore) . . . . . [6304-42]

5:10 pm: **Performance analysis of high-capacity integrated fiber radio communicaiton systems,** A. Goel, Maulana Azad Natl Institute of Technology, Bhopal (India) . . . . . [6304-40]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Three-stage tracking approach in development of a free-space laser communicator,** A. S. Koujelev, A. E. Dudelzak, Canadian Space Agency (Canada) . . . . . [6304-12]

✔ **Double-prism scanner for testing tracking performance of inter-satellite laser communication terminals,** A. Li, L. Liu, J. Sun, X. Zhong, D. Xu, Q. Shen, Y. Zhou, Z. Luan, L. Wang, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-65]

✔ **Finite element analysis on the assembly of circular wedge prism,** A. Li, J. Sun, Y. Zhu, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-66]

✔ **A double-focus collimator system for full PAT performance testing of inter-satellite laser communication terminals,** L. Wang, Z. Luan, J. Sun, Y. Zhou, D. Liu, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-67]

✔ **Transportable optical ground station in a stratospheric balloon trial: PAT concepts and atmospheric measurement instruments,** M. Knapek, J. Horwath, N. Perlot, B. Wilkerson, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6304-69]

✔ **Large-aperture laser beam scanner for inter-satellite laser communications ground test: assembly and test,** J. Sun, L. Yang, L. Liu, Q. Shen, N. Xu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-70]

✔ **DH-PIM with coding schemes for optical wireless communications,** N. M. Aldibbiat, F. Z. Ghassemlooy, O. S. Sanyaolu, Northumbria Univ. (United Kingdom) . . . . . [6304-71]

✔ **Modulation scheme for wireless optical intensity channel based spatial coding,** W. Pan, L. Liu, J. Wang, D. Zhao, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-72]

✔ **Coherent effects and aperture averaging using retroreflectors,** R. Mahon, L-3 Titan Group; W. S. Rabinovich, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc.; M. Ferraro, Sachs Freeman Associates, Inc.; C. I. Moore, J. L. Murphy, M. R. Suite, L. M. Wasiczko, Naval Research Lab. . . . . [6304-74]

✔ **Effects of wavefront aberrations of lens on the optical simulator for free-space laser long-distance propagation,** L. Wan, Guangxi Univ. (China); L. Liu, J. Sun, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6304-20]

Thursday 17 August

SESSION 5

Conv. Ctr. Room 15A . . . . . Thurs. 8:00 to 11:50 am

Coding and Networking

Chair: **Christopher C. Davis**, Univ. of Maryland/College Park

8:00 am: **Network of optical wireless sensor,** S. Arnon, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6304-43]

8:20 am: **Three-dimensional optical pointing system encoded by radial trifocal tensors,** S. Ho, C. C. Davis, Univ. of Maryland/College Park . . . . . [6304-44]

8:40 am: **Optical multiple input multiple output (MIMO) systems in optical wireless: challenges and possibilities,** D. C. O'Brien, Univ. of Oxford (United Kingdom) . . . . . [6304-45]

9:00 am: **Free-space quantum cryptography in the H-alpha Fraunhofer window,** D. J. Rogers, National Institute of Standards and Technology and Univ. of Maryland Chemical Physics Program; J. C. Bienfang, A. Mink, B. Hershman, A. Nakassis, X. Tang, L. Ma, D. H. Su, C. J. Williams, C. W. Clark, National Institute of Standards and Technology . . . . . [6304-46]

9:20 am: **Using a GPS-aided inertial system for coarse-pointing of free-space optical communication terminals,** B. Epple, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6304-47]

9:40 am: **Packet-layer forward error correction coding for fading mitigation,** H. Henniger, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6304-48]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Optical wireless communications with micromachines,** D. C. O'Brien, W. W. Yuan, J. J. Liu, S. Sivathasan, G. E. Faulkner, S. Collins, S. J. Elston, Univ. of Oxford (United Kingdom) . . . . . [6304-49]

10:50 am: **Multibeam space-time coded systems for optical atmospheric channels,** J. A. Anguita, M. A. Neifeld, B. V. Vasic, The Univ. of Arizona . . . . . [6304-50]

11:10 am: **Optimum and suboptimum detection mechanisms for free-space binary PPM optical communication systems with APD detector arrays,** K. Kiasaleh, M. Cole, The Univ. of Texas at Dallas . . . . . [6304-51]

11:30 am: **Design and implementation of a complete bootstrapping model for free-space optical backbone networks,** J. Llorca, S. D. Milner, Univ. of Maryland/College Park . . . . . [6304-52]

Lunch Break . . . . . 11:50 am to 12:50 pm

SESSION 6

Conv. Ctr. Room 15A . . . . . Thurs. 12:50 to 4:50 pm

Mitigation, Scintillation, and Adaptive Control

Chairs: **G. Charmaine Gilbreath**, Naval Research Lab.; **Shlomi Arnon**, Ben-Gurion Univ. of the Negev (Israel)

12:50 pm: **Aperture averaging analysis and aperture shape invariance of received scintillation in free-space optical communication links,** H. Yuksel, Univ. of Maryland/College Park; C. C. Davis, Univ. of Maryand/College Park . . . . . [6304-53]

1:10 pm: **Low-complexity methods to mitigate inter-slot-interference in PPM,** B. Moision, J. Hamkins, Jet Propulsion Lab. . . . . [6304-54]

1:30 pm: **Adaptive control of jitter in laser beam pointing and tracking,** J. S. Gibson, N. Perez, T. Tsao, Univ. of California/Los Angeles [6304-55]

1:50 pm: **Wavelength-diversity transmission for fading mitigation in the atmospheric optical communications channel,** D. Giggenbach, B. Wilkerson, H. Henniger, N. Perlot, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6304-56]

2:10 pm: **Beam-tracking in FSO links impaired by correlated fading,** K. Kiasaleh, The Univ. of Texas at Dallas . . . . . [6304-57]

2:30 pm: **Mitigation of dynamic wavefront distortions using a modified simplex optimization approach,** R. M. Khandekar, V. V. Nikulin, Binghamton Univ. . . . . [6304-58]

2:50 pm: **A novel approach to mitigating scintillation: SLED communications,** R. S. Winsor, ITT Industries . . . . . [6304-60]

Coffee Break . . . . . 3:10 to 3:30 pm

3:30 pm: **3.5-micron free-space laser communications,** C. Ting, E. Burlbaw, A. R. Geiger, G. Ding, B. Odom, S. Sheu, Akamai Physics Inc. [6304-61]

3:50 pm: **Analysis of a ground to satellite optical link with a cooperative satellite beacon,** S. Basu, D. G. Voelz, New Mexico State Univ. . . . . [6304-62]

4:10 pm: **Broadband backhaul communication for stratospheric platforms: results of the stratospheric optical payload experiment,** J. Horwath, B. Epple, B. L. Wilkerson, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6304-63]

4:30 pm: **Measurements of the beam-wave fluctuations over a 142-km atmospheric path,** N. Perlot, J. Horwath, D. Giggenbach, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6304-64]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (Phillips, Andrews) Mon. 14 Aug., 8:30 am to 5:30 pm

SC196 **Imaging Through Turbulence** (Roggemann) Weds. 16 Aug., 8:30 am to 5:30 pm

SC656 **Fundamentals of Free-Space Laser Communications** (Majumdar) Mon. 14 Aug., 1:30 to 5:30 pm

Sunday-Monday 13-14 August 2006 • Proceedings of SPIE Vol. 6305

Quantum Communications and Quantum Imaging IV

Conference Chairs: **Ronald E. Meyers**, Army Research Lab.; **Yanhua Shih**, Univ. of Maryland/Baltimore County; **Keith S. Deacon**, Army Research Lab.

Program Committee: **Stefania A. Castelletto**, Istituto Elettrotecnico Nazionale Galileo Ferraris (Italy); **Richard J. Hughes**, Los Alamos National Lab.; **Yoon-Ho Kim**, Pohang Univ. of Science and Technology (South Korea); **Todd B. Pittman**, Johns Hopkins Univ.; **Barry C. Sanders**, Univ. of Calgary (Canada); **Alexander V. Sergienko**, Boston Univ.; **Dmitry V. Strekalov**, Jet Propulsion Lab.; **Shigeki Takeuchi**, Hokkaido Univ. (Japan); **Zhi Zhao**, Oak Ridge National Lab.

Sunday 13 August

SESSION 1

Conv. Ctr. Room 14A . . . . . Sun. 8:00 to 10:05 am

Quantum Communications & Quantum Technology I

8:00 am: **High bandwidth quantum cryptography *(Invited Paper)*,** J. C. Howell, Univ. of Rochester . . . . . [6305-01]

8:25 am: **Individual incoherent eavesdropping on a two-way quantum communication protocol *(Invited Paper)*,** G. Di Giuseppe, M. Lucamarini, A. Cerè, P. Tombesi, Univ. di Camerino (Italy) . . . . . [6305-02]

8:50 am: **Remotely prepared single-photon time-encoded ebits: tomographic characterization and Bell's inequality test *(Invited Paper)*,** M. D'Angelo, LENS-Florence (Italy); A. Zavatta, Istituto Nazionale di Ottica Applicata (Italy); V. Parigi, European Lab. for Non-linear Spectroscopy (Italy); M. Bellini, Istituto Nazionale di Ottica Applicata (Italy) . . . [6305-03]

9:15 am: **The decoy-state method for practical quantum key distribution *(Invited Paper)*,** X. Wang, Japan Science and Technology Agency (Japan) . . . . . [6305-04]

9:40 am: **An absolute self-calibration method to measure the quantum efficiency of single-photon detectors *(Invited Paper)*,** L. Wu, Institute of Physics (China); X. Chen, Institute of Physics (China) and Liaoning Univ. (China); Y. Zhai, D. Zhang, Institute of Physics (China) . . . . . [6305-05]

Coffee Break . . . . . 10:05 to 10:35 am

SESSION 2

Conv. Ctr. Room 14A . . . . . Sun. 10:35 am to 11:45 pm

Quantum Communications and Quantum Technology II

10:35 am: **Demonstration of active quantum key distribution network,** X. Tang, L. Ma, National Institute of Standards and Technology [6305-07]

10:55 am: **Towards a quasi-deterministic single-photon source *(Invited Paper)*,** N. A. Peters, K. J. Arnold, A. P. VanDevender, E. R. Jeffrey, R. Rangarajan, O. Hosten, J. T. Barreiro, J. B. Altepeter, P. G. Kwiat, Univ. of Illinois at Urbana-Champaign . . . . . [6305-08]

11:20 am: **Quantum stream cipher part IV: effects of the deliberate signal randomization *(Invited Paper)*,** K. Kato, National Tsing Hua Univ. (Taiwan); O. Hirota, Tamagawa Univ. (Japan) . . . . . [6305-09]

Lunch Break . . . . . 11:45 am to 1:00 pm

SESSION 3

Conv. Ctr. Room 14A . . . . . Sun. 1:00 to 2:05 pm

Quantum Information I

1:00 pm: **Toward quantum voting *(Invited Paper)*,** M. Hillery, Hunter College/CUNY . . . . . [6305-10]

1:25 pm: **Optimal state estimation experiments for photon polarization,** A. Ling, K. P. Soh, A. Lamas-Linares, C. Kurtsiefer, National Univ. of Singapore (Singapore) . . . . . [6305-11]

1:45 pm: **Generating entangled states of two ququarts using linear optical elements,** S. Baek, Y. Kim, Pohang Univ. of Science and Technology (South Korea) . . . . . [6305-48]

SESSION 4

Conv. Ctr. Room 14A . . . . . Sun. 2:05 to 5:25 pm

Quantum Information II

2:05 pm: **Quantum computation by communication *(Invited Paper)*,** W. J. Munro, Hewlett-Packard Labs. (United Kingdom); K. Nemoto, National Institute of Informatics (Japan); T. P. Spiller, Hewlett-Packard Labs. (United Kingdom); S. L. Braunstein, The Univ. of York (United Kingdom); P. van Loock, National Institute of Informatics (Japan); G. J. Milburn, The Univ. of Queensland (Australia) . . . . . [6305-14]

2:30 pm: **Quantum information primitives using linear optics *(Invited Paper)*,** M. Fiorentino, R. G. Beausoleil, Hewlett-Packard Labs.; W. J. Munro, Hewlett-Packard Labs. (United Kingdom); C. M. Santori, S. M. Spillane, D. Fattal, Hewlett-Packard Labs. . . . . [6305-15]

2:55 pm: **Characterization of errors in quantum processes using finite sets of test measurements *(Invited Paper)*,** H. F. Hofmann, Hiroshima Univ. (Japan) . . . . . [6305-16]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Optical coherence theory for phase-sensitive light,** B. I. Erkmen, J. H. Shapiro, Massachusetts Institute of Technology . [6305-17]

4:10 pm: **Large cross-phase modulation between slow co-propagating weak pulses in rubidium *(Invited Paper)*,** B. C. Sanders, Univ. of Calgary (Canada) and Macquarie Univ. (Australia); Z. Wang, K. Marzlin, Univ. of Calgary (Canada) . . . . . [6305-18]

4:35 pm: **Realization of optimal asymmetric cloning and telecloning with linear optics elements *(Invited Paper)*,** Z. Zhao, Oak Ridge National Lab. . . . . [6305-19]

5:00 pm: **Quantum no-key protocol with inherent identification *(Invited Paper)*,** L. Yang, L. Hu, Graduate School of the Chinese Academy of Sciences (China) . . . . . [6305-20]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 14A . . . . . Mon. 8:00 to 10:00 am

Quantum Imaging

8:00 am: **Quantum lithography *(Invited Paper)*,** R. W. Boyd, H. Chang, H. Shin, M. N. O'Sullivan-Hale, K. W. Chan, Univ. of Rochester . . . [6305-21]

8:25 am: **Controlling correlated images through polarization using a pseudothermal light source *(Invited Paper)*,** D. P. Caetano, Univ. Federal de Estado de Alagoas (Brazil); E. J. S. Fonseca, Univ. of California/Santa Barbara; J. M. Hickmann, Univ. Federal de Estado de Alagoas (Brazil) . . . . . [6305-22]

8:50 am: **Design rules for quantum imaging devices: experimental progress using CMOS single-photon detectors,** E. Charbon, École Polytechnique Fédérale de Lausanne (Switzerland); G. B. Beretta, Hewlett-Packard Co.; N. J. Gunther, Performance Dynamics Consulting [6305-23]

9:10 am: **Quantum ghost imaging experiments *(Invited Paper)*,** R. E. Meyers, K. S. Deacon, Army Research Lab. . . . . [6305-24]

9:35 am: **Can two-photon correlation of chaotic light be considered as correlation of intensity fluctuations? *(Invited Paper)*,** G. Scarcelli, Univ. of Maryland/Baltimore County; V. Berardi, Politecnico di Bari (Italy); Y. Shih, Univ. of Maryland/Baltimore County . . . . . [6305-25]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 14A . . . . . Mon. 10:30 am to 12:05 pm

Entanglement and Quantum Technology I

10:30 am: **Time-displaced entanglement and nonlinear quantum evolution *(Invited Paper)*,** T. C. Ralph, The Univ. of Queensland (Australia) . . . . . [6305-26]

10:55 am: **Demonstration of multiphoton de Broglie wavelength by state projection *(Invited Paper)*,** Z. J. Ou, Indiana Univ.-Purdue Univ. Fort Wayne; F. Sun, G. Guo, Univ. of Science and Technology of China (China) . . . . . [6305-27]

11:20 am: **Higher detector photon counting rates using a multiplexed system of detector *(Invited Paper)*,** A. L. Migdall, National Institute of Standards and Technology; S. A. Castelletto, I. P. Degiovanni, V. Schettini, Istituto Elettrotecnico Nazionale Galileo Ferraris (Italy); J. Fan, S. Polyakov, National Institute of Standards and Technology . . . . . [6305-28]

11:45 am: **Tailoring of the frequency correlations and the bandwidth of paired photons in noncollinear parametric downconversion,** A. C. Valencia, A. Cerè, X. Shi, N. Garcia Gonzalez, J. P. Torres, Institut de Ciències Fotòniques (Spain) . . . . . [6305-29]

Lunch Break . . . . . 12:05 to 1:45 pm

SESSION 7

Conv. Ctr. Room 14A . . . . . Mon. 1:45 to 3:00 pm

Entanglement and Quantum Technology II

1:45 pm: **Experimental study on fiber propagation of entanglement and applications *(Invited Paper)*,** M. Genovese, Istituto Elettrotecnico Nazionale Galileo Ferraris (Italy) . . . . . [6305-30]

2:10 pm: **Concentrating partial entanglement of two photons via entanglement swapping *(Invited Paper)*,** Y. Kim, M. Hwang, Pohang Univ. of Science and Technology (South Korea) . . . . . [6305-33]

2:35 pm: **Engineering optical entanglement for quantum telecommunication *(Invited Paper)*,** A. V. Sergienko, M. A. Jaspan, B. E. Saleh, M. C. Teich, Boston Univ. . . . . [6305-34]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 8

Conv. Ctr. Room 14A . . . . . Mon. 3:30 to 5:50 pm

Quantum Technology and Metrology

3:30 pm: **Violation of orbital angular momentum conservation in type-I spontaneous parametric down-conversion *(Invited Paper)*,** S. Feng, C. Chen, G. Barbosa, P. Kumar, Northwestern Univ. . . . . [6305-35]

3:55 pm: **Is entanglement dispensable in quantum lithography?,** Y. Shih, Univ. of Maryland/Baltimore County . . . . . [6305-47]

4:15 pm: **Single-photon sources using two-photon absorption and the quantum Zeno effect *(Invited Paper)*,** B. C. Jacobs, T. B. Pittman, J. Franson, Johns Hopkins Univ. . . . . [6305-37]

4:40 pm: **Generation of nonclassical states from thermal radiation *(Invited Paper)*,** M. Bellini, A. Zavatta, Istituto Nazionale di Ottica Applicata (Italy); M. D'Angelo, V. Parigi, European Lab. for Non-linear Spectroscopy (Italy) . . . . . [6305-38]

5:05 pm: **Optical coherence tomography with phase-sensitive light,** B. I. Erkmen, J. H. Shapiro, Massachusetts Institute of Technology [6305-39]

5:25 pm: **Time-reversal and super-resolving phase measurements *(Invited Paper)*,** G. J. Pryde, K. J. Resch, K. L. Pregnell, The Univ. of Queensland (Australia); R. Prevedel, Univ. Wien (Austria); A. Gilchrist, J. L. O'Brien, A. G. White, The Univ. of Queensland (Australia) . . . . . [6305-40]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Engineering the frequency correlations of paired photons by achromatic phase matching,** M. Hendrych, N. Gonzalez, J. P. Torres, Institut de Ciències Fotòniques (Spain) . . . . . [6305-41]

✔ **Polarization recovery and auto-compensation in quantum key distribution network,** L. Ma, H. Xu, National Institute of Standards and Technology; X. Tang, National Institute of Standards and Tehcnology . . . . . [6305-42]

✔ **Characterization of atomic coherence decay for storage of light experiments,** E. V. Figueroa Barragan, F. Vewinger, Univ. of Calgary (Canada); J. Appel, Univ. Konstanz (Germany); A. I. Lvovsky, G. Günter, Univ. of Calgary (Canada) . . . . . [6305-43]

✔ **Influence of quantum dots on photo-electric properties of photodetectors on the basis of structures c-Si/Ge,** R. S. Udovitska, O. V. Vakulenko, S. V. Kondratenko, National Taras Shevchenko Univ. of Kyiv (Ukraine) . . . . . [6305-44]

✔ **Toward entangled photon metrology with known uncertainty *(Invited Paper)*,** P. J. Thomas, J. Y. Cheung, C. J. Chunnilall, National Physical Lab. (United Kingdom) . . . . . [6305-32]

✔ **Atmosphere effects on a single photon in a quantum communication channel from Earth to Space,** N. Antonietti, Politecnico di Torino (Italy); G. Brida, M. Genovese, Istituto Nazionale di Ricerca Metrologica (INRIM) (Italy) . . . . . [6305-46]

Courses of Related Interest

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SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (Phillips, Andrews) Mon. 14 Aug., 8:30 am to 5:30 pm

SC196 **Imaging Through Turbulence** (Roggemann) Weds. 16 Aug., 8:30 am to 5:30 pm

SC656 **Fundamentals of Free-Space Laser Communications** (Majumdar) Mon. 14 Aug., 1:30 to 5:30 pm

Monday-Tuesday 14-15 August 2006 • Proceedings of SPIE Vol. 6306

Advanced Wavefront Control: Methods, Devices, and Applications IV

Conference Chairs: **Michael K. Giles**, New Mexico State Univ. and OptiMetrics, Inc.; **John D. Gonglewski**, Air Force Research Lab.; **Richard A. Carreras**, Air Force Research Lab.

Program Committee: **Leonid A. Beresnev**, Army Research Lab.; **Thomas G. Bifano**, Boston Univ.; **Philip J. Bos**, Kent State Univ.; **James M. Brase**, Lawrence Livermore National Lab.; **Keith A. Bush**, AgilOptics, Inc.; **David C. Dayton**, Applied Technology Associates; **Lewis F. DeSandre**, Air Force Research Lab.; **Sergei A. Dimakov**, S.I. Vavilov State Optical Institute (Russia); **Matthew E. Goda**, Air Force Institute of Technology; **Mark T. Gruneisen**, Air Force Research Lab.; **Gordon D. Love**, Univ. of Durham (United Kingdom); **Dan K. Marker**, Air Force Research Lab.; **Kent L. Miller**, Air Force Office of Scientific Research; **Scot S. Olivier**, Lawrence Livermore National Lab.; **Troy A. Rhoadarmer**, Air Force Research Lab.; **James F. Riker**, Air Force Research Lab.; **James R. Rotgé**, The Boeing Co.; **Don D. Seeley**, Joint Technology Office; **Michael L. Shilko, Sr.**, ITT Industries, Inc.; **Vladimir Y. Venediktov**, Research Institute for Laser Physics (Russia)

Monday 14 August

SESSION 1

Conv. Ctr. Room 10 . . . . . Mon. 8:30 to 11:40 am

Wavefront Control Devices

Chairs: **Don Seeley**, Consultant; **Thomas G. Bifano**, Boston Univ.; **Mark T. Gruneisen**, Air Force Research Lab.

8:30 am: **Optical wavefront control with reconfigurable spatial light modulator technology *(Invited Paper)*,** M. T. Gruneisen, Air Force Research Lab.; R. C. Dymale, J. R. Rotge, Boeing LTS, Inc.; M. B. Garvin, Air Force Institute of Technology . . . . . [6306-01]

9:00 am: **High-power liquid crystal spatial light modulators *(Invited Paper)*,** D. Gu, B. Wen, M. P. Mahajan, D. B. Taber, B. K. Winker, Rockwell Scientific Co., LLC; D. M. Guthals, B. F. Campbell, D. Sox, The Boeing Co. . . . . [6306-02]

9:30 am: **Highly stable wavefront control by a hybrid type of liquid-crystal spatial light modulator,** T. Inoue, Hamamatsu Photonics K.K. (Japan); N. Matsumoto, Hamamatsu Photonics K. K. (Japan); N. Fukuchi, Y. Kobayashi, T. Hara, Hamamatsu Photonics K.K. (Japan) . . . . [6306-03]

9:50 am: **Control algorithms for liquid crystal phase arrays used as adaptive optic correctors,** D. C. Dayton, Applied Technology Associates; J. D. Gonglewski, Air Force Research Lab. . . . . [6306-05]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **Characterization of a membrane deformable mirror under vibration,** C. C. Wilcox, Naval Research Lab.; F. Santiago, Univ. de Puerto Rico Mayagüez; J. R. Andrews, S. R. Restaino, Naval Research Lab.; T. Martinez, Air Force Research Lab.; E. A. Roura, Univ. de Puerto Rico Mayagüez; S. W. Teare, New Mexico Institute of Mining and Technology; D. M. Payne, Narrascape . . . . . [6306-06]

11:00 am: **Development of a 4096 element MEMS continuous membrane deformable mirror for high contrast astronomical imaging,** S. Cornelissen, Boston Micromachines Corp. . . . . [6306-07]

11:20 am: **Proposed adaptive optics control loop for a continuous face sheet MEMS-based deformable membrane mirror,** R. A. Carreras, D. K. Marker, Air Force Research Lab. . . . . [6306-08]

Lunch Break . . . . . 11:40 am to 1:30 pm

SESSION 2

Conv. Ctr. Room 10 . . . . . Mon. 1:30 to 5:00 pm

Adaptive Optics Systems and Control Algorithms

Chairs: **Richard A. Carreras**, Air Force Research Lab.; **Michael K. Giles**, New Mexico State Univ.; **Scot S. Olivier**, Lawrence Livermore National Lab.

1:30 pm: **Intensity redistribution for multiconjugate adaptive optics,** C. C. Beckner, Jr., T. A. Rhoadarmer, L. M. Klein, Air Force Research Lab. . . . . [6306-10]

1:50 pm: **A lightweight adaptive telescope,** S. W. Teare, New Mexico Institute of Mining and Technology; T. Martinez, Air Force Research Lab.; J. R. Andrews, C. C. Wilcox, S. R. Restaino, Naval Research Lab.; R. C. Romeo, R. N. Martin, Composite Mirror Applications, Inc.; D. M. Payne, Narrascape . . . . . [6306-11]

2:10 pm: **Adaptive optics for microscopy, optical data storage, and micromachining,** M. J. Booth, M. Schwertner, T. Wilson, Univ. of Oxford (United Kingdom) . . . . . [6306-12]

2:30 pm: **Performance of a woofer-tweeter deformable mirror control architecture for high-bandwidth high-spatial-resolution adaptive optics,** T. A. Rhoadarmer, Air Force Research Lab.; T. J. Brennan, The Optical Sciences Co. . . . . [6306-13]

2:50 pm: **Closed-loop adaptive optics using a CMOS image sharpness chip,** C. Ting, M. K. Giles, A. Rayankula, P. Furth, New Mexico State Univ. . . . . [6306-14]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **A stochastic gradient descent algorithm optimized for serially-addressed wavefront modulators,** T. Simpkins, J. R. Hui, Optron Systems, Inc. . . . . [6306-15]

4:00 pm: **Adaptive control and filtering for closed-loop adaptive-optical wavefront reconstruction,** S. Gibson, N. Chen, Univ. of California/Los Angeles; T. A. Rhoadarmer, L. M. Klein, Air Force Research Lab. . . . . [6306-16]

4:20 pm: **Closed-loop control schemes for an adaptive-optical system with an interferometric wavefront sensor,** L. M. Klein, T. A. Rhoadarmer, C. A. St. Arnauld, Air Force Research Lab. . . . . [6306-17]

4:40 pm: **Beam control of a 2D polarization maintaining fiber optic phased array with high-fiber count,** J. E. Kansky, C. X. Yu, S. E. J. Shaw, D. V. Murphy, C. Higgs, MIT Lincoln Lab. . . . . [6306-18]

Tuesday 15 August

SESSION 3

Conv. Ctr. Room 10 . . . . . Tues. 8:30 to 10:30 am

Wavefront Sensing

Chairs: **Troy A. Rhoadarmer**, Air Force Research Lab.; **James M. Brase**, Lawrence Livermore National Lab.

8:30 am: **Adaptive wave-front correction in multiphoton microscopy using coherence-gated wavefront sensing,** M. Rueckel, W. T. Denk, Max-Planck-Institut Für Medizinische Forschung (Germany) . . . [6306-19]

8:50 am: **Direct wavefront phase measurement using point-diffraction interferometer with application to large-scale AO,** A. K. Kirby, T. J. D. Oag, G. D. Love, Univ. of Durham (United Kingdom) . . . . . [6306-20]

9:10 am: **A novel high-resolution and large-range diffractive wavefront sensor,** Y. Liu, L. Warden, K. J. Dillon, G. Mills, A. W. Dreher, Ophthonix, Inc. . . . . [6306-21]

9:30 am: **Design of a spatially phase-shifted self-referencing interferometer wavefront sensor,** T. A. Rhoadarmer, L. M. Klein, C. A. St. Arnauld, Air Force Research Lab. . . . . [6306-22]

9:50 am: **Wavelet-based wavefront control: wavelet phase determination and adaptive wavelet distortion correction,** K. J. Jones, Rice Univ. . . . . [6306-23]

10:10 am: **A model-based approach to wave-front sensorless adaptive optics,** M. J. Booth, Univ. of Oxford (United Kingdom) . . . . . [6306-24]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 4

Conv. Ctr. Room 10 . . . . . Tues. 11:00 am to 12:00 pm

Turbulence Simulation and Phase Screens

Chairs: **John D. Gonglewski**, Air Force Research Lab.; **Lewis F. DeSandre**, Air Force Research Lab.; **Philip J. Bos**, Kent State Univ.

11:00 am: **Aberration production using a high-resolution liquid crystal spatial light modulator,** J. D. Schmidt, Univ. of Dayton; M. E. Goda, Air Force Institute of Technology; J. S. Loomis, B. D. Duncan, Univ. of Dayton . . . . . [6306-25]

11:20 am: **Emulating bulk turbulence with a liquid crystal spatial light modulator,** J. D. Schmidt, Univ. of Dayton; M. E. Goda, Air Force Institute of Technology; B. D. Duncan, Univ. of Dayton . . . . . [6306-26]

11:40 am: **Laboratory phase plate turbulence strength characterization,** C. Ting, M. K. Giles, D. G. Voelz, New Mexico State Univ. . . . . [6306-27]

Lunch Break . . . . . 12:00 to 1:30 pm

SESSION 5

Conv. Ctr. Room 10 . . . . . Tues. 1:30 to 4:10 pm

Novel Systems and Applications

Chairs: **David C. Dayton**, Applied Technology Associates; **Michael K. Giles**, New Mexico State Univ.

1:30 pm: **Large, lightweight, low scatter composite active/adaptive mirror development,** H. E. Bennett, H. F. Blazek, J. Appleton, Bennett Optical Research . . . . . [6306-28]

1:50 pm: **The 1.4-meter lightweight carbon fiber mount for the Naval Prototype Optical Interferometer,** J. R. Andrews, S. R. Restaino, C. C. Wilcox, Naval Research Lab.; S. W. Teare, New Mexico Institute of Mining and Technology; T. Martinez, Air Force Research Lab.; J. H. Clark, Naval Research Lab.; J. P. Walton, U.S. Naval Observatory; R. C. Romeo, R. N. Martin, Composite Mirror Applications, Inc. . . . . [6306-29]

2:10 pm: **Bootstrap beacon creation for dynamic wavefront compensation,** A. V. Sergeyev, M. C. Roggemann, T. J. Schulz, Michigan Technological Univ. . . . . [6306-30]

2:30 pm: **Closed-loop wavefront correction for high-contrast imaging: the "peak-a-boo" algorithm,** A. Give'on, J. N. Kasdin, Princeton Univ.; R. J. Vanderbei, Princeton Univ . . . . . [6306-31]

2:50 pm: **Broadband performance of TPF's high-contrast imaging testbed: modeling and simulations,** E. Sidick, D. Moody, F. Shi, A. C. Kuhnert, J. T. Tauger, Jet Propulsion Lab. . . . . [6306-32]

Coffee Break . . . . . 3:10 to 3:30 pm

3:30 pm: **AOSLO: from the benchtop to the clinic,** Y. Zhang, A. Roorda, Univ. of California/Berkeley . . . . . [6306-33]

3:50 pm: **Correction of images in telescope with membrane primary mirror,** S. A. Dimakov, S.I. Vavilov State Optical Institute (Russia)[6306-35]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (Phillips, Andrews) Mon. 14 Aug., 8:30 am to 5:30 pm

SC196 **Imaging Through Turbulence** (Roggemann) Weds. 16 Aug., 8:30 am to 5:30 pm

SC656 **Fundamentals of Free-Space Laser Communications** (Majumdar) Mon. 14 Aug., 1:30 to 5:30 pm

Sunday 13 August 2006 • Proceedings of SPIE Vol. 6307

Unconventional Imaging II

Conference Chairs: **Victor L. Gamiz**, Air Force Research Lab.; **Paul S. Idell**, The Boeing Co.; **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

Program Committee: **Richard J. Becherer**, Schafer Corp.; **John F. Belsher**, The Optical Sciences Co.; **Keith A. Bush**, AgilOptics, Inc.; **Jean J. Dolne**, The Boeing Co.; **Paul W. Fairchild**, Trex Enterprises; **James R. Fienup**, Univ. of Rochester; **Richard M. Heinrichs**, MIT Lincoln Lab.; **Charles L. Matson**, Air Force Research Lab.; **Paul F. McManamon III**, Air Force Research Lab.; **Timothy J. Schulz**, Michigan Technological Univ.; **Laura J. Ulibarri**, Air Force Research Lab.; **David G. Voelz**, New Mexico State Univ.

Sunday 13 August

SESSION A

Conv. Ctr. Room 16A . . . . . Sun. 8:30 am

Welcome and Opening Remarks

Chair: **Victor L. Gamiz**, Air Force Research Lab.

SESSION 1

Conv. Ctr. Room 16A . . . . . Sun. 8:35 to 10:15 am

Active Techniques

Chairs: **Victor L. Gamiz**, Air Force Research Lab.; **Gonzalo Paez**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

8:35 am: **Simulation of a Fourier telescopy imaging system for objects in low Earth orbit,** J. L. Stapp, B. Spivey, L. Chen, L. Leon, K. A. Hughes, D. G. Sandler, E. L. Cuellar, Trex Enterprises . . . . . [6307-01]

8:55 am: **Phase closure and object reconstruction algorithm for Fourier telescopy applied to fast-moving targets,** D. G. Sandler, B. Spivey, Trex Enterprises . . . . . [6307-08]

9:15 am: **Phase diversity techniques for high-resolution active imaging,** P. M. Johnson, M. E. Goda, Air Force Institute of Technology; V. L. Gamiz, Air Force Research Lab. . . . . [6307-04]

9:35 am: **Range detection through the atmosphere using Laguerre-Gaussian beams,** C. Ly, Army Research Lab.; M. E. Testorf, Dartmouth College; J. N. Mait, Army Research Lab. . . . . [6307-05]

9:55 am: **Estimation of beam pointing parameters using return signal statistics: atmospheric turbulence effects,** S. P. Adepu, S. Basu, S. Avula, D. G. Voelz, New Mexico State Univ. . . . . [6307-09]

Coffee Break . . . . . 10:15 to 10:45 am

SESSION 2

Conv. Ctr. Room 16A . . . . . Sun. 10:45 am to 12:25 pm

Passive Techniques

Chair: **Gonzalo Paez**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

10:45 am: **Analysis of the spectral image improvement of the model-based spectral imaging deconvolution algorithm,** T. F. Blake, U.S. Air Force; M. E. Goda, S. C. Cain, Air Force Institute of Technology; K. Jerkatis, Boeing SVS, Inc. . . . . [6307-02]

11:05 am: **Image reconstruction from joint processing of conventional and Shack-Hartmann image sequences,** D. R. Gerwe, J. P. Stone, C. E. Luna, The Boeing Co.; B. Calef, Boeing LTS, Inc. . . . . [6307-10]

11:25 am: **Image restoration using blind deconvolution,** J. J. Dolne, The Boeing Co. . . . . [6307-12]

11:45 am: **High-resolution anisoplanatic imaging from an airborne platform,** D. C. Dayton, Applied Technology Associates; J. D. Gonglewski, Air Force Research Lab . . . . . [6307-07]

12:05 pm: **Active optical zoom for space-based imaging,** D. V. Wick, B. E. Bagwell, Sandia National Labs.; T. Martinez, Air Force Research Lab.; S. R. Restaino, Naval Research Lab.; D. M. Payne, Narrascape . . [6307-34]

Lunch Break . . . . . 12:25 to 2:00 pm

SESSION 3

Conv. Ctr. Room 16A . . . . . Sun. 2:00 to 3:20 pm

Synthetic Aperture Imaging and Image Synthesis

Chair: **Victor L. Gamiz**, Air Force Research Lab.

2:00 pm: **The Magdalena Ridge Observatory interferometer: a high-sensitivity imaging array,** D. F. Buscher, Univ. of Cambridge (United Kingdom); E. J. Bakker, Leiden Univ. (Netherlands); T. A. Coleman, M. J. Creech-Eakman, New Mexico Institute of Mining and Technology; C. A. Haniff, Univ. of Cambridge (United Kingdom); C. A. Jurgenson, D. A. Klinglesmith III, C. B. Parameswariah, New Mexico Institute of Mining and Technology; J. S. Young, Univ. of Cambridge (United Kingdom) [6307-15]

2:20 pm: **Optical fringe formation in Michelson stellar interferometry,** V. L. Gamiz, Air Force Research Lab. . . . . [6307-14]

2:40 pm: **Multispectral sparse aperture imaging,** P. E. Nebolsine, N. Humer, Physical Sciences Inc.; C. Rollins, Research Support Instruments, Inc.; M. G. Miller, Physical Sciences Inc. . . . . [6307-16]

3:00 pm: **Photometric signature inversion,** B. Calef, D. T. Hall, B. Birge, Boeing LTS, Inc. . . . . [6307-11]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 4

Conv. Ctr. Room 16A . . . . . Sun. 3:50 to 5:10 pm

Session 4

Chair: **Gonzalo Paez**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

3:50 pm: **Development of noise-immune oximetry: theory and measurement,** C. Vazquez-Jaccaud, G. Páez, M. Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-20]

4:10 pm: **Thermal characterization of EuTTA for its use in formation of thermal images,** M. Alfaro, G. Páez, M. Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-19]

4:30 pm: **Spatial and spectral mathematical model for alignment of optical systems in extra-solar planet detection,** P. Vacas-Jacques, M. Strojnik, G. Paez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-30]

4:50 pm: **Interferometric characterization of flames,** G. Paez, M. S. Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-35]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Noninvasive method for tooth diagnosis in IR,** E. Alatorre-Alvarez, M. Strojnik, G. Páez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-17]

✔ **Tolerance determination for a Dove prism using exact ray trace,** E. Gutiérrez, M. Strojnik, G. Páez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-18]

✔ **Thermal characterization of flames,** J. C. Granados, G. Páez, M. Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . [6307-21]

✔ **Development of some conditions to detect extra-solar planets with rotational shearing interferometer,** M. Galan, M. Strojnik, G. Páez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-22]

✔ **The research on the role of several feature extraction methods in the land use/land cover classification,** L. Cui, Shanghai Meteorological Bureau (China) . . . . . [6307-23]

✔ **Optimization of wavefront director system, for a vectorial shearing interferometer,** C. N. Ramirez, M. Strojnik, G. Páez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-25]

✔ **Medical diagnosis via non-attenuated photon interferometry: performance prediction and simulation,** P. Vacas-Jacques, M. Strojnik, G. Páez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6307-26]

✔ **Light intensity measurement,** T. B. Kranjc, Univ. v Ljubljani (Slovenia) . . . . . [6307-28]

✔ **Influence of ionic contamination on optical properties of LC cells,** T. B. Kranjc, Univ. v Ljubljani (Slovenia) . . . . . [6307-29]

✔ **Temperature dependence of resistivity of glassy carbon,** M. Strojnik, G. Páez, Centro de Inv. en Optica (Mexico) . . . . . [6307-31]

✔ **Low background photodetectors based on AIVBVI alloys,** V. F. Chishko, N. B. Zaletaev, Orion Research and Production Association (Russia) . . . . . [6307-33]

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Monday-Tuesday 14-15 August 2006 • Proceedings of SPIE Vol. 6308

Photonics for Space Environments XI

Conference Chair: **Edward W. Taylor**, International Photonics Consultants, Inc.

Cochairs: **David A. Cardimona**, Air Force Research Lab.; **Andrew R. Pirich**, Air Force Research Lab.; **Dominic B. Doyle**, European Space Research and Technology Ctr. (Netherlands)

Program Committee: **Mansoor Alam**, Nufern; **Richard R. Barto**, Lockheed Martin; **Francis Berghmans**, SCK•CEN (Belgium); **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.; **Douglas M. Craig**, Air Force Research Lab.; **Stephen A. DeWalt**, Ball Aerospace & Technologies Corp.; **James G. Grote**, Air Force Research Lab.; **Frank K. Hopkins**, Air Force Research Lab.; **DanHong Huang**, Air Force Research Lab.; **Melanie N. Ott**, NASA Goddard Space Flight Ctr.; **Cengiz S. Ozkan**, Univ. of California/Riverside; **Anthony D. Sanchez**, Air Force Research Lab.; **Marco Van Uffelen**, SCK•CEN (Belgium); **John S. Zetts**, Air Force Research Lab.

Monday 14 August

SESSION A

Conv. Ctr. Room 15B . . . . . Mon. 8:00 am

Opening Remarks

Chair: **Edward W. Taylor**, International Photonics Consultants, Inc.

SESSION 1

Conv. Ctr. Room 15B . . . . . Mon. 8:05 to 11:20 am

Space Effects on Organic-, Polymer-, and Inorganic-Based Photonic Materials and Devices

Chair: **Andrew R. Pirich**, Air Force Research Lab.

8:05 am: **Low-driving voltage polymer modulators with applications in space missions *(Invited Paper)*,** R. Dinu, D. Jin, D. Huang, Y. Fang, Lumera Corp. . . . . [6308-01]

8:30 am: **Two-photon 3D high-density optical storage media: optical properties, temperature, radiation, and fatigue studies *(Invited Paper)*,** P. M. Rentzepis, A. S. Dvorniov, Univ. of California/Irvine . . . . . [6308-02]

8:55 am: **Phthalocyanine molecules with extremely strong two-photon absorption for 3D rewritable optical information storage *(Invited Paper)*,** M. A. Drobizhev, N. S. Makarov, A. Rebane II, Montana State Univ.-Bozeman; H. Wolleb, H. Spahni, Ciba Specialty Chemicals (Switzerland) . . . . . [6308-03]

9:20 am: **Proven space survivability of POSS polyimides *(Invited Paper)*,** S. J. Tomczak, U.S. Air Force; V. Vij, ERC Inc.; T. K. Minton, A. Brunsvold, Montana State Univ.; J. Mabry, D. Marchant, U.S. Air Force; T. Haddad, ERC Inc.; M. E. Wright, U.S. Navy; A. Lee, Michigan State Univ. . . . . [6308-04]

9:45 am: **In-situ measurement of liquid crystal spatial light modulators' beam-steering characteristics during gamma irradiation *(Invited Paper)*,** J. E. Stockley, S. A. Serati, Boulder Nonlinear Systems Inc.; D. Dauwe, T. F. Deaton, J. Nonnast, ATK Mission Research . . . . . [6308-05]

Coffee Break . . . . . 10:10 to 10:40 am

Keynote

10:40 am: **Novel solar cell nanotechnology for improved efficiency and radiation hardness *(Invited Paper)*,** A. Fedoseyev, CFD Research Corp.; A. A. Balandin, Univ. of California/Riverside; M. Turowski, CFD Research Corp. . . . . [6308-06]

11:20 am: **The role of quantum dots in organic/polymer-based solar cells and IR detectors for space applications,** E. W. Taylor, International Photonics Consultants, Inc. . . . . [6308-07]

Lunch Break . . . . . 11:40 am to 1:15 pm

SESSION 2

Conv. Ctr. Room 15B . . . . . Mon. 1:15 to 5:00 pm

Photonics Technology for Radiation Environments I

Chair: **Mansoor Alam**, Nufern

1:15 pm: **Passive and active optical fibers for space and terrestrial applications *(Invited Paper)*,** M. Alam, J. Abramczyk, J. Farroni, U. H. Manyam, D. P. Guertin, Nufern . . . . . [6308-08]

1:40 pm: **Electron-beam irradiation of polymer-carbon nanotubes composites,** M. Chipara, Indiana Univ.; B. Wendland, A. W. Hunt, Idaho State Univ.; J. M. Zaleski, Indiana Univ.; E. W. Taylor, International Photonics Consultants, Inc. . . . . [6308-09]

2:00 pm: **Multiple quantum well-based modulating retroreflectors for inter- and intra-spacecraft communication *(Invited Paper)*,** P. G. Goetz, W. S. Rabinovich, G. C. Gilbreath, R. Mahon, M. S. Ferraro, L. A. Swingen, J. L. Murphy, N. G. Creamer, H. R. Burris, Jr., M. F. Stell, S. C. Binari, C. I. Moore, Naval Research Lab. . . . . [6308-31]

2:25 pm: **Laser altimeter for planetary exploration technology demonstrator: the timing system,** J. Blazej, I. Prochazka, K. Hamal, P. Jirousek, M. Kropik, M. Fedyszyn, Czech Technical Univ. in Prague (Czech Republic); Y. Fumin, H. Peicheng, Shanghai Astronomical Observatory (China); H. Michaelis, Deutsches Zentrum für Luft und Raumfahrt e.V. (Germany); U. Schreiber, Technical Univ. of Munich (Germany) . [6308-11]

2:45 pm: **High-G effects on optical fiber-based displacement sensing for re-entry bodies,** B. R. Nadler, Los Alamos National Lab.; J. Greene, Lambda Instruments, Inc. . . . . [6308-12]

Coffee Break . . . . . 3:05 to 3:35 pm

3:35 pm: **Microsystem technology toughens up sun sensors for extreme environments *(Invited Paper)*,** J. Leijtens, K. de Boom, TNO (Netherlands) . . . . . [6308-13]

4:00 pm: **Fiber optic sensor technologies for detection of hydrogen in space application,** A. A. Kazemi, The Boeing Co.; K. Goswami, InnoSense LLC . . . . . [6308-14]

4:20 pm: **Space flight qualification on a multifiber ribbon cable and array connector assembly,** X. Jin, QSS Groups, Inc.; M. N. Ott, NASA Goddard Space Flight Ctr.; R. M. Baker, B. E. N. Keeler, Sandia National Labs.; P. R. Friedberg, NASA Goddard Space Flight Ctr.; R. Chuska, MEI Technologies; M. Malenab, QSS Group, Inc.; S. Macmurphy, MEI Technologies . . . . . [6308-15]

4:40 pm: **The reliability of the laser diode arrays,** A. A. Vasilyev, E. Troupaki, Science Systems and Applications, Inc.; G. R. Allan, Sigma Space Corp.; N. B. Kashem, M. A. Stephen, NASA Goddard Space Flight Ctr. . . . . [6308-16]

Tuesday 15 August

SESSION B

Conv. Ctr. Room 15B . . . . . Tues. 8:00 am

Opening Remarks

Chair: **Edward W. Taylor**, International Photonics Consultants, Inc.

SESSION 3

Conv. Ctr. Room 15B . . . . . Tues. 8:05 am to 12:00 pm

Novel Photonic and Optoelectronic Devices and Concepts for Space-Based Applications I

Chair: **DanHong Huang**, Air Force Research Lab.

8:05 am: **Engineering photonic nanostructure profiles using nanosphere lithography and reactive-ion etching,** J. Wang, Y. Zhao, G. Mao, Wayne State Univ. . . . . [6308-17]

8:25 am: **Three-dimensional photonic crystal for photovoltaic applications *(Invited Paper)*,** S. Lin, Rensselaer Polytechnic Institute . . . . . [6308-18]

8:50 am: **Si-compatible plasmonics and nanophotonics,** M. L. Brongersma, Stanford Univ. . . . . [6308-19]

9:15 am: **Optical absorption and plasma oscillations for nanotubes with spin-orbit interaction *(Invited Paper)*,** G. A. Gumbs, Hunter College/ CUNY . . . . . [6308-20]

9:40 am: **Linear and nonlinear optical phenomena in quantum dot systems in interlevel resonance region: effect of electron-electron interaction,** V. Bondarenko, Wayne State Univ.; M. Zaluzny, Maria Curie-Sklodowska Univ. (Poland); Y. Zhao, Wayne State Univ. . . . . [6308-21]

Coffee Break . . . . . 10:00 to 10:35 am

Keynote

10:35 am: **Photonic sensing for space situational awareness *(Invited Paper)*,** D. J. Silversmith, K. Reinhardt, Air Force Office of Scientific Research . . . . . [6308-22]

11:15 am: **Terahertz quantum well photodetectors *(Invited Paper)*,** H. C. Liu, National Research Council Canada (Canada) . . . . . [6308-23]

11:40 am: **Novel tunneling photodetector with very high gain and detectivity,** J. S. Moon, HRL Labs., LLC . . . . . [6308-24]

Lunch Break . . . . . 12:00 to 2:00 pm

SESSION 4

Conv. Ctr. Room 15B . . . . . Tues. 2:00 to 3:10 pm

Novel Photonic and Optoelectronic Devices and Concepts for Space-Based Applications II

Chair: **Paul M. Alsing**, The Univ. of New Mexico and Air Force Research Lab.

2:00 pm: **Multicolor megapixel QWIP focal plane arrays for remote sensing instruments *(Invited Paper)*,** S. D. Gunapala, California Institute of Technology and Jet Propulsion Lab. . . . . [6308-25]

2:25 pm: **The carbon nanotube-silicon heterojunction as infrared sensor *(Invited Paper)*,** D. A. Straus, Brown Univ.; M. B. Tzolov, Lock Haven Univ. of Pennsylvania; T. Kuo, A. Yin, J. M. Xu, Brown Univ.; D. A. Cardimona, Air Force Research Lab. . . . . [6308-26]

2:50 pm: **Recent progress in quantum-dot semiconductor optical amplifiers,** T. Akiyama, Fujitsu Labs. (Japan) . . . . . [6308-27]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 5

Conv. Ctr. Room 15B . . . . . Tues. 3:30 to 4:15 pm

Photonics Technology for Radiation Environments II

Chair: **Douglas M. Craig**, Air Force Research Lab.

3:30 pm: **Photonic component qualification and implementation activities at NASA Goddard Space Flight Center *(Invited Paper)*,** M. N. Ott, NASA Goddard Space Flight Ctr.; X. Jin, QSS Inc.; R. Chuska, Muniz Engineering, Inc.; P. R. Friedberg, NASA Goddard Space Flight Ctr.; S. Macmurphy, Muniz Engineering, Inc.; M. Malenab, QSS Group, Inc.; A. Matuszeski, NASA Goddard Space Flight Ctr. . . . . [6308-28]

3:55 pm: **Evaluation of optical connectors for consideration in military avionics,** B. L. Uhlhorn, G. M. Drexler, R. L. Nelson, R. C. Stevens, Lockheed Martin Corp. . . . . [6308-10]

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Instruments, Methods, and Missions for Astrobiology IX

Monday 14 August

SESSION A

Conv. Ctr. Room 16A . . . . . Mon. 8:00 am

Welcome and Opening Remarks

Chairs: **Richard B. Hoover**, NASA Marshall Space Flight Ctr.; **Alexei Y. Rozanov**, Paleontological Institute (Russia); **Gilbert V. Levin**, Spherix Inc.

SESSION 1

Conv. Ctr. Room 16A . . . . . Mon. 8:15 to 10:25 am

Morphological Biomarkers and Microfossils in Ancient Rocks and Meteorites

Chairs: **Gilbert V. Levin**, Spherix Inc.; **Gene D. McDonald**, The Univ. of Texas at Austin

8:15 am: **Carbon-rich features in Martian meteorite Nakhla *(Invited Paper)*,** D. S. McKay, E. J. Gibson, Jr., NASA Johnson Space Ctr.; S. J. Clemett, S. J. Wentworth, K. L. Thomas-Keprta, L. Le, Jacobs Engineering; F. Robert, A. Meibom, S. Mostefaoui, Muséum National d'Histoire Naturelle (France); A. B. Verchovsky, I. P. Wright, C. T. Pillinger, The Open Univ. (United Kingdom); T. M. Rice, B. Van Leer, FEI Co. . . . . [6309-01]

8:55 am: **Fossils of Prokaryotic microorganisms in the Orgueil meteorite *(Invited Paper)*,** R. B. Hoover, NASA Marshall Space Flight Ctr. . . . . [6309-02]

9:25 am: **The water-igneous rock interface: potential microbial habitats on Mars *(Invited Paper)*,** M. R. Fisk, Oregon State Univ.; M. C. Storrie-Lombardi, Kinohi Institute; J. Josef, Bruce Museum of Arts and Science . . . . . [6309-03]

9:55 am: **Fossil microorganisms in Archaean *(Invited Paper)*,** M. M. Astafieva, Paleontological Institute (Russia); R. B. Hoover, NASA Marshall Space Flight Ctr.; A. Y. Rozanov, A. B. Vrevskiy, Paleontological Institute (Russia) . . . . . [6309-04]

Coffee Break . . . . . 10:25 to 10:45 am

SESSION 2

Conv. Ctr. Room 16A . . . . . Mon. 10:45 am to 12:15 pm

Elemental and Chemical Biosignatures

Chair: **Martin R. Fisk**, Oregon State Univ.

10:45 am: **The use of biochemical methods in extraterrestrial life detection *(Invited Paper)*,** G. D. McDonald, The Univ. of Texas at Austin and Kinohi Institute . . . . . [6309-05]

11:15 am: **Probabilistic classification of elemental abundance distributions in Nakhla and Apollo 17 lunar dust samples *(Invited Paper)*,** M. C. Storrie-Lombardi, Kinohi Institute; R. B. Hoover, NASA Marshall Space Flight Ctr.; M. R. Fisk, Oregon State Univ.; M. Abbas, G. A. Jerman, J. Coston, NASA Marshall Space Flight Ctr. . . . . [6309-06]

11:45 am: **Amino acids as probes for ancient life in the solar system *(Invited Paper)*,** M. H. Engel, Univ. of Oklahoma; R. S. Perry, Univ. of Washington . . . . . [6309-07]

Lunch Break . . . . . 12:15 to 1:30 pm

SESSION 3

Conv. Ctr. Room 16A . . . . . Mon. 1:30 to 3:30 pm

Chiral Biomolecules

Chairs: **Alexei Y. Rozanov**, Paleontological Institute (Russia); **Michael C. Storrie-Lombardi**, Kinohi Institute

Keynote

1:30 pm: **Keynote Presentation,** P. C. W. Davies, Macquarie Univ. (Australia) . . . . . [6309-08]

2:10 pm: **Search for extraterrestrial life using chiral molecules: Mandelate racemase as a test case *(Invited Paper)*,** T. L. Thaler, A. S. Bommarius, Georgia Institute of Technology . . . . . [6309-09]

2:40 pm: **Bacterial utilization of L-sugars and D-amino acids,** E. V. Pikuta, R. B. Hoover, NASA Marshall Space Flight Ctr.; B. Klyce, Astrobiology Research Trust; P. C. W. Davies, P. Davies, Macquarie Univ. (Australia) . . . . . [6309-10]

3:00 pm: **On the Maillard reaction of meteoritic amino acids *(Invited Paper)*,** V. M. Kolb, M. Bajagic, Univ. of Wisconsin/Parkside; W. Zhu, Johnson Polymer; G. D. Cody, Carnegie Institution of Washington[6309-11]

Coffee Break . . . . . 3:30 to 3:50 pm

SESSION 4

Conv. Ctr. Room 16A . . . . . Mon. 3:50 to 5:50 pm

Astrobiology of Mars

Chairs: **Francois C. Raulin**, Univ. Paris VII (France); **Caleb Scharf**, Columbia Univ.

3:50 pm: **Modern myths of Mars *(Invited Paper)*,** G. V. Levin, Spherix Inc. . . . . [6309-12]

4:20 pm: **Multispectral microimager for astrobiology,** R. G. Sellar, Jet Propulsion Lab.; J. D. Farmer, Arizona State Univ. . . . . [6309-14]

4:40 pm: **Rovers within Rovers: a hierarchical approach,** G. A. Konesky, SGK Nanostructures, Inc. . . . . [6309-15]

5:00 pm: **Carbon isotopic gradients in the martian crust: implications for past or present life on Mars *(Invited Paper)*,** M. A. Sephton, Imperial College Loudon (United Kingdom); S. Self, A. B. Verchovsky, M. M. Grady, The Open Univ. (United Kingdom); R. S. Perry, Imperial College Loudon (United Kingdom); M. H. Engel, Univ. of Oklahoma; I. Wright, The Open Univ. (United Kingdom) . . . . . [6309-35]

5:30 pm: **On the definitions of life: taking the Aristotelian approach,** V. M. Kolb, Univ. of Wisconsin/Parkside . . . . . [6309-31]

Tuesday 15 August

SESSION B

Conv. Ctr. Room 16A . . . . . Tues. 8:00 am

Welcome and Introduction

Chair: **Richard B. Hoover**, NASA Marshall Space Flight Ctr.

SESSION 5

Conv. Ctr. Room 16A . . . . . Tues. 8:10 to 10:00 am

Water in the Solar System

Chairs: **Muradin A. Kumakhov**, Institute for Roentgen Optics (Russia); **Jonathan D. Trent**, NASA Ames Research Ctr.

Keynote

8:10 am: **The new Titan: an astrobiological perspective,** F. C. Raulin, Univ. Paris VII (France) . . . . . [6309-17]

8:50 am: **Comets, asteroids, and the origin of the Biosphere,** R. B. Hoover, NASA Marshall Space Flight Ctr. . . . . [6309-18]

9:10 am: **Tidally heated moons: from icy worlds to temperate habitats *(Invited Paper)*,** C. A. Scharf, Columbia Univ. . . . . [6309-19]

9:40 am: **Implications of cometary water: deep impact, stardust, and Hyabusa,** R. B. Sheldon, NASA Marshall Space Flight Ctr. . . . . [6309-20]

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 6

Conv. Ctr. Room 16A . . . . . Tues. 10:20 to 11:20 am

Microbial Extremophiles

Chair: **Michael H. Engel**, Univ. of Oklahoma

10:20 am: **The sulfur cycle in a permanently meromictic haloalkaline lake *(Invited Paper)*,** H. C. Pinkart, Central Washington Univ. . [6309-21]

10:50 am: **Changes in carbon cycling under lowered sulfate conditions in hypersaline microbial mats as ascertained by stable carbon isotopes *(Invited Paper)*,** C. A. Kelley, Univ. of Missouri/Columbia; B. M. Bebout, L. E. Prufert-Bebout, NASA Ames Research Ctr.; J. M. Smith, Univ. of Florida . . . . . [6309-22]

SESSION 7

Conv. Ctr. Room 16A . . . . . Tues. 11:20 am to 12:40 pm

Origin and Distribution of Life

Chairs: **Alexei I. Erko**, BESSY GmbH (Germany); **Holly C. Pinkart**, Central Washington Univ.

11:20 pm: **The origins of life and the mechanisms of biological evolution *(Invited Paper)*,** F. J. Carrapico, Univ. de Lisboa (Portugal) . . . . . [6309-23]

11:50 pm: **A sideways view of stromatolites: complexity metrics for stromatolite laminae *(Invited Paper)*,** M. C. Storrie-Lombardi, Kinohi Institute; S. M. Awramik, Univ. of California/Santa Barbara . . . . [6309-24]

12:20 pm: **Thiophenes as indicators of aqueous alteration in carbonaceous meteorites,** M. A. Sephton, R. S. Perry, Imperial College London (United Kingdom); R. B. Hoover, NASA/National Space Science and Technology Ctr . . . . . [6309-36]

Lunch Break . . . . . 12:40 to 2:00 pm

SESSION 8

Conv. Ctr. Room 16A . . . . . Tues. 2:00 to 3:10 pm

Astrobiology Outreach

Chair: **Adrian J. Brown**, SETI Institute

2:00 pm: **How can we teach astrobiology and survive? *(Invited Paper)*,** T. Rodrigues, F. J. Carrapico, Univ. de Lisboa (Portugal) . . . . . [6309-25]

2:30 pm: **Adaptations for life at its upper temperature limits: the role of HSP60s in hyperthermophilic archaea,** J. D. Trent, NASA Ames Research Ctr.; Y. Li SETI Institute; S. Mitsuzawa, Japan Agency for Marine-Earth Science and Technology (Japan); J. Pham, Foothill College; H. Kagawa, SETI Institute . . . . . [6309-26]

2:50 pm: **Role of the Mailard reaction in the biosilification process,** V. M. Kolb, P. J. Liesch, M. Bajagic, A. I. Philip, Univ. of Wisconsin/Parkside . . . . . [6309-16]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 9

Conv. Ctr. Room 16A . . . . . Tues. 3:30 to 5:20 pm

Instrumentation for Astrobiology

Chairs: **David S. McKay**, NASA Johnson Space Ctr.; **Vera M. Kolb**, Univ. of Wisconsin/Parkside

3:30 pm: **New generation of x-ray analytical instruments *(Invited Paper)*,** M. A. Kumakhov, Institute for Roentgen Optics (Russia) [6309-27]

4:00 pm: **MR PRISM: a spectral analysis tool for the CRISM instrument *(Invited Paper)*,** A. J. Brown, SETI Institute; M. C. Storrie-Lombardi, Kinohi Institute . . . . . [6309-28]

4:30 pm: **μXRFA and μEXAFS measurements of organic and non-organic samples *(Invited Paper)*,** A. Erko, BESSY GmbH (Germany) . . . . . [6309-29]

5:00 pm: **Suppression of speckles at high-adaptive correction using speckle symmetry,** E. E. Bloemhof, Jet Propulsion Lab. . . . . [6309-30]

Optical Instrumentation

Program on **Algorithms, Architectures, and Devices**

Program Chair: **Bahram Javidi,** Univ. of Connecticut

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
	6310 **Photonic Devices and Algorithms for Computing VIII** *(Iftekharuddin/ Awwal)*, p. 107		6311 **Optical Information Systems IV** *(Javidi/Psaltis)*, p. 109	
		6312 **Applications of Digital Image Processing XXIX** *(Tescher)*, p. 112		
		6313 **Advanced Signal Processing Algorithms, Architectures, and Implementations XVI** *(Luk)*, p. 115		
			6314 **Photorefractive Fiber and Crystal Devices: Materials, Optical Properties, and Applications XII** *(Yu/Guo/Yin)*, p. 117	
Courses				
	SC017 **Principles of Fourier Optics and Diffraction** (Gaskill), 8:30 am to 5:30 pm		SC661 **Applied Image Processing** (Iftekharuddin), 8:30 am to 5:30 pm	
				Register for Courses onsites at the SPIE Registration Desk!
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	**SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18		
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

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Photonic Devices and Algorithms for Computing VIII

Conference Chairs: **Khan M. Iftekharuddin**, Univ. of Memphis; **Abdul A. S. Awwal**, Lawrence Livermore National Lab.

Program Committee: **Fred R. Beyette, Jr.**, Univ. of Cincinnati; **David P. Casasent**, Carnegie Mellon Univ.; **H. John Caulfield**, Fisk Univ.; **James G. Grote**, Air Force Research Lab.; **Mohammad A. Karim**, Old Dominion Univ.; **Yao Li**, Alliance Fiber Optic Products Inc.; **Alastair D. McAulay**, Lehigh Univ.; **Ting-Chung Poon**, Virginia Polytechnic Institute and State Univ.; **Jun Tanida**, Osaka Univ. (Japan); **Shyh-Lin Tsao**, National Taiwan Normal Univ. (Taiwan); **Kelvin H. Wagner**, Univ. of Colorado at Boulder; **Toyohiko Yatagai**, Univ. of Tsukuba (Japan); **Francis T. S. Yu**, The Pennsylvania State Univ.

Monday 14 August

Plenary Presentation

Conv. Ctr. Room 8 . . . . . Mon. 8:30 to 9:10 am

From Signals to Sudoku: Reconstructions from Partial Information

Veit Elser, Cornell Univ.

See p. 8 for further information.

SESSION 1

Conv. Ctr. Room 14B . . . . . Mon. 9:20 to 10:30 am

Switching

Chair: **Alastair D. McAulay**, Lehigh Univ.

9:20 am: **Manipulating light with photonic crystals and plasmonic devices *(Invited Paper)*,** S. Fan, Stanford Univ. . . . . [6310-01]

9:50 am: **Application of 64-channel laser for free-space interconnections,** Y. Tsai, Y. Lin, C. Chiang, S. Tsao, National Taiwan Normal Univ. (Taiwan) . . . . . [6310-02]

10:10 am: **Design of photonic switching function of 32x2 arrayed waveguide grating,** C. Lin, C. Ko, National Taiwan Normal Univ. (Taiwan) and Institute of Electro-Optical Science and Technology (Taiwan); C. Chiang, S. Tsao, National Taiwan Normal Univ. (Taiwan) . . . . . [6310-03]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 2

Conv. Ctr. Room 14B . . . . . Mon. 11:00 to 11:50 am

Computing Systems

Chair: **Byoungho Lee**, Seoul National Univ. (South Korea)

11:00 am: **Light field synthesis using spatial light modulators with feedback control and its applications to optical interconnection and switching *(Invited Paper)*,** B. Lee, H. Kim, J. Hahn, Seoul National Univ. (South Korea) . . . . . [6310-05]

11:30 am: **Development of an optical analog-to-digital converter using photonic crystals,** A. S. Sharkawy, EM Photonics, Inc.; C. Chen, B. Miao, S. Shi, D. W. Prather, Univ. of Delaware . . . . . [6310-06]

Lunch Break . . . . . 11:50 am to 1:20 pm

SESSION 3

Conv. Ctr. Room 14B . . . . . Mon. 1:20 to 3:00 pm

Photonic Devices I

Chair: **Guoqiang Li**, College of Optical Sciences/The Univ. of Arizona

1:20 pm: **Potential applications of OLEDs in data storage *(Invited Paper)*,** G. E. Jabbour, M. Lauters, Arizona State Univ. . . . . [6310-08]

1:50 pm: **Silicon-based micro and subwavelength optical elements and applications *(Invited Paper)*,** J. Chang, C. Hsu, C. Wang, Y. Liu, M. Wu, T. Yang, National Central Univ. (Taiwan) . . . . . [6310-09]

2:20 pm: **Alexandrite effect spectropyrometer,** Y. Liu, Liu Research Labs, LLC . . . . . [6310-10]

2:40 pm: **Combination of CPW-PBG cell for achieving three-band frequency division multiplexer,** M. Weng, W. Lee, C. Chiang, S. Tsao, National Taiwan Normal Univ. (Taiwan) . . . . . [6310-11]

Coffee Break . . . . . 3:00 to 3:20 pm

SESSION 4

Conv. Ctr. Room 14B . . . . . Mon. 3:20 to 4:30 pm

Photonic Devices II

Chair: **Shyh-Lin Tsao**, National Taiwan Normal Univ. (Taiwan)

3:20 pm: **High-efficiency switchable diffractive lens *(Invited Paper)*,** G. Li, D. L. Mathine, P. Valley, P. Ayras, J. Haddock, G. Malalahalli, G. Williby, J. Schwiegerling, G. R. Meredith, College of Optical Sciences/The Univ. of Arizona; B. Kippelen, Georgia Institute of Technology; S. Honkanen, N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona[6310-12]

3:50 pm: **Modeling optical micromachines,** V. L. Y. Loke, T. A. Nieminen, A. Branczyk, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) . . . . . [6310-14]

4:10 pm: **Nonlinear conjugate gradient method for designing diffractive optical elements focusing desired optical intensity distributions on arbitrarily curved surfaces,** H. Kim, B. Lee, Seoul National Univ. (South Korea) . . . . . [6310-15]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **A novel two-way wavelength division multiplexed fiber laser,** H. Ke, J. Chiu, C. Chiang, S. Tsao, National Taiwan Normal Univ. (Taiwan) . . . . . [6310-26]

✔ **50-GHZ optical pulse generation for synchronization of high-speed computing signals,** P. Chu, Y. Yang, C. Chiang, S. Tsao, National Taiwan Normal Univ. (Taiwan) . . . . . [6310-27]

✔ **Design and analysis of PBG structure for achieving SOI buffer,** M. Pan, C. Chu, C. Chiang, S. Tsao, National Taiwan Normal Univ. (Taiwan) . . . . . [6310-28]

✔ **Optical implementation of iterative Fourier transform algorithm using spatial light modulator,** J. Hahn, H. Kim, Y. Lim, J. Lee, B. Lee, Seoul National Univ. (South Korea) . . . . . [6310-29]

✔ **Design of 1x3 photonic crystal power dividers by the technique of impedance matching,** R. Chen, P. Cheng, C. Tu, Lunghwa Univ. of Science and Technology (Taiwan) . . . . . [6310-30]

✔ **Switchable lasing of 1040 and 1537-nm based on the optical bistability in the pump-bypassed ytterbium-doped fiber laser,** J. L. Li, M. Musha, A. Shirakawa, K. Ueda, The Univ. of Electro-Communications (Japan) . . . . . [6310-31]

✔ **Theory of a 2Å~2 switch based on electro-optic and piezoelectric effects,** X. Yan, Shanghai Univ. (China) . . . . . [6310-32]

Tuesday 15 August

SESSION 5

Conv. Ctr. Room 14B . . . . . Tues. 9:00 to 10:00 am

Algorithms I

Chair: **Khan M. Iftekharuddin**, Univ. of Memphis

9:00 am: **Biologically inspired object selection technique based on attractor selection,** S. Irie, Y. Ogura, J. Tanida, Osaka Univ. (Japan) . . . . . [6310-16]

9:20 am: **Model-based tracking using motion estimation of a static vehicle in airborne image sequences,** G. J. Power, Wright State Univ.; C. Roush, Spectral Systems Inc. . . . . [6310-17]

9:40 am: **A reinforcement learning approach in rotated image recognition and its convergence analysis,** K. M. Iftekharuddin, Y. Li, Univ. of Memphis . . . . . [6310-18]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 14B . . . . . Tues. 10:30 to 11:30 am

Algorithms II

Chair: **Wilbert A. McClay III**, Lawrence Livermore National Lab.

10:30 am: **Visualizing the differentially expressed genes,** A. U. Islam, K. M. Iftekharuddin, D. J. Russomanno, Univ. Of Memphis . . . . . [6310-19]

10:50 am: **Amplitude Modulated Phase Only Filtering and High Dimensional Warping for Registration on MRI Brain Images,** W. A. McClay III, Lawrence Livermore National Lab.; A. Haas, Dataura Software; P. Thompson, A. W. Toga, Univ. of California/Los Angeles . . . . . [6310-21]

11:10 am: **Multi-object feature detection and error correction for NIF automatic optical alignment,** A. A. S. Awwal, Lawrence Livermore National Lab. . . . . [6310-22]

Lunch/Exhibition Break . . . . . 11:30 am to 1:30 pm

SESSION 7

Conv. Ctr. Room 14B . . . . . Tues. 1:30 to 2:30 pm

Algorithms and Systems

Chair: **Gregory J. Power**, Wright State Univ.

1:30 pm: **Best angle to orient two intersecting lines,** A. A. S. Awwal, W. S. Ferguson, Lawrence Livermore National Lab. . . . . [6310-24]

1:50 pm: **Finite element analysis of the thermoelastic damping,** Y. Yi, Univ. of Denver; M. A. Matin, Univ of Denver . . . . . [6310-13]

2:10 pm: **Design and development of dynamic electro-optic devices for application in photonics by microstructuring lithium niobate crystals,** P. Ferraro II, M. Paturzo, S. Grilli, P. De Natale, S. M. De Nicola, A. Finizio, Istituto Nazionale di Ottica Applicata (Italy) . . . . . [6310-34]

SESSION 8

Conv. Ctr. Room 14B . . . . . Tues. 2:30 to 3:10 pm

Keynote Presentation

3:10 pm: **NSF perspectives on photonics and device research *(Keynote Presentation)*,** R. Hui, National Science Foundation[6310-35]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC017 **Principles of Fourier Optics and Diffraction** (Gaskill) Mon. 14 Aug., 8:30 am to 5:30 pm

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Optical Information Systems IV

Conference Chairs: **Bahram Javidi**, Univ. of Connecticut; **Demetri Psaltis**, California Institute of Technology

Program Committee: **Henri H. Arsenault**, Univ. Laval (Canada); **George Barbastathis**, Massachusetts Institute of Technology; **David P. Casasent**, Carnegie Mellon Univ.; **Yeshaiahu Fainman**, Univ. of California/San Diego; **Pietro Ferraro II**, Consiglio Nazionale delle Ricerche (Italy); **Laurence G. Hassebrook**, Univ. of Kentucky; **Kazuyoshi Itoh**, Osaka Univ. (Japan); **Robert Magnusson**, Univ. of Connecticut; **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control; **Manuel Martínez-Corral**, Univ. de València (Spain); **Osamu Matoba**, Kobe Univ. (Japan); **Alastair D. McAulay**, Lehigh Univ.; **Maria S. Millán García-Varela**, Univ. Politècnica de Catalunya (Spain); **Nasser M. Nasrabadi**, Army Research Lab.; **Thomas J. Naughton**, National Univ. of Ireland/Maynooth (Ireland); **Takanori Nomura**, Wakayama Univ. (Japan); **Elisabet Pérez-Cabré**, Univ. Politècnica de Catalunya (Spain); **Philippe Réfrégier**, Institut Fresnel (France); **Nabeel A. Riza**, College of Optics and Photonics/Univ. of Central Florida; **Joseph Rosen**, Ben-Gurion Univ. of the Negev (Israel); **Firooz A. Sadjadi**, Lockheed Martin Corp.; **John T. Sheridan**, National Univ. of Ireland/Dublin (Ireland); **Jung-Young Son**, Hanyang Univ. (South Korea); **Clay J. Stanek**, ANZUS, Inc.; **Enrique Tajahuerce**, Univ. Jaume I (Spain); **Cardinal Warde**, Massachusetts Institute of Technology; **Frank Wyrowski**, Friedrich-Schiller-Univ. Jena (Germany); **Toyohiko Yatagai**, Univ. of Tsukuba (Japan); **Maria J. Yzuel**, Univ. Autònoma de Barcelona (Spain)

Tuesday 15 August

Optics in Information Systems Technical Group Meeting

Marriott Rancho Las Palmas . . . Tues. 8:00 to 10:00 pm

Chair: **Bahram Javidi,** Univ. of Connecticut; **Demetri Psaltis,** California Institute of Technology

See p. 19 for futher information.

Wednesday 16 August

SESSION 1

Conv. Ctr. Room 10 . . . . . Wed. 8:00 to 11:10 am

3D Imaging Systems

Chair: **Jung-Young Son**, Hanyang Univ. (South Korea)

8:00 am: **Optimized integral imaging display by global pixel mapping *(Invited Paper)*,** M. Martinez-Corral, R. Martinez-Cuenca, G. Saavedra, Univ. de Valencia (Spain); B. Javidi, Univ. of Connecticut . . . . . [6311-01]

8:30 am: **LCD-based stereoscopic imaging system *(Invited Paper)*,** J. Son, Hanyang Univ. (South Korea); S. Kim, M. Park, Korea Institute of Science and Technology (South Korea); K. Cha, SAMSUNG Electronics Co., Ltd. (South Korea) . . . . . [6311-02]

9:00 am: **Real-time automated 3D visualization and recognition of biological microorganism *(Invited Paper)*,** B. Javidi, I. Moon, S. Yeom, Univ. of Connecticut . . . . . [6311-03]

9:30 am: **Integral image compression methods *(Invited Paper)*,** A. Stern, Ben-Gurion Univ. of the Negev (Israel); B. Javidi, Univ. of Connecticut . . . . . [6311-04]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Stereoscopic conversion of two-dimensional movie encoded in MPEG-2,** J. Kim, Y. Kim, J. Park, J. Kang, B. Lee, Seoul National Univ. (South Korea) . . . . . [6311-05]

10:50 am: **An algorithm for synthesizing elemental images using the line of sight in three-dimensional integral imaging,** Y. Kim, J. Bae, B. Lee, Seoul National Univ. (South Korea) . . . . . [6311-06]

SESSION 2

Conv. Ctr. Room 10 . . . . . Wed. 11:10 am to 12:20 pm

Optical Signal Processing I

Chair: **Maria J. Yzuel**, Univ. Autònoma de Barcelona (Spain)

11:10 am: **On the computation of the coherent point spread function using a low-complexity representation *(Invited Paper)*,** S. Bagheri, D. P. de Farias, G. Barbastathis, Massachusetts Institute of Technology; M. A. Neifeld, The Univ. of Arizona . . . . . [6311-07]

11:40 am: **An optical parallel processing for multiplier modulo using optical interferometer,** K. Nitta, O. Matoba, T. Yoshimura, Kobe Univ. (Japan) . . . . . [6311-08]

12:00 pm: **Spatial modulators exploiting a multiphonon light scattering in crystals,** A. S. Shcherbakov, E. Tepichín-Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); A. Aguirre Lopez, Univ. Technologica de la Mixteca (Mexico) . . . . . [6311-09]

Lunch/Exhibition Break . . . . . 12:20 to 1:40 pm

SESSION 3

Conv. Ctr. Room 10 . . . . . Wed. 2:00 to 3:30 pm

Digital Holography I

Chair: **Thomas J. Naughton**, National Univ. of Ireland/Maynooth (Ireland)

2:00 pm: **Measurement of compression defects in phase-shifting digital holographic data *(Invited Paper)*,** E. Darakis, Univ. of Strathclyde (United Kingdom); T. J. Naughton, National Univ. of Ireland/Maynooth (Ireland); J. J. Soraghan, Univ. of Strathclyde (United Kingdom); B. Javidi, Univ. of Connecticut . . . . . [6311-10]

2:30 pm: **Digital in-line holography of biological specimens,** J. P. Ryle, U. Gopinathan, S. McDonnell, National Univ. of Ireland/Dublin (Ireland); T. J. Naughton, National Univ. of Ireland/Maynooth (Ireland); J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland) . . . . . [6311-12]

2:50 pm: **Experimental synthesis of general complex fields using an amplitude modulator,** R. Ponce-Díaz, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); V. M. Arrizón, Instituto Nacional de Astrofísica, Optica y Electrónica (Mexico); J. C. Gutierrez-Vega, A. Serrano-Heredia, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) . . . . . [6311-13]

3:10 pm: **Single exposure recording of multiple holograms with an object-beam encoding,** W. K. Yang, G. L. Chen, Chung Cheng Institute of Technology (Taiwan); W. H. Wu, Sunsui Print & Graphic Ctr. (Taiwan); L. Tang, C. Chang, Chung Cheng Institute of Technology (Taiwan) [6311-14]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 4

Conv. Ctr. Room 10 . . . . . Wed. 4:00 to 5:10 pm

Optical Signal Processing II

Chair: **John T. Sheridan**, National Univ. of Ireland/Dublin (Ireland)

4:00 pm: **Spectral interference technique in stimulated parametric emission microscopy *(Invited Paper)*,** K. Itoh, K. Isobe, Osaka Univ. (Japan) . . . . . [6311-15]

4:30 pm: **Optical processor for solving the traveling salesman problem (TSP),** N. T. Shaked, T. Tabib, S. Gil, S. Messika, S. Dolev, J. Rosen, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6311-16]

4:50 pm: **Passive 3D imaging using polarimetric diversity *(Invited Paper)*,** F. A. Sadjadi, Lockheed Martin Corp. . . . . [6311-45]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Field lens 3D display: dual-layer LCDs enable to modulate orthogonal polarized illuminations,** K. Sakamoto, T. Nishida, Shimane Univ. (Japan) . . . . . [6311-36]

✔ **Active and interactive floating image display using holographic 3D images,** T. Morii, K. Sakamoto, Shimane Univ. (Japan) . . . . . [6311-37]

✔ **Information encryption with phase key by using single-exposure digital holography,** G. L. Chen, W. K. Yang, M. K. Kuo, C. Chang, Chung Cheng Institute of Technology (Taiwan) . . . . . [6311-38]

✔ **Pattern recognition with an adaptive phase-only joint transform correlator,** V. H. Diaz-Ramirez, V. Kober, J. Alvarez-Borrego, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6311-39]

✔ **Optical encryption system using quadrature multiplexing,** M. N. Islam, M. S. Alam, Univ. of South Alabama . . . . . [6311-40]

✔ **Collinear holography with magneto-optic spatial light modulator,** T. Imura, FDK Corp. (Japan); H. Koga, K. Okamoto, Toyohashi Univ. of Technology (Japan); P. Lim, Japan Science and Technology Agency (Japan) and Toyohashi Univ. of Technology (Japan); H. M. Umezawa, FDK Corp. (Japan); H. Horimai, OPTWARE Corp. (Japan); M. Inoue, Toyohashi Univ. of Technology (Japan) . . . . . [6311-41]

✔ **Fabrication and properties of spatial light modulator with magneto-optical Faraday effect,** K. Iwasaki, H. Kawai, Y. Suzuki, H. M. Umezawa, FDK Corp. (Japan); M. Inoue, Toyohashi Univ. of Technology (Japan) . . . . . [6311-42]

✔ **Fourier plane and optical processing for sub-pixel image registration,** T. J. Grycewicz, B. E. Evans, C. J. Florio, The Aerospace Corp.; T. Christian, Massachusetts Institute of Technology . . [6311-44]

Thursday 17 August

SESSION 5

Conv. Ctr. Room 10 . . . . . Thurs. 8:00 to 10:10 am

Digital Holography II

Chair: **Takanori Nomura**, Wakayama Univ. (Japan)

8:00 am: **One-shot digital holography by use of polarization *(Invited Paper)*,** T. Nomura, Wakayama Univ. (Japan); B. Javidi, Univ. of Connecticut; S. Murata, E. Nitanai, T. Numata, Wakayama Univ. (Japan) . . . . . [6311-18]

8:30 am: **Superresolution by the superposition of digital holograms *(Invited Paper)*,** B. M. Hennelly, National Univ. of Ireland/Maynooth (Ireland) and National Univ. of Ireland/Dublin (Ireland); T. J. Naughton, J. B. McDonald, National Univ. of Ireland/Maynooth (Ireland); Y. Frauel, Univ. Nacional Autónoma de México (Mexico); B. Javidi, Univ. of Connecticut . . . . . [6311-19]

9:00 am: **Reconstruction of digital holograms on tilted planes *(Invited Paper)*,** P. Ferraro II, Istituto Nazionale di Ottica Applicata (Italy); S. M. De Nicola, A. Finizio, G. Pierattini, Consiglio Nazionale delle Ricerche (Italy) . . . . . [6311-20]

9:30 am: **Digital holography and the Wigner distribution function,** B. M. Hennelly, National Univ. of Ireland/Maynooth (Ireland) and National Univ. of Ireland/Dublin (Ireland); T. J. Naughton, J. B. McDonald, National Univ. of Ireland/Maynooth (Ireland) . . . . . [6311-21]

9:50 am: **Reconstruction of partially occluded objects,** B. M. Hennelly, National Univ. of Ireland/Maynooth (Ireland) and National Univ. of Ireland/Dublin (Ireland); J. W. Maycock, C. P. Mc Elhinney, T. J. Naughton, J. B. McDonald, National Univ. of Ireland/Maynooth (Ireland); B. Javidi, Univ. of Connecticut . . . . . [6311-22]

Coffee Break . . . . . 10:10 to 10:40 am

SESSION 6

Conv. Ctr. Room 10 . . . . . Thurs. 10:40 am to 12:00 pm

Optical Security

Chair: **Osamu Matoba**, Kobe Univ. (Japan)

10:40 am: **Secure verification by multifactor optical validation *(Invited Paper)*,** B. Javidi, Univ. of Connecticut; M. S. Millán García-Varela, E. Pérez-Cabré, Univ. Politècnica de Catalunya (Spain) . . . . . [6311-23]

11:10 am: **Optical security based on three-dimensional phase object *(Invited Paper)*,** O. Matoba, K. Nitta, T. Yoshimura, Kobe Univ. (Japan) . . . . . [6311-24]

11:40 am: **A numerical analysis of double random phase encryption,** D. S. Monaghan, U. Gopinathan, National Univ. of Ireland/Dublin (Ireland); T. J. Naughton, National Univ. of Ireland/Maynooth (Ireland); J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland) . . . . . [6311-25]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 7

Conv. Ctr. Room 10 . . . . . Thurs. 1:30 to 4:10 pm

Optical Devices and Systems

Chair: **Alastair D. McAulay**, Lehigh Univ.

1:30 pm: **Multiplexed lenses written onto a liquid crystal display for increasing depth of focus *(Invited Paper)*,** J. Campos, Univ. Autònoma de Barcelona (Spain); C. C. Iemmi, Univ. de Buenos Aires (Argentina); M. J. Yzuel, J. C. Escalera, Univ. Autònoma de Barcelona (Spain) . . . [6311-26]

2:00 pm: **Design and optimization of the cubic phase pupil for the extension of the depth of field of task-based imaging systems,** S. Bagheri, Massachusetts Institute of Technology; P. E. X. Silveira, R. Narayanswamy, CDM Optics, Inc.; D. P. de Farias, Massachusetts Institute of Technology . . . . . [6311-27]

2:20 pm: **Hardware implementation of a high-throughput 64-PPM serial concatenated turbo decoder,** R. C. Shoup, MIT Lincoln Lab. . . . . [6311-28]

2:40 pm: **Concentrating laser pulses in space and time,** A. D. McAulay, Lehigh Univ. . . . . [6311-29]

Coffee Break . . . . . 3:00 to 3:30 pm

3:30 pm: **Seeing the unseen: a novel hybrid camera system for depth imaging with color information,** T. D. A. Prasad, K. Hartmann, W. Weihs, S. E. Ghobadi, A. Sluiter, Univ. Siegen (Germany) . . . . . [6311-30]

3:50 pm: **Programmable pixelated lens with long depth of focus for shape recovering applications,** L. A. Gonzalez Lopez, Univ. de Sonora (Mexico); V. M. Arrizón, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); A. Vera, Univ. de Sonora (Mexico) . . . . . [6311-31]

SESSION 8

Conv. Ctr. Room 10 . . . . . Thurs. 4:10 to 5:30 pm

Optical Target Detection

Chair: **Mohammad S. Alam**, Univ. of South Alabama

4:10 pm: **Automatic target detection in multiband imagery using stochastic expectation maximization,** M. Elbakary, M. S. Alam, Univ. of South Alabama . . . . . [6311-32]

4:30 pm: **Target detection in hyperspectral imagery using stable distribution analysis and one-dimensional fringe-adjusted joint transform correlation,** S. Ochilov, S. Mercan, M. S. Alam, Univ. of South Alabama . . . . . [6311-33]

4:50 pm: **Pattern recognition using maximum likelihood estimation and orthogonal subspace projection,** M. M. Islam, M. S. Alam, Univ. of South Alabama . . . . . [6311-34]

5:10 pm: **Target detection using principal component analysis and spectral angel mapper,** Z. Boz, M. S. Alam, Univ. of South Alabama . . . . . [6311-35]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC017 **Principles of Fourier Optics and Diffraction** (Gaskill) Mon. 14 Aug., 8:30 am to 5:30 pm

Tuesday-Thursday 15-17 August 2006 • Proceedings of SPIE Vol. 6312

Applications of Digital Image Processing XXIX

Conference Chair: **Andrew G. Tescher**, AGT Associates

Program Committee: **Bernard V. Brower**, Eastman Kodak Co.; **Wo L. Chang**, National Institute of Standards and Technology; **Mohammad F. Daemi**, The Univ. of Nottingham (United Kingdom); **Touradj Ebrahimi**, Emitall S.A. (Switzerland); **Robert A. Gonsalves**, Tufts Univ.; **Ali Habibi**, The Aerospace Corp.; **T. Russell Hsing**, Telcordia Technologies, Inc.; **C. C. J. Kuo**, Univ. of Southern California; **Catherine Lambert-Nebout**, Ctr. National d'Études Spatiales (France); **Andre J. Oosterlinck**, Katholieke Univ. Leuven (Belgium); **Sethuraman Panchanathan**, Arizona State Univ.; **John A. Saghri**, California Polytechnic State Univ.; **Pankaj N. Topiwala**, FastVDO LLC; **Mohan M. Trivedi**, Univ. of California/San Diego; **Mihaela van der Schaar**, Univ. of California/Los Angeles; **Bhaskaran Vasudev**, Epson Palo Alto Lab.

Monday 14 August

Plenary Presentation

Conv. Ctr. Room 8 . . . . . Mon. 9:20 to 10:30 am

From Signals to Sudoku: Reconstructions from Partial Information

Veit Elser, Cornell Univ.

See p. 8 for further information.

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 12 . . . . . Tues. 8:30 to 11:40 am

Image Models and Processing I

Chair: **Andrew G. Tescher**, AGT Associates

8:30 am: **Locally adaptive detection of differences in images,** H. H. Arsenault, Univ. Laval (Canada); P. Garcia-Martinez, Univ. de València (Spain); A. Gherabi, Univ. Laval (Canada) . . . . . [6312-01]

8:50 am: **One visual measure of muzzle flame image,** H. Wu, Nanchang Institute of Aeronautical Technology (China) . . . . . [6312-03]

9:10 am: **Resolution reduction and context-based image processing for retinal prosthesis,** G. A. Naghdy, Univ. of Wollongong (Australia) . . . . . [6312-04]

9:30 am: **Target detection by radial basis neural network filtering of spectral data,** T. G. Thomas, Jr., Univ. of South Alabama . . . . . [6312-07]

9:50 am: **Comparing multispectral image fusion methods,** Y. Lanir, M. Maltz, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6312-08]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **Discrete filters and transforms for digital image data analysis,** R. Sundaram, Gannon Univ. . . . . [6312-09]

11:00 am: **An overlap-invariant mutual information estimation method for image registration,** H. Chen, T. Lin, C. Hsieh, The Univ. of Texas at Arlington . . . . . [6312-10]

11:20 am: **MMW video sequence denoising and enhancement in concealed weapons detection application,** X. Wei, H. Chen, I. Ahmad, The Univ. of Texas at Arlington . . . . . [6312-11]

Lunch/Exhibition Break . . . . . 11:40 am to 1:30 pm

SESSION 2

Conv. Ctr. Room 12 . . . . . Tues. 1:30 to 4:40 pm

Image Coding and Structures

Chair: **Bhaskaran Vasudev**, Epson Palo Alto Lab.

1:30 pm: **Resolution scalable coding and region of interest access with three-dimensional SBHP algorithm,** Y. Liu, W. A. Pearlman, Rensselaer Polytechnic Institute . . . . . [6312-12]

1:50 pm: **Reduction of blocking artifacts using side information,** F. Kamisli, J. S. Lim, Massachusetts Institute of Technology . . . . . [6312-13]

2:10 pm: **Deinterlacing based on motion compensation with variable block sizes,** I. Kim, C. Lee, Yonsei Univ. (South Korea) . . . . . [6312-14]

2:30 pm: **An experimental comparison of block matching techniques for detection of moving objects,** N. S. Love, C. Kamath, Lawrence Livermore National Lab. . . . . [6312-15]

2:50 pm: **Hardware acceleration of the motion compensation algorithms in synthetic aperture radar (SAR) platforms,** F. E. Ortiz, Univ. of Delaware; J. P. Durbano, E. J. Kelmelis, EM Photonics, Inc.; D. Price, M. Bodnar, Univ. of Delaware . . . . . [6312-16]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Effective selection of tempo features for movie segmentation,** S. Lee, Univ. of Southern California; Y. Chen, Yuan Ze Univ. (Taiwan); C. H. Yeh, MAVs Lab., Inc. (Taiwan); C. C. J. Kuo, Univ. of Southern California . . . . . [6312-18]

4:00 pm: **Optimized rice coding algorithm of lossless and progressive near-lossless image compression,** C. Xie, Y. Su, Beihua Univ. (China) . . . . . [6312-19]

4:20 pm: **Application study of piecewise context-based adaptive binary arithmetic coding combined with modified LZC,** C. Xie, Y. Su, Beihua Univ. (China) . . . . . [6312-20]

Wednesday 16 August

SESSION 3

Conv. Ctr. Room 12 . . . . . Wed. 8:30 to 10:10 am

Imaging Security

Chair: **Touradj Ebrahimi**, École Polytechnique Fédérale de Lausanne (Switzerland) and Emitall S.A. (Switzerland)

8:30 am: **Recent advances in secure JPEG 2000,** V. Conan, Thales Group (France) . . . . . [6312-21]

8:50 am: **On the use of local features for image replica detection,** Y. Maret, F. Dufaux, T. Ebrahimi, École Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [6312-22]

9:10 am: **Securing image and video by luring,** D. Lecomte, Medialive (France) . . . . . [6312-23]

9:30 am: **Toward a secure JPEG,** F. Dufaux, T. Ebrahimi, Emitall S.A. (Switzerland) . . . . . [6312-24]

9:50 am: **Perceptually driven 3D distance metrics with application to watermarking,** G. Lavoué, Univ. Claude Bernard Lyon 1 (France); E. Drelie Gelasca, École Polytechnique Fédérale de Lausanne (Switzerland); F. Dupont, A. M. Baskurt, Univ. Claude Bernard Lyon 1 (France) . [6312-25]

Coffee Break . . . . . 10:10 to 10:40 am

SESSION 4

Conv. Ctr. Room 12 . . . . . Wed. 10:40 am to 12:00 pm

Wireless and Mobile Multimedia Systems

Chairs: **Mihaela van der Schaar**, Univ. of California/Davis; **Sungkwan Heo**, SAMSUNG Electronics Co., Ltd. (South Korea)

10:40 am: **Sparse superresolution reconstructions of video from mobile devices for broadcast applications,** O. G. Guleryuz, DoCoMo Communications Labs. USA, Inc. . . . . [6312-26]

11:00 am: **Intelligent video display to raise quality of experience on mobile devices,** C. Kim, Information and Communications Univ. (South Korea) . . . . . [6312-27]

11:20 am: **Effect of parameterization and joint layer control for video streaming over wireless network,** M. Pozhenko, J. Kim, S. Heo, S. Suh, J. Lee, SAMSUNG Electronics Co., Ltd. (South Korea) . . . . . [6312-28]

11:40 pm: **Game-theoretic resource management for wireless multimedia,** M. van der Schaar, H. Park, Univ. of California/Los Angeles . . . . . [6312-30]

Lunch/Exhibition Break . . . . . 12:00 to 2:00 pm

SESSION 5

Conv. Ctr. Room 12 . . . . . Wed. 2:00 to 5:30 pm

H.264/AVC and Applications

Chair: **Pankaj N. Topiwala**, FastVDO LLC

2:00 pm: **Status of the scalable video coding (SVC) project in JVT,** P. N. Topiwala, FastVDO LLC . . . . . [6312-31]

2:20 pm: **A fast mode decision algorithm in H.264,** , ... [6312-32]

2:40 pm: **Rate-adaptive H.264 video for information for global research (IFGR),** D. L. Hench, Air Force Research Lab.; P. N. Topiwala, W. Dai, FastVDO LLC . . . . . [6312-33]

3:00 pm: **Performance comparison of JPEG2000 vs. AVC/I-frame only coding,** L. Liu, T. D. Tran, P. N. Topiwala, FastVDO LLC . . . . . [6312-34]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **On comparing JPEG2000 and intraframe AVC,** T. Ebrahimi, Emitall S.A. (Switzerland) . . . . . [6312-35]

4:10 pm: **Patent-pool licensing of H.264/AVC,** L. A. Horn, MPEG LA, LLC . . . . . [6312-36]

4:30 pm: **An efficient H.264-based video encoder using multiscale recurrent patterns,** N. Rodrigues, Escola Superior de tecnologia e Gestão (Portugal) and Instituto de Telecomunicações (Portugal); E. Silva, Univ. Federal do Rio de Janeiro (Brazil); M. Carvalho, Univ. Federal Fluminense (Brazil); S. Faria, Escola Superior Tecnologia e Gestão (Portugal) and Instituto Politécnico de Leiria (Portugal); V. Silva, Univ. de Coimbra Polo II (Portugal) . . . . . [6312-37]

4:50 pm: **Quality analysis of requantization transcoding architectures for H.264/AVC,** S. Notebaert, J. De Cock, D. De Schrijver, K. De Wolf, R. Van de Walle, Univ. Gent (Belgium) . . . . . [6312-38]

5:10 pm: **Comparison of MPEG-2 and AVC coding on synthetic test materials,** C. P. Fenimore, National Institute of Standards and Technology . . . . . [6312-39]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Registration of large data sets for multimodal inspection,** G. Sheri, V. V. Vedula, GE Global Research (India); F. H. Little, General Electric Co. . . . . [6312-02]

✔ **Dual-views display: dual-layer LCDs enable high-resolution full-screen viewing,** K. Sakamoto, M. Yoshigi, Shimane Univ. (Japan) . . . . . [6312-53]

✔ **Pseudoscopic-free high-resolution lenticular 3D display,** M. Nishida, K. Sakamoto, Shimane Univ. (Japan) . . . . . [6312-55]

✔ **Passive ranging within a differential framework,** Q. Yang, L. Liu, H. Lang, Y. Zhu, W. Lu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6312-58]

✔ **Adaptive SDF filters for recognition of partially occluded objects,** A. J. González-Fraga, V. I. Kober, J. Álvarez-Borrego, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . [6312-61]

✔ **Detection and localization of degraded objects,** E. M. Ramos Michel, V. I. Kober, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6312-62]

✔ **Implementation of the DMV-based 3D target tracking and monitoring system,** J. Ko, Kwangwoon Univ. (South Korea); W. Ohm, Inha Technical College (South Korea) . . . . . [6312-63]

✔ **Stereo camera based intelligent UGV system for path planning and navigation,** J. Ko, Kwangwoon Univ. (South Korea); J. Lee, Inha Technical College (South Korea) . . . . . [6312-64]

✔ **Extraction of desirable details with adaptive rank-order filters,** S. Martinez Diaz, V. Kober, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6312-65]

✔ **Single encoder and decoder design for multiview video,** M. Kim, H. Kim, A. Ignatov, W. Son, Kangwon National Univ. (South Korea) . . . . . [6312-66]

✔ **A robust digital watermarking technique with improved performance under JPEG compression,** F. Fang, S. Tan, South Dakota State Univ. . . . . [6312-69]

✔ **A device for the color measurement and detection of spots on the skin,** J. M. Pladellorens, A. Pinto, J. Pujol, J. Segura, M. Vilaseca, Univ. Politècnica de Catalunya (Spain); J. Coll, Antonio Puig S.A. (Spain) . . . . . [6312-70]

✔ **Correlation pattern recognition: optimal parameters for quality control of chocolate covered marshmallow candy,** J. L. Flores, G. Garcia-Torales, A. G. Álvarez, J. Constante, Univ. de Guadalajara (Mexico) . . . . . [6312-72]

✔ **Aircraft route reconstruction by mutual information based image registration,** T. Lin, H. Chen, H. Hsiao, C. Hsieh, The Univ. of Texas at Arlington . . . . . [6312-73]

✔ **Resolution improvement of computationally reconstructed 3D images by use of intermediate elemental images,** J. Park, D. Hwang, D. Shin, E. Kim, Kwangwoon Univ. (South Korea) . . . . . [6312-75]

✔ **A simple SVC algorithm incorperated with the DMB video codec,** D. W. Kang, K. Jung, Kookmin Univ. (South Korea) . . . . . [6312-76]

✔ **A fast level set implementation method for image segmentation and object tracking,** S. Zhang, College of Staten Island/CUNY . [6312-77]

✔ **Image preprocessing for fast multiple-frame superresolution reconstruction,** S. Zhang, College of Staten Island/CUNY . [6312-78]

✔ **Stereovision-based 2D spatial map construction for a safe vehicle driving,** J. Ko, Kwangwoon Univ. (South Korea); J. Lee, Inha Technical College (South Korea) . . . . . [6312-79]

✔ **Theoretical optimization of artificial ice for Arctic seas,** T. V. Tulaikova, Institute of Geosphere's Dynamics (Russia); S. R. Amirova, Moscow Institute of Physics and Technology . . . . . [6312-80]

Thursday 17 August

SESSION 6

Conv. Ctr. Room 12 . . . . . Thurs. 9:00 to 10:00 am

MPEG-7 and Applications

Chair: **Wo L. Chang**, National Institute of Standards and Technology

9:00 am: **MPEG-7 multimedia-based query format,** W. L. Chang, National Institute of Standards and Technology . . . . . [6312-81]

9:20 am: **Using MPEG-7 audio descriptors for music querying,** M. Gruhne, Fraunhofer Institut Digitale Medientechnologie (Germany) . . . . . [6312-82]

9:40 am: **Recent advances in MPEG-7 cameras,** F. Dufaux, T. Ebrahimi, École Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [6312-40]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 7

Conv. Ctr. Room 12 . . . . . Thurs. 10:30 to 11:50 am

Image Models and Processing II

Chair: **John A. Saghri**, California Polytechnic State Univ.

10:30 am: **Exploitation of target shadows in synthetic aperture radar imagery for automatic target recognition,** J. A. Saghri, A. J. DeKelaita, California Polytechnic State Univ. . . . . [6312-41]

10:50 am: **Registration technique for close-range applications,** A. Habib, R. W. T. Cheng, Univ. of Calgary (Canada) . . . . . [6312-42]

11:10 am: **Fractal dimension based corneal fungal infection diagnosis,** M. Balasubramanian, Louisiana State Univ.; L. A. Perkins, Univ. of Southern Mississippi; R. W. Beuerman, S. S. Iyengar, Louisiana State Univ. . . . . [6312-43]

11:30 am: **Autonomous characterization of plastic-bonded explosives,** K. D. Linder, P. J. DeRego, S. Charles, C. W. Baumgart, Honeywell, Inc. . . . . [6312-44]

Lunch/Exhibition Break . . . . . 11:50 am to 1:40 pm

SESSION 8

Conv. Ctr. Room 12 . . . . . Thurs. 1:40 to 4:10 pm

Image Models and Processing III

Chair: **John A. Saghri**, California Polytechnic State Univ.

1:40 pm: **A Bayesian multiscale edge detection approach for water waves application,** A. P. Zeris, Aristotle Univ. of Thessaloniki (Greece) . . . . . [6312-46]

2:00 pm: **An ultrahigh-speed digitizer for the Harvard College Observatory astronomical plates,** R. J. Simcoe, Harvard-Smithsonian Ctr. for Astrophysics; E. J. Los, Harvard College Observatory; J. E. Grindlay, Harvard-Smithsonian Ctr. for Astrophysics; A. Doane, Harvard College Observatory; S. G. Laycock, D. J. Mink, Harvard-Smithsonian Ctr. for Astrophysics; G. Champine, A. P. Sliski, Harvard College Observatory . . . . . [6312-47]

2:20 pm: **Camera calibration and stability analysis for low-cost digital cameras,** A. Habib, Y. Wong, Univ. of Calgary (Canada) . . . . . [6312-48]

2:40 pm: **A hybrid spatiotemporal and Hough-based motion estimation approach applied to magnetic resonance cardiac images,** G. Cristóbal-Perez, N. Carranza, Consejo Superior de Investigaciones Científicas (Spain); F. Sroubek, Institute of Information Theory and Automation (Czech Republic); M. J. Ledesma, A. Santos, Univ. Politécnica de Madrid (Spain) . . . . . [6312-49]

Coffee Break . . . . . 3:00 to 3:30 pm

3:30 pm: **An improved version of DAS,** R. Raushan, A. K. Choubey, Jr., Dr. M.G.R. Educational and Research Institute (India) . . . . . [6312-50]

3:50 pm: **Image fusion with the multiscale Hermite transform,** B. Escalante-Ramírez, Univ. Nacional Autónoma de México (Mexico); A. A. López-Caloca, Ctr. de Investigación en Geografía y Geomática (Mexico) . . . . . [6312-51]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC661 **Applied Image Processing** (Iftekharuddin) Weds. 16 Aug., 8:30 am to 5:30 pm

Tuesday-Wednesday 15-16 August 2006 • Proceedings of SPIE Vol. 6313

Advanced Signal Processing Algorithms, Architectures, and Implementations XVI

Conference Chair: **Franklin T. Luk**, Rensselaer Polytechnic Institute

Program Committee: **Leon Cohen**, Hunter College/CUNY; **Michael Gabbay**, Information Systems Labs., Inc.; **Graham A. Jullien**, Univ. of Calgary (Canada); **Patrick J. Loughlin**, Univ. of Pittsburgh; **Victor P. Pauca**, Wake Forest Univ.; **Bruce W. Suter**, Air Force Research Lab.; **Alexandre F. Tenca**, Synopsys, Inc.; **William J. Williams**, Univ. of Michigan

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 13 . . . . . Tues. 8:30 to 10:30 am

Computer Arithmetic I

Chair: **Graham A. Jullien**, Univ. of Calgary (Canada)

8:30 am: **Optimization of spanning tree adders,** M. Ladha, M. Kandamani, E. E. Swartzlander, Jr., The Univ. of Texas at Austin [6313-01]

8:50 am: **Estimating adders for a low-density parity-check decoder,** B. Phillips, The Univ. of Adelaide (Australia) and Ctr. for High Performance Integrated Technologies and Systems (CHiPTec) (Australia) . . . [6313-02]

9:10 am: **16-bit Radix-4 continuous valued digit adder,** M. Mirhassani, M. A. Ahmadi, Univ. of Windsor (Canada); G. A. Jullien, Univ. of Calgary (Canada) . . . . . [6313-03]

9:30 am: **Residue systems efficiency for modular products summation: application to elliptic curves cryptography,** J. Bajard, Univ. Montpellier II (France); M. D. Ercegovac, Univ. of California/Los Angeles; N. Meloni, Univ. Montpellier II (France) . . . . . [6313-04]

9:50 am: **Multiplication by an integer constant in the double-base number system,** L. Imbert, Ctr. National de la Recherche Scientifique (France); V. S. Dimitrov, Univ. of Calgary (Canada) . . . . . [6313-05]

10:10 am: **Crosstalk in QCA arithmetic circuits,** F. Karim, K. Walus, A. Ivanov, The Univ. of British Columbia (Canada) . . . . . [6313-06]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 2

Conv. Ctr. Room 13 . . . . . Tues. 11:00 am to 12:00 pm

Computer Arithmetic II

Chair: **Alexandre F. Tenca**, Synopsys, Inc.

11:00 am: **New identities and transformations for hardware power operators,** R. Michard, École Normale Supérieure de Lyon (France); A. Tisserand, Univ. Montpellier II (France); N. Veyrat-Charvillon, École Normale Supérieure de Lyon (France) . . . . . [6313-07]

11:20 am: **Interconnection scheme for networks of online modules,** P. Dormiani, M. D. Ercegovac, Univ. of California/Los Angeles . . . [6313-08]

11:40 am: **Faster and smaller hardware implementation of XTR,** M. Neve, E. T. Peeters, G. Meurice de Dormale, J. Quisquater, Univ. Catholique de Louvain (Belgium) . . . . . [6313-09]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 3

Conv. Ctr. Room 13 . . . . . Tues. 1:30 to 2:10 pm

Computer Arithmetic III

Chair: **Alexandre F. Tenca**, Synopsys, Inc.

1:30 pm: **Reconfigurable architecture for the efficient solution of large-scale non-Hermitian eigenvalue problems,** F. E. Ortiz, Univ. of Delaware; J. R. Humphrey, J. P. Durbano, E. J. Kelmelis, EM Photonics, Inc.; D. Price, Univ. of Delaware . . . . . [6313-10]

1:50 pm: **FPGA-based neural network implementation using the CORDIC algorithm,** A. A. Liddicoat, L. Slivovsky, T. S. McLenegan, California Polytechnic State Univ. . . . . [6313-11]

SESSION 4

Conv. Ctr. Room 13 . . . . . Tues. 2:10 to 5:00 pm

Image Processing

Chair: **Victor P. Pauca**, Wake Forest Univ.

2:10 pm: **Total variation wavelet inpainting,** H. Zhou, Georgia Institute of Technology . . . . . [6313-12]

2:30 pm: **High-resolution iris image reconstruction from low-resolution imagery,** R. T. Barnard, Wake Forest Univ.; J. Chung, Emory Univ.; J. van der Gracht, HoloSpex, Inc.; J. Nagy, Emory Univ.; V. P. Pauca, R. J. Plemmons, Wake Forest Univ.; S. Prasad, Univ. of New Mexico; T. Torgerson, Wake Forest Univ.; G. Behrmann, EM Photonics Inc.; S. Mathews, M. Mirotznik, Catholic Univ. . . . . [6313-13]

2:50 pm: **Using mean squared error to assess visual image quality,** C. C. Beckner, Jr., Air Force Research Lab. . . . . [6313-14]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Modeling of image perception and discrimination by the visually impaired,** A. Ben-Guigui, U. Efron, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6313-15]

4:00 pm: **Alternative sculpting hypotheses for terrain data compression,** C. Westort, W. R. Franklin, Rensselaer Polytechnic Institute . . . . . [6313-16]

4:20 pm: **Compressing terrain datasets using segmentation,** W. R. Franklin, M. Inanc, Rensselaer Polytechnic Institute . . . . . [6313-17]

4:40 pm: **Automated pattern recognition in hyperspectral imagery using linear mixing model and vertex component analysis,** N. Haq, E. Sarigul, M. S. Alam, Univ. of South Alabama . . . . . [6313-18]

Wednesday 16 August

SESSION 5

Conv. Ctr. Room 13 . . . . . Wed. 8:40 to 10:00 am

Implementation

Chair: **Michael Gabbay**, Information Systems Labs., Inc.

8:40 am: **Phase unwrapping of self-mixing signals observed in optical feedback interferometry for displacement measurement,** J. Xi, Univ. of Wollongong (Australia); Y. Yu, Zhengzhou Univ. (China); J. F. Chicharo, Univ. of Wollongong (Australia) . . . . . [6313-19]

9:00 am: **New fast algorithm for the numerical computation of quadratic-phase integrals,** J. J. Healy, J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland) . . . . . [6313-20]

9:20 am: **Performance of nonlinear littoral acoustic beamformer,** N. F. Rulkov, M. L. Larsen, M. Gabbay, Information Systems Labs., Inc.; L. S. Tsimring, Univ. of California/San Diego . . . . . [6313-21]

9:40 am: **Model-based detection and localization of underwater electromagnetic transient signals,** M. L. Larsen, M. Gabbay, Information Systems Labs., Inc. . . . . [6313-22]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 13 . . . . . Wed. 10:30 to 11:50 am

Time Frequency I

Chairs: **Leon Cohen**, Hunter College/CUNY; **Patrick J. Loughlin**, Univ. of Pittsburgh; **William J. Williams**, Univ. of Michigan

10:30 am: **Modulation decompositions for broadband signals,** L. E. Atlas, S. M. Schimmel, Univ. of Washington . . . . . [6313-24]

10:50 am: **Time-frequency analysis of quantum noise,** L. Cohen, Hunter College/CUNY . . . . . [6313-25]

11:10 am: **Application of time-frequency analysis methods to speaker verification,** W. J. Williams, Quantum Signal LLC; R. W. Bossemeyer, Speech Technology Applied Research, Inc . . . . . [6313-26]

11:30 am: **Visual detection of transients,** L. Galleani, Politecnico di Torino (Italy); L. Cohen, Hunter College/CUNY; D. J. Nelson, U.S. Dept. of Defense . . . . . [6313-27]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 7

Conv. Ctr. Room 13 . . . . . Wed. 1:30 to 5:00 pm

Time Frequency II

Chairs: **Leon Cohen**, Hunter College/CUNY; **Patrick J. Loughlin**, Univ. of Pittsburgh; **William J. Williams**, Univ. of Michigan

1:30 pm: **Time-frequency decomposition based on information,** S. Aviyente, Michigan State Univ. . . . . [6313-28]

1:50 pm: **Time-frequency approximations with applications to filtering, modulation, and propagation,** P. J. Loughlin, Univ. of Pittsburgh[6313-29]

2:10 pm: **High-resolution spectral analysis,** D. J. Nelson, D. C. Smith, U.S. Dept. of Defense . . . . . [6313-30]

2:30 pm: **Analysis of fault propagation in high-voltage tranmission lines via time-frequency analysis,** Y. Shin, P. Crapse, J. J. Wang, Univ. of South Carolina . . . . . [6313-31]

2:50 pm: **On the development of a linear alternative approach to the Wigner distribution,** G. Cristóbal-Perez, S. Gabarda, Consejo Superior de Investigaciones Científicas (Spain) . . . . . [6313-32]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Multi-carrier wireless systems and evolutionary spectrum,** L. F. Chaparro, Univ. of Pittsburgh; A. Akan, Istanbul Univ. (Turkey); S. Senay, Univ. of Pittsburgh . . . . . [6313-33]

4:00 pm: **Characterization of time-varying channels,** D. L. Hench, Air Force Research Lab.; L. Galleani, Politecnico di Torino (Italy); L. Cohen, Hunter College/CUNY . . . . . [6313-34]

4:20 pm: **A novel signal detection technique based on generalized scale transforms,** R. Nickel, The Pennsylvania State Univ. . . . [6313-35]

4:40 pm: **Exploring new signal representations,** B. W. Suter, Air Force Research Lab. . . . . [6313-36]

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Photorefractive Fiber and Crystal Devices: Materials, Optical Properties, and Applications XII

Conference Chairs: **Francis T. S. Yu**, **Ruyan Guo**, **Shizhuo S. Yin**, The Pennsylvania State Univ.

Program Committee: **Partha P. Banerjee**, Univ. of Dayton; **Arthur E. T. Chiou**, National Yang Ming Univ. (Taiwan); **Kung-Li Deng**, GE Global Research; **Venkatraman Gopalan**, The Pennsylvania State Univ.; **Joseph Grant**, NASA Marshall Space Flight Ctr.; **Ken Yuh Hsu**, National Chiao Tung Univ. (Taiwan); **Tracy D. Hudson**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Suganda Jutamulia**, Consultant; **Eckhard Kratzig**, Univ. Osnabrück (Germany); **John S. Kruger**, U.S. Army Research Office; **Nickolai V. Kukhtarev**, Alabama A&M Univ.; **Byoungho Lee**, Seoul National Univ. (South Korea); **Shiuan Huei Lin**, National Chiao Tung Univ. (Taiwan); **Zhiwen Liu**, The Pennsylvania State Univ.; **Sergei F. Lyuksyutov**, Univ. of Akron; **Karl M. Reichard**, The Pennsylvania State Univ.; **Gérald Roosen**, Univ. Paris-Sud II (France); **Paul B. Ruffin**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Ching-Cherng Sun**, National Central Univ. (Taiwan); **Bo Wang**, Agilent Technologies; **Xiang Zhang**, Univ. of California/Berkeley

Tuesday 15 August

Optical Materials and Optics Fabrication Technical Group Meeting

Marriott Torrance . . . . . Tues. 8:00 to 10:00 pm

Chair: **Francis T.S. Yu**, The Pennsylvania State Univ.

Cochairs: **Walter Czajkowski,** Edmund Optics; **Ruyan Guo**, The Pennsylvania State Univ.

See p. 19 for further information.

Wednesday 16 August

SESSION 1

Conv. Ctr. Room 14A . . . . . Wed. 8:00 to 9:50 am

Materials Aspects and Properties I

Chair: **Ruyan Guo**, The Pennsylvania State Univ.

8:00 am: **Efficient local fixing of photorefractive polymer holograms recorded with CW and pulsed beams *(Invited Paper)*,** G. Li, M. Eralp, College of Optical Sciences/The Univ. of Arizona; P. Wang, Nitto Denko Technical Corp.; J. Thomas, S. Tay, R. A. Norwood, College of Optical Sciences/The Univ. of Arizona; M. Yamamoto, Nitto Denko Technical Corp.; N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona . . . . . [6314-01]

8:30 am: **Distinction between deterministic and random beam fanning in photorefractive materials,** P. P. Banerjee, A. M. Venkataraman, Univ. of Dayton . . . . . [6314-02]

8:50 am: **Pulsed electrophoresis generated by photogalvanic and pyroelectric effect,** N. V. Kukhtarev, T. V. Kukhtareva, D. E. Edwards, F. Okafor, J. Jones, Alabama A&M Univ. . . . . [6314-03]

9:10 am: **Patterning of ferroelectric volume domains in lithium niobate crystals with the help of photorefractive space-charge fields,** F. Kalkum, H. A. Eggert, K. Buse, Univ. Bonn (Germany) . . . . . [6314-04]

9:30 am: **Measuring phase contribution to population dynamic gratings recorded in Er-doped fiber with saturable absorption,** S. Stepanov, E. Hernandez, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6314-05]

Coffee Break . . . . . 9:50 to 10:20 am

SESSION 2

Conv. Ctr. Room 14A . . . . . Wed. 10:20 to 11:50 am

Materials Aspects and Properties II

Chair: **Partha P. Banerjee**, Univ. of Dayton

10:20 am: **Calculated simulation of supercontinuum generation in nanofiber *(Invited Paper)*,** G. Feng, P. Ying, Sichuan Univ. (China); R. R. Gattass, E. Mazur, Harvard Univ. . . . . [6314-06]

10:50 am: **Doped photopolymers for volume holographic applications,** S. H. Lin, K. Y. Hsu, National Chiao Tung Univ. (Taiwan) . . . . . [6314-07]

11:10 am: **Multilevel photorefractivity in doped sillenite crystals,** K. Y. Hsu, S. H. Lin, National Chiao Tung Univ. (Taiwan); V. Marinova, Bulgarian Academy of Sciences (Bulgaria) . . . . . [6314-08]

Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

SESSION 3

Conv. Ctr. Room 14A . . . . . Wed. 1:00 to 3:10 pm

Fiber Optic Gyros I

Chair: **Paul B. Ruffin**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

1:00 pm: **Fiber optic gyroscopes and the accomplishments of the GPS guidance package (GGP) program *(Invited Paper)*,** V. C. Lefevre, U.S. Army Aviation and Missile Command . . . . . [6314-10]

1:30 pm: **Saluting Vali and Shorthill for the FOG concept *(Invited Paper)*,** S. Ezekiel, Massachusetts Institute of Technology . . . . [6314-11]

2:00 pm: **Progress in noise reduction in fiber optic gyroscopes *(Invited Paper)*,** W. Burns, Photonic Systems, Inc. . . . . [6314-12]

2:30 pm: **Polarization analysis of crossover-free fiber optic gyroscope sensor coils,** A. Lompado, Polaris Sensor Technologies, Inc.; J. S. Baeder, L. C. Heaton, Morgan Research Corp.; P. B. Ruffin, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6314-13]

2:50 pm: **Development of crossover-free fiber optic gyroscope sensor coils,** J. S. Baeder, L. C. Heaton, Morgan Research Corp.; P. B. Ruffin, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6314-14]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 4

Conv. Ctr. Room 14A . . . . . Wed. 3:30 to 5:30 pm

Fiber Optic Gyros II

Chair: **Shizhuo S. Yin**, The Pennsylvania State Univ.

3:30 pm: **Fiber optic gyros: the vision realized *(Invited Paper)*,** G. A. Pavlath, Northrop Grumman Corp. . . . . [6314-15]

4:00 pm: **Early work on fiber optic gyro technology at McDonnell Douglas and spin offs leading to acoustic intrusion sensing, distributed sensing, and a secure fiber optic communication system *(Invited Paper)*,** E. Udd, Blue Road Research . . . . . [6314-16]

4:30 pm: **Optical fiber placement for crossover-free fiber optic gyros,** M. Williams, Morgan Research Corp. . . . . [6314-17]

4:50 pm: **Components for IFOG-based inertial measurement units using active and passive polymer materials,** P. R. Ashley, M. G. Temmen, U.S. Army Aviation and Missile Command; W. Diffey, U.S. Army Research, Development and Engineering Command; M. Sanghadasa, The Univ. of Alabama in Huntsville; M. D. Bramson, G. A. Lindsay, A. J. Guenthner, Naval Air Warfare Ctr. . . . . [6314-18]

5:10 pm: **Role of Ru in electrochromic effect during domain-inversion in LiNbO3 crystals,** D. Liu, Y. Zhi, A. Yan, Z. Luan, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-19]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Diffraction characteristics of volume holographic gratings with finite size for the ultrashort pulsed-beam readout,** C. Wang, L. Liu, A. Yan, D. Liu, Z. Hu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-39]

✔ **Role of hole in the process of photorefractive grating erasure,** R. Zhu, D. Liu, Y. Guo, Z. Chai, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-40]

✔ **Optimization of fixed diffraction efficiency for $LiNbO_3$:Cr:Cu crystal by optimal switching time,** Y. Guo, L. Yang, D. Liu, Z. Chai, R. Zhu, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) [6314-41]

✔ **Influence of light intensity on formation of crossed-beam photorefractive gratings in doubly doped $LiNbO_3$ crystals,** X. Wang, L. Liu, A. Yan, Z. Luan, Z. Hu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-42]

✔ **Investigation for the high recording sensitivity with two center recording in $LiNbO_3$:Fe:Ru crystals,** Z. Chai, D. Liu, R. Zhu, Y. Zhi, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) [6314-43]

✔ **Design of photorefractive volume holographic cylindrical lenses with different recording and readout wavelengths,** Z. Hu, A. Yan, D. Liu, W. Qu, X. Wang, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-44]

✔ **Time-dependent physical response during photorefractive grating formation at large modulation,** D. Li, L. Liu, D. Liu, A. Yan, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-45]

✔ **Wavefront conversion by 90-degree geometry volume holograms between plane and spherical waves,** A. Yan, L. Liu, D. Liu, Y. Zhou, Z. Luan, Shanghai Institute of Optics and Fine Mechanics (China)[6314-46]

✔ **Domain inversion and electrochromism in congruent RuO_2:$LiNbO_3$ crystal,** Y. Zhi, D. Liu, W. Qu, Y. Zhou, Z. Luan, Z. Chai, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6314-47]

✔ **Double infrared dynamic holographic interferometry on CdTe crystals based on beam coupling and photo EMF,** N. V. Kukhtarev, T. V. Kukhtareva, P. P. Land, Alabama A&M Univ.; T. W. Murray, Boston Univ.; Y. P. Gnatenko, Institute of Physics (Ukraine) . . . . . [6314-48]

✔ **Analysis of TIR holography using pseudo-Fourier modal analysis method,** H. Kim, S. Kim, B. Lee, Seoul National Univ. (South Korea) . . . . . [6314-49]

✔ **Projected fringe profilometry using a supercontinum light illumination for microscale measurements,** W. Su, C. Huang, National Sun Yat-Sen Univ. (Taiwan) . . . . . [6314-50]

✔ **Computer-generated holograms for creating three-dimensional images using a LCSLM,** M. Hsieh, National Taiwan Normal Univ. (Taiwan) . . . . . [6314-51]

✔ **Effects of surface particle size of photopolymerizable silica glasses in holographic recording,** M. Hsu, Chinese Military Academy (Taiwan) and National Cheng Kung Univ. (Taiwan); S. Cheng, Y. Ouyang, P. Lee, J. Song, C. Chu, Chinese Military Academy (Taiwan); F. Yen, National Cheng Kung Univ. (Taiwan) . . . . . [6314-52]

✔ **Quantitatively analyze the performance of an all-fiber electronically tunable wavelength filter with a four-layer model,** S. S. Yin, Q. Zhang, J. E. Lee, Q. Chen, K. M. Reichard, The Pennsylvania State Univ. . . . . [6314-53]

✔ **An investigation on fiber optic gyroscopes using microstructured fibers,** S. S. Yin, The Pennsylvania State Univ.; P. B. Ruffin, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; C. Luo, General Opto Solutions, LLC . . . . . [6314-54]

✔ **An all-fiber optical phased array for ultrafast beam scanning,** S. S. Yin, J. Kim, The Pennsylvania State Univ.; P. B. Ruffin, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; C. Luo, General Opto Solutions, LLC . . . . . [6314-55]

✔ **Detecting population grating in Er-doped optical fiber via transient fluorescence excited by vibrating interference pattern,** S. Stepanov, E. Hernandez, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6314-56]

✔ **Miniature optical fiber sensor for dynamic pressure measurements under high background pressure,** X. Wang, J. Xu, K. L. Cooper, A. Wang, Virginia Polytechnic Institute and State Univ. . . . . [6314-58]

✔ **A new speckle-based hologram multiplexing recording technique,** H. Liu, J. Y. Fu, M. Gu, R. Guo, A. S. Bhalla, The Pennsylvania State Univ. . . . . [6314-59]

✔ **Single-beam holographic using anisotropic self-diffraction,** P. Buranasiri, P. P. Banerjee, Univ. of Dayton . . . . . [6314-60]

✔ **Minimum digital system emulated by a reconfigurable single-lens holographic memory,** E. Rodriguez-Vázquez, H. Zuñiga, A. Castro, J. D. Sánchez-de-la-Llave, E. Tepichín-Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6314-61]

✔ **Synthesizing planar holographic Bragg reflectors with layer-peeling algorithm,** S. Cheng, M. Hsu, Y. Ouyang, Chinese Military Academy (Taiwan) . . . . . [6314-62]

✔ **Phase-locked collinear holography,** X. Tan, H. Horimai, OPTWARE Corp. (Japan) and Japan Science and Technology Agency (Japan); P. Lim, Toyohashi Univ. of Technology (Japan) and Japan Science and Technology Agency (Japan); M. Inoue, Toyohashi Univ. of Technology (Japan) . . . . . [6314-63]

✔ **Fabricating harsh environment fiber gratings by ultrafast laser pulses,** S. S. Yin, C. Zhan, Y. Zhu, The Pennsylvania State Univ. . . . . [6314-64]

✔ **Investigate the doped magnetic garnets and their applications to ultrafast switching,** S. S. Yin, S. Kang, Y. Zhu, Q. Li, V. Adyam, The Pennsylvania State Univ. . . . . [6314-65]

✔ **IR and THz generations by ultrafast laser pulses,** S. S. Yin, J. Kim, F. Wu, P. Li, Z. Liu, The Pennsylvania State Univ. . . . . [6314-66]

✔ **An investigation on the recent advance of solid state lighting for entertainment, film, and studio lighting,** J. Huang, Tianjin Audio/Video Institute (China) . . . . . [6314-67]

✔ **Measurements of the piezoelectric and electrostrictive properties of zinc oxide single-crystal microtubes,** J. Y. Fu, H. Liu, J. H. Wang, J. Cheng, A. S. Bhalla, R. Guo, The Pennsylvania State Univ. . . [6314-68]

✔ **Resolution-enhanced position sensing with volume holographic optical element,** Y. Yu, T. Teng, C. Sun, National Central Univ. (Taiwan) . . . . . [6314-69]

✔ **Influence of photorefractive effect on optical parametric oscillator's properties in periodically poled Mg-doped stoichiometric lithium tantalate,** Y. Liu, National Institute for Materials Science (Japan) and AstronauticsNational Institute for Materials Science (Japan); S. Kurimura, M. Nakamura, S. Takekawa, K. Kitamura, National Institute for Materials Science (Japan) . . . . . [6314-70]

✔ **Theoretical study of time-varying diffraction and transmission of a photorefractive grating illuminated by a femtosecond pulse,** X. Yan, Shanghai Univ. (China) . . . . . [6314-71]

Thursday 17 August

SESSION 5

Conv. Ctr. Room 14A . . . . . Thurs. 8:30 to 10:00 am

Wave Mixing and Devices I

Chair: **Ken Yuh Hsu**, National Chiao Tung Univ. (Taiwan)

8:30 am: **Magneto-optic spatial light modulators for collinear holography *(Invited Paper)*,** M. Inoue, Toyohashi Univ. of Technology (Japan); P. Lim, Japan Science And Technology Agency (Japan); H. M. Umezawa, T. Imura, FDK Corp. (Japan); H. Horimai, OPTWARE Corp. (Japan) . . . . . [6314-20]

9:00 am: **An optimal design for volume holographic optical disc without pixel misregistration,** T. Teng, C. Chen, C. Wu, C. Sun, National Central Univ. (Taiwan) . . . . . [6314-21]

9:20 am: **A critical analysis of propagation through optically induced photonic bandgap structures in photorefractive materials,** K. M. Pasala, P. P. Banerjee, Univ. of Dayton . . . . . [6314-23]

9:40 am: **High-frequency photorefractive amplification for ATR applications,** R. M. Kurtz, A. O. Okorogu, J. Piranian, T. C. Forrester, T. P. Jannson, Physical Optics Corp. . . . . [6314-24]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 14A . . . . . Thurs. 10:30 am to 12:00 pm

Wave Mixing and Devices II

Chair: **Byoungho Lee**, Seoul National Univ. (South Korea)

10:30 am: **Projected fringe profilometry using a $LiNbO_3$ crystal for large-scale measurements *(Invited Paper)*,** W. Su, W. Chen, J. Huang, C. Kuo, National Sun Yat-Sen Univ. (Taiwan) . . . . . [6314-25]

11:00 am: **A review on the recent advances of an all-fiber electronically tunable wavelength filter,** S. S. Yin, Q. Zhang, J. E. Lee, Q. Chen, K. M. Reichard, J. S. Mazurowski, D. H. Ditto, The Pennsylvania State Univ.; M. Hackert, Naval Air Systems Command . . . . . [6314-26]

11:20 am: **Low-cost multimode fiber Mach Zehnder interferometer for differential phase demodulation,** Y. K. Lize, R. Kashyap, École Polytechnique de Montréal (Canada) . . . . . [6314-27]

11:40 am: **Single-mode volume waveguides in ferroelectrics written by bright soliton beams: toward 3D integrated circuits,** E. Fazio, F. Pettazzi, G. Leahu, M. Alonzo, Univ. degli Studi di Roma/La Sapienza (Italy); M. Chauvet, Univ. de Franche-Comté (France); A. Petris, V. I. Vlad, Institutul National pentru Fizica Laserilor, Plasmei si Radiatiei (Romania); N. Argiolas, M. Bazzan, P. Mazzoldi, C. Sada, Univ. degli Studi di Padova (Italy) . . . . . [6314-28]

Lunch Break . . . . . 12:00 to 1:30 pm

SESSION 7

Conv. Ctr. Room 14A . . . . . Thurs. 1:30 to 3:20 pm

Materials and Applications

Chair: **Karl M. Reichard**, The Pennsylvania State Univ.

1:30 pm: **Acousto-optic crystal devices for beam control of powerful lasers *(Invited Paper)*,** S. V. Kulakov, St. Petersburg State Univ. of Aerospace Instrumentation (Russia); Y. G. Gradoboev, Y. M. Mokrushin, St.-Petersburg State Polytechnical Univ. (Russia); O. V. Shakin, A.F. Ioffe Physico-Technical Institute (Russia); V. V. Kludzin, St.-Petersburg State Univ. of Information Technologies, Mechanics and Optics (Russia)[6314-29]

2:00 pm: **Optimal design of integrated acousto-optic tunable filters based on investigation of SAW in acoustic waveguide,** J. Yang, H. Xu, Tianjin Univ. (China) . . . . . [6314-30]

2:20 pm: **Surface plasmon resonance diffractive optics for polymer/metal structures,** B. Lee, H. Kim, K. Choi, Y. Lim, S. Kim, Seoul National Univ. (South Korea) . . . . . [6314-31]

2:40 pm: **Photonic crystal fiber with Er^{3+}-Tm^{3+} codoped tellurite glass for broadband optical amplifier in 1550 nm,** E. F. Chillcce, C. M. B. Cordeiro, E. Rodriguez, C. H. Brito Cruz, C. L. Cesar, L. C. Barbosa, Univ. Estadual de Campinas (Brazil) . . . . . [6314-32]

3:00 pm: **Microwave electrooptic coefficient and modulation applications using ferroelectric single-crystal fibers,** C. Huang, J. Taylor, A. S. Bhalla, R. Guo, The Pennsylvania State Univ. . . . . [6314-33]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 8

Conv. Ctr. Room 14A . . . . . Thurs. 3:50 to 5:20 pm

Harsh Environment Fiber Sensors

Chair: **Kung-Li Deng**, GE Global Research

3:50 pm: **A review on harsh environment fiber optic sensing networks for bridge structural fatigue monitoring *(Invited Paper)*,** Y. Zhu, W. Chen, S. Huang, Chongqing Univ. (China) . . . . . [6314-34]

4:20 pm: **Sapphire-fiber-based high-temperature sensor for harsh environment,** J. Wu, K. Deng, A. A. Briceno, B. K. Lee, GE Global Research . . . . . [6314-35]

4:40 pm: **Feasibility study of optical fiber distributed temperature sensing (DTS) system based on Raman backscattering effect in harsh environment,** B. K. Lee, K. Deng, J. Wu, A. A. Briceno, K. McCarthy, GE Global Research . . . . . [6314-36]

5:00 pm: **Temperature-dependent fiber optic gas sensor response characteristics,** H. Xia, K. Deng, K. Bouseman, K. Borst, J. Wu, B. K. Lee, R. Guida, K. McCarthy, GE Global Research . . . . . [6314-37]

Optical Instrumentation

Program on **Mathematical Methods**

Program Chair: **Gerhard X. Ritter,** Univ. of Florida

Conferences

6315 **Mathematics of Data/Image Pattern Recognition, Compression, and Encryption with Applications** *(Ritter/Schmalz/Barrera/Astola)*, p. 121

6316 **Image Reconstruction from Incomplete Data IV** *(Bones/Fiddy/Millane)*, p. 123

Courses

Register for Courses onsites at the SPIE Registration Desk!

SC661 **Applied Image Processing** (Iftekharuddin), 8:30 am to 5:30 pm

Special Events

Sunday	Monday	Tuesday	Wednesday	Thursday
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13		
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

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Mathematics of Data/Image Pattern Recognition, Compression, and Encryption with Applications

Conference Chairs: **Gerhard X. Ritter**, Univ. of Florida; **Mark S. Schmalz**, Univ. of Florida; **Junior Barrera**, Univ. de São Paulo (Brazil); **Jaakko T. Astola**, Tampere Univ. of Technology (Finland)

Tuesday 15 August

Introductory Remarks . . . . . Tues. 8:30 to 8:35 am

Chair: **Mark S. Schmalz**, Univ. of Florida

SESSION 1

Conv. Ctr. Room 18 . . . . . Tues. 8:35 to 10:15 am

Compression

Chair: **Mark L. Fowler**, Binghamton Univ.

8:35 am: **Biorthogonal wavelets of maximum coding gain through pseudoframes for subspaces,** M. A. Herman, Univ. of California at Davis . . . . . [6315-01]

9:00 am: **A piecewise affine prediction scheme for dynamic 3D mesh compression,** K. B. Mammou, T. B. Zaharia, F. J. Prêteux, Institut National des Télécommunications (France) . . . . . [6315-02]

9:25 am: **Fractal boundary coding for object-based compression,** M. S. Schmalz, Univ. of Florida . . . . . [6315-03]

9:50 am: **Two-pass hexagonal motion estimation algorithm for video coding,** Y. Wu, The Univ. of Reading (United Kingdom) . . . . . [6315-04]

Coffee Break . . . . . 10:15 to 10:35 am

SESSION 2

Conv. Ctr. Room 18 . . . . . Tues. 10:35 to 11:50 am

Compressive Processing

Chair: **Mark S. Schmalz**, Univ. of Florida

10:35 am: **Perspectives on data compression for estimations from remote sensors,** M. L. Fowler, Binghamton Univ. . . . . [6315-05]

11:00 am: **Exploiting data compression methods for network-level management of multisensor systems,** M. L. Fowler, M. Chen, Binghamton Univ. . . . . [6315-06]

11:25 am: **A model utilizing artificial neural network for perceptual image quality assessment in image compression algorithms,** K. Fliegel, Czech Technical Univ. in Prague (Czech Republic) . . . . . [6315-07]

Lunch/Exhibition Break . . . . . 11:50 am to 1:45 pm

SESSION 3

Conv. Ctr. Room 18 . . . . . Tues. 1:45 to 3:00 pm

Watermarking and Authentication

Chair: **James F. Scholl**, College of Optical Sciences/The Univ. of Arizona

1:45 pm: **Use of adaptive models in watermark identification,** L. McLauchlan, M. Mehrubeoglu, Texas A&M Univ. . . . . [6315-08]

2:10 pm: **Data payload optimality: a key issue for video watermarking applications,** M. P. Mitrea, S. A. Duta, F. J. Prêteux, Institut National des Télécommunications (France); A. Vlad, Univ. Politehnica Bucuresti (Romania) . . . . . [6315-09]

2:35 pm: **Quantization index modulation based watermarking using holography,** O. E. Okman, G. Bozdagi Akar, Middle East Technical Univ. (Turkey) . . . . . [6315-10]

Coffee Break . . . . . 3:00 to 3:30 pm

Introductory Remarks . . . . . Tues. 3:30 to 3:35 pm

Chair: **Gerhard X. Ritter**, Univ. of Florida

SESSION 4

Conv. Ctr. Room 18 . . . . . Tues. 3:35 to 5:15 pm

Pattern Recognition and Image Processing

Chair: **Junior Barrera**, Univ. de São Paulo (Brazil)

3:35 pm: **The synaptic morphological perceptron,** D. S. Myers, Sandia National Labs. . . . . [6315-12]

4:00 pm: **The optimum estimation of statistical signals based on systematic expression of many types of sample arrays in multidimensional space,** Y. Kida, Ohu Univ. (Japan); T. Kida, Nihon Univ. (Japan) . . . . . [6315-13]

4:25 pm: **New camera calibration algorithm using a robust estimation of the perspective projection matrix,** R. Guerchouche, F. Coldefy, France Telecom R&D (France) . . . . . [6315-14]

4:50 pm: **A method of support vectors with a composite step for reconstruction of the images distorted by a linear operator,** N. Shcherbakova, V. Fazylov, Kazan State Univ. (Russia) . . . . . [6315-15]

Wednesday 16 August

Introductory Remarks . . . . . Tues. 8:15 to 8:20 am

Chair: **Junior Barrera**, Univ. de São Paulo (Brazil)

SESSION 5

Conv. Ctr. Room 18 . . . . . Wed. 8:20 to 9:35 am

Multi- and Hyperspectral Image Analysis

Chair: **Gerhard X. Ritter**, Univ. of Florida

8:20 am: **Optimizing clutter mitigation for automated feature extraction in multispectral images,** N. R. Harvey, S. J. Perkins, Los Alamos National Lab. . . . . [6315-16]

8:45 am: **Hyperspectral feature classification with alternate wavelet transform representations,** J. F. Scholl, College of Optical Sciences/The Univ. of Arizona; E. L. Dereniak, College of Optical Sciences /The Univ. of Arizona; E. K. Hege, MKS Imaging Technology, LLC and The Univ. of Arizona/Steward Observatory . . . . . [6315-18]

9:10 am: **Figure of merit calculations for spectral unmixing algorithms,** J. F. Scholl, E. L. Dereniak, College of Optical Sciences/Univ. of Arizona; E. K. Hege, MKS Imaging Technology, LLC and The Univ. of Arizona/Steward Observatory . . . . . [6315-19]

SESSION 6

Conv. Ctr. Room 18 . . . . . Wed. 9:35 to 10:25 am

Image Segmentation and Understanding

Chair: **Jaakko T. Astola**, Tampere Univ. of Technology (Finland)

9:35 am: **Region-based statistical segmentation using informational active contours,** N. F. Rougon, A. Discher, F. J. Prêteux, Institut National des Télécommunications (France) . . . . . [6315-20]

10:00 am: **Segmentation of multiple motion textures using mixed-state Markov random fields,** T. E. Crivelli, B. Cernuschi-Frias, Univ. de Buenos Aires (Argentina); P. Bouthemy, IRISA (France) . . . . . [6315-23]

Coffee Break . . . . . 10:25 to 10:55 am

SESSION 7

Conv. Ctr. Room 18 . . . . . Wed. 10:55 am to 12:35 pm

Image and Video Understanding

Chair: **Mark S. Schmalz**, Univ. of Florida

10:55 am: **Mathematical foundations for quantifying shape, shading, and cast shadows in realist master drawings and paintings,** D. G. Stork, Ricoh Innovations, Inc. . . . . [6315-24]

11:20 am: **Time-coherence of stylized silhouette: a 3D mesh-controlled approach,** F. Lepouliquen, F. J. Préteux, Institut National des Télécommunications (France) . . . . . [6315-25]

11:45 am: **Automated volumetric approach for quantifying bronchial wall remodeling in MDCT,** A. Saragaglia, C. I. Fetita, F. J. Prêteux, Institut National des Télécommunications (France); P. A. Grenier, Pitié-Salpêtrière . . . . . [6315-26]

12:10 pm: **Application of a new method for analyzing images: two-dimensional non-linear additive decomposition,** M. A. Zaccaria, D. M. Brudnoy, J. E. Stasenko, Lockheed Martin Corp. . . . . [6315-33]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Use of minimal inter-quantile distance estimation in image processing,** V. V. Lukin, S. K. Abramov, National Aerospace Univ. (Ukraine); A. A. Zelensky, National Aerospace Univ (Ukraine); J. T. Astola, Tampere Univ. of Technology (Finland) . . . . . [6315-29]

✔ **Automatic inspection of small component on loaded PCB based on SVD and SVM,** Y. Wang, Dalian Univ. of Technology (China) and Public Security Marine Police Academy (China); Y. Sun, Dalian Univ. of Technology (China) . . . . . [6315-30]

✔ **Automatic reflectogram analysis for optical time-domain reflectometer with correlation method,** H. L. Lysenko, R. V. Prosolovskyy, I. I. Tyutyunnyk, Vinnitsa State Technical Univ. (Ukraine) . . . . . [6315-32]

✔ **Maximizing reading: text acquisition as energy minimization for a system of charged particles,** R. Paeglis, K. Bagucka, A. Podniece, N. Sjakste, I. Lacis, Latvijas Univ. (Latvia) . . . . . [6315-34]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC661 **Applied Image Processing** (Iftekharuddin) Weds. 16 Aug., 8:30 am to 5:30 pm

Monday-Tuesday 14-15 August 2006 • Proceedings of SPIE Vol. 6316

Image Reconstruction from Incomplete Data IV

Conference Chairs: **Philip J. Bones**, Univ. of Canterbury (New Zealand); **Michael A. Fiddy**, The Univ. of North Carolina at Charlotte; **Rick P. Millane**, Univ. of Canterbury (New Zealand)

Program Committee: **Mark A. Anastasio**, Illinois Institute of Technology; **David J. Brady**, Duke Univ.; **Julian C. Christou**, Univ. of California/Santa Cruz; **Christopher J. Dainty**, National Univ. of Ireland/Galway (Ireland); **Peter C. Doerschuk**, Purdue Univ.; **James R. Fienup**, Univ. of Rochester; **Donald Fraser**, Univ. of New South Wales (Australia); **Richard G. Lane**, ARANZ (New Zealand); **Marc Saillard**, Institut Fresnel (France); **Markus E. Testorf**, Dartmouth College; **Kevin J. Webb**, Purdue Univ.; **Jong Chul Ye**, Korea Advanced Institute of Science and Technology (South Korea)

Monday 14 August

Introduction . . . . . Mon. 8:50 to 9:00 am

Chair: **Michael A. Fiddy**, The Univ. of North Carolina at Charlotte

SESSION 1

Conv. Ctr. Room 19 . . . . . Mon. 9:00 to 10:00 am

Imaging Through Turbulence

Chair: **Michael A. Fiddy**, The Univ. of North Carolina at Charlotte

9:00 am: **Turbulence profiling using extended objects for slope detection and ranging (SLODAR),** A. J. Lambert, Univ. of New South Wales (Australia); C. Jenkins, M. Goodwin, The Australian National Univ. (Australia) . . . . . [6316-01]

9:20 am: **Mitigating atmospheric effects in high-resolution infrared surveillance imagery with bispectral speckle imaging,** C. J. Carrano, Lawrence Livermore National Lab. . . . . [6316-02]

9:40 am: **Restoration of nonuniformly warped images using accurate frame by frame shift map accumulation,** M. Tahtali, A. J. Lambert, D. Fraser, Univ. of New South Wales (Australia) . . . . . [6316-03]

Coffee Break . . . . . 10:00 to 10:40 am

SESSION 2

Conv. Ctr. Room 19 . . . . . Mon. 10:40 am to 12:10 pm

Tomography

Chair: **Philip J. Bones**, Univ. of Canterbury (New Zealand)

10:40 am: **Three-dimensional image reconstruction in variable density acoustic diffraction tomography *(Invited Paper),*** M. A. Anastasio, D. Shi, Illinois Institute of Technology . . . . . [6316-04]

11:10 am: **Imaging with singular electromagnetic beams,** M. E. Testorf, Dartmouth College; C. Ly, J. N. Mait, Army Research Lab. . . . . [6316-05]

11:30 am: **Comparative study of projection/back-projection schemes in Cryo-EM tomography,** Y. Liu, J. C. Ye, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6316-06]

11:50 am: **Intensity diffraction tomography with a novel scanning protocol,** D. Shi, M. A. Anastasio, Illinois Institute of Technology [6316-07]

Lunch Break . . . . . 12:10 to 2:00 pm

SESSION 3

Conv. Ctr. Room 19 . . . . . Mon. 2:00 to 3:00 pm

Deblurring and Motion Compensation

Chair: **Rick P. Millane**, Univ. of Canterbury (New Zealand)

2:00 pm: **Quantifying and correcting motion artifacts in MRI,** P. J. Bones, J. R. Maclaren, R. P. Millane, R. Watts, Univ. of Canterbury (New Zealand) . . . . . [6316-08]

2:20 pm: **Improved image reconstruction from multiple frames,** M. E. Testorf, Dartmouth College; M. A. Fiddy, The Univ. of North Carolina at Charlotte . . . . . [6316-09]

2:40 pm: **The optimal reconstruction from blurred and nonuniformly sampled data based on the optimum discrete approximation minimizing various worst-case measures of error,** Y. Kida, Ohu Univ. (Japan); T. Kida, Nihon Univ. (Japan) . . . . . [6316-10]

Coffee Break . . . . . 3:00 to 3:40 pm

SESSION 4

Conv. Ctr. Room 19 . . . . . Mon. 3:40 to 4:40 pm

Model-based Inversion

Chair: **Mark A. Anastasio**, Illinois Institute of Technology

3:40 pm: **Analysis of gravel river beds using three-dimensional laser scanning,** R. P. Millane, M. Qi, A. Haider, M. I. Weir, M. E. Fitzsimons, Univ. of Canterbury (New Zealand) . . . . . [6316-11]

4:00 pm: **Enhancement of chest radiographs using eigenimage processing,** P. J. Bones, A. P. H. Butler, Univ. of Canterbury (New Zealand); M. Hurrell, Christchurch Hospital (New Zealand) . . . . [6316-12]

4:20 pm: **Modeling substitution disorder in the myosin lattice of vertebrate muscle,** R. P. Millane, C. Yoon, N. D. Blakeley, A. Goyal, Univ. of Canterbury (New Zealand) . . . . . [6316-13]

Tuesday 15 August

SESSION 5

Conv. Ctr. Room 19 . . . . . Tues. 9:00 to 10:00 am

Phase Retrieval

Chair: **Markus E. Testorf**, Dartmouth College

9:00 am: **Recent advances in phase retrieval,** R. P. Millane, Univ. of Canterbury (New Zealand) . . . . . [6316-14]

9:20 am: **A unified phase retrieval algorithm for both far-field and near-field diffractive imaging,** X. Xiao, M. D. de Jonge, Q. Shen, Y. S. Chu, Argonne National Lab. . . . . [6316-15]

9:40 am: **Applying phase retrieval techniques to infrared spectrometer alignment,** P. T. Spuhler, T. J. Valle, T. U. Kampe, Ball Aerospace & Technologies Corp. . . . . [6316-16]

Coffee Break . . . . . 10:00 to 10:40 am

SESSION 6

Conv. Ctr. Room 19 . . . . . Tues. 10:40 to 11:50 am

Algorithms

Chair: **Andrew J. Lambert**, Univ. of New South Wales (Australia)

10:40 am: **K-space design methods for optical and imaging hardware *(Invited Paper)*,** M. A. Fiddy, The Univ. of North Carolina at Charlotte; M. E. Testorf, Dartmouth College . . . . . [6316-17]

11:10 am: **A spectral band limiting approach to chromotomographic reconstruction,** K. Orlov, Univ. of Virginia; W. S. Ewing, Air Force Research Lab.; J. M. Mooney, J.M. Mooney Imaging Technology . . . . . [6316-18]

11:30 am: **Adaptive convex filter in sinogram decomposition for extension of reconstruction field of view,** A. A. Zamyatin, Bio-Imaging Research, Inc.; S. Nakanishi, Toshiba Medical Systems Corp. (Japan) . . . . . [6316-19]

Lunch/Exhibition Break . . . . . 11:50 am to 2:00 pm

SESSION 7

Conv. Ctr. Room 19 . . . . . Tues. 2:00 to 3:00 pm

Inverse Scattering and Tomography

Chair: **Rick P. Millane**, Univ. of Canterbury (New Zealand)

2:00 pm: **Statistical properties of multiple-detector intensity diffraction tomography,** Y. Huang, M. A. Anastasio, Illinois Institute of Technology . . . . . [6316-21]

2:20 pm: **The Wigner distribution function applied to the detection of subsurface objects,** M. E. Testorf, Dartmouth College; M. Saillard, Univ. de Sud-Toulon-Var (France) . . . . . [6316-22]

2:40 pm: **Optical image reconstruction of inhomogeneities in tissue,** M. Mandal, U. B. Desai, M. P. Thaddeus, Indian Institute of Technology Bombay (India) . . . . . [6316-23]

Wrap-Up . . . . . Tues. 3:00 to 3:10 pm

Chair: **Rick P. Millane**, Univ. of Canterbury (New Zealand)

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC661 **Applied Image Processing** (Iftekharuddin) Weds. 16 Aug., 8:30 am to 5:30 pm

Optical Instrumentation

Program on X-Ray, Gamma-Ray, and Particle Technologies

Program Chairs: **George A. Kyrala,** Los Alamos National Lab.

Program Cochairs: **Sandra G. Biedron,** Argonne National Lab.; **Massimo Altarelli,** European XFEL Project Team/DESY (Germany)

Conferences

6317 **Advances in X-Ray/EUV Optics, Components, and Applications** *(Khounsary/Morawe)*, p. 126

6318 **Developments in X-Ray Tomography V** *(Bonse)*, p. 129

6319A **Hard X-Ray and Gamma-Ray Detector Physics VIII** *(Franks/Burger/James)*, p. 133

6319B **Penetrating Radiation Systems and Applications VIII** *(Doty/Barber/Roehrig)*, p. 136

Courses

SC794 **X-ray microCT** (Micro Computed Tomography) (Stock), 1:30 to 5:30 pm

Register for Courses onsites at the SPIE Registration Desk!

Special Events

Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7

Special Program: **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41

X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8

Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20

Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8

Solar Energy Plenary, 1:30 to 5:30 pm, p. 9

Poster Session, 6:00 to 7:30 pm, p. 6

All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6

Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17

Illumination Technical Group, 8:00 to 10:00 pm, p. 17

Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18

EXHIBITION, p. 24
10:00 am to 5:00 pm

Organic and Nanophotonics Plenary, 8:30 am to 12:00 pm, p. 11

Industry Perspectives: **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14

SPIEWorks Career Fair, 10:00 am to 5:00 pm, p. 20

Fellows Luncheon, 12:00 to 2:00 pm, p. 5

Industry Perspectives: **Solid State Lighting,** 12:30 to 1:15 pm, p. 15

Future of Imaging Plenary Session, 1:00 to 2:20 pm, p. 13

Annual General Meeting of the SPIE Corporation, 6:00 to 7:00 pm, p. 4

SPIE Members Reception, 7:00 to 8:30 pm, p.5

Workshop: **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17

Poster/Demo Session, 8:00 to 10:00 pm, p. 6

Lens Design Technical Group, 8:00 to 10:00 pm, p. 18

Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18

Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19

Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19

Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19

Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19

Book Publishing for Engineers and Scientists, 8:30 to 11:00 am, p. 21

The Craft of Scientific Presentations: a Workshop on Technical Presentations, 8:30 am to 12:30 pm, p.22

Essential Interpersonal Skills for Technical Professionals, 8:30 am to 5:30 pm, p. 21

Industry Perspectives: **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16

Industry Perspectives: **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16

Industry Perspectives: **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15

SPIEWorks Career Fair, 10:00 am to 5:00 pm, p. 20

Special Program: Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42

The Craft of Scientific Writing: A Workshop On Technical Writing, 1:30 to 5:30 pm, p. 23

Poster Session, 5:30 to 7:00 pm, p. 6

SPIE's 2006 Annual Awards Banquet, Banquet and Awards presentations, 7:30 pm, p. 5

10:00 am to 2:00 pm

How to Start a Small High Tech Business Almost Anywhere, 8:30 am to 12:30 pm, p. 22

Special Panel/Workshop: **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19

SPIE Women in Optics Presentation and Reception, 4:00 to 5:30 pm, p.6

Monday-Wednesday 14-16 August 2006 • Proceedings of SPIE Vol. 6317

Advances in X-Ray/EUV Optics, Components, and Applications

Conference Chairs: **Ali M. Khounsary**, Argonne National Lab.; **Christian Morawe**, European Synchrotron Radiation Facility (France)

Program Committee: **Lahsen Assoufid**, Argonne National Lab.; **Stefan Braun**, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); **Sultan B. Dabagov**, Istituto Nazionale di Fisica Nucleare (Italy); **Alexei I. Erko**, BESSY GmbH (Germany); **Shunji Goto**, Japan Synchrotron Radiation Research Institute (Japan); **Hans M. Hertz**, Kungliga Tekniska Högskolan (Sweden); **Olivier Hignette**, European Synchrotron Radiation Facility (France); **Gene E. Ice**, Oak Ridge National Lab.; **Werner H. Jark**, Sincrotrone Trieste S.C.p.A. (Italy); **Igor V. Kozhevnikov**, A.V. Shubnikov Institute of Crystallography (Russia); **Carolyn A. MacDonald**, SUNY/Univ. at Albany; **Howard A. Padmore**, Lawrence Berkeley National Lab.; **Ladislav Pina**, REFLEX sro (Czech Republic); **Yuriy Y. Platonov**, Osmic, Inc.; **Kawal J. S. Sawhney**, Diamond Light Source Ltd. (United Kingdom); **John F. Seely**, Naval Research Lab.; **Regina Soufli**, Lawrence Livermore National Lab.; **Peter Z. Takacs**, Brookhaven National Lab.; **John S. Taylor**, Lawrence Livermore National Lab.; **Edmond I. C. Turcu**, Rutherford Appleton Lab. (United Kingdom); **Kazuto Yamauchi**, Osaka Univ. (Japan)

Monday 14 August

Plenary Session

Conv. Ctr. Room 8 . . . . . Mon. 8:30 to 9:50 am

8:30 am: **From Signals to Sudoku: Reconstructions from Partial Information,** Veit Elser, Cornell Univ.

9:10 am: **Opportunities and Challenges in Instrumentation Development for Biomedical X-Ray and Gamma-Ray Imaging,** Lars R. Furenlid, College of Optical Sciences/Univ. of Arizona

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 1

Conv. Ctr. Room 17B . . . . . Mon. 10:20 am to 12:00 pm

Sources, Systems, and Instruments I

Chairs: **Ali M. Khounsary**, Argonne National Lab.; **Ladislav Pina**, REFLEX sro (Czech Republic)

10:20 am: **Novel compact spectrophotometer for EUV optics characterization,** K. Starke, H. Blaschke, S. Nevas, D. Ristau, Laser Zentrum Hannover e.V. (Germany); R. Lebert, C. Wies, AIXUV GmbH (Germany); A. Bayer, F. Barkusky, K. R. Mann, Laser Laboratorium Göttingen e.V. (Germany) . . . . . [6317-01]

10:40 am: **An analysis of the GOES-N x-ray imager in-flight calibration using the Crab Nebula,** K. K. Klett, Jr., Swales Aerospace; S. M. Hill, National Oceanic and Atmospheric Administration . . . . . [6317-02]

11:00 am: **Dark-field image of full-field transmission hard x-ray microscope in 8-11 keV,** G. Yin, National Synchrotron Radiation Research Ctr. (Taiwan) and National Chiao Tung Univ. (Taiwan); F. W. Duewer, X. Zeng, A. F. Lyon, W. Yun, Xradia, Inc.; F. Chen, National Tsing Hua Univ. (Taiwan); K. S. Liang, National Synchrotron Radiation Research Ctr. (Taiwan) . . . . . [6317-03]

11:20 am: **Compact x-ray microscopes for EUV- and soft x-radiation with spectral imaging capabilities,** D. Schaefer, T. Nisius, R. Frueke, S. Rausch, Univ. of Applied Sciences Koblenz (Germany); M. Wieland, Univ. Hamburg (Germany); U. Vogt, Kungliga Tekniska Högskolan (Sweden); T. Wilhein, Univ. of Applied Sciences Koblenz (Germany) . . . . . [6317-04]

11:40 am: **EUV radiation from gas-puff laser plasma focused by multifoil optics,** L. Pina, Czech Technical Univ. (Czech Republic); A. Inneman, REFLEX sro (Czech Republic); L. Sveda, Czech Technical Univ. (Czech Republic); R. Hudec, V. Semencova, REFLEX sro (Czech Republic); A. Bartnik, H. Fiedorowicz, K. Jakubczak, Wojskowa Akademia Techniczna (Poland) . . . . . [6317-05]

Lunch Break . . . . . 12:00 to 1:30 pm

SESSION 2

Conv. Ctr. Room 17B . . . . . Mon. 1:30 to 2:10 pm

Sources, Systems, and Instruments II

Chairs: **Christian Morawe**, European Synchrotron Radiation Facility (France); **Kawal J. S. Sawhney**, Diamond Light Source Ltd. (United Kingdom)

1:30 pm: **Compact EUV source and optics for applications apart from lithography,** A. Bayer, F. Barkusky, C. Peth, H. Töttger, K. R. Mann, Laser-Laboratorium Göttingen e.V. (Germany) . . . . . [6317-06]

1:50 pm: **SXR optical diagnostics of capillary discharge plasma,** L. Pina, REFLEX sro (Czech Republic); A. Jancarek, M. Vrbova, Czech Technical Univ. in Prague (Czech Republic); P. Vrba, Institute of Plasma Physics (Czech Republic) . . . . . [6317-07]

SESSION 3

Conv. Ctr. Room 17B . . . . . Mon. 2:10 to 5:00 pm

Metrology

Chairs: **Olivier Hignette**, European Synchrotron Radiation Facility (France); **Lahsen Assoufid**, Argonne National Lab.

2:10 pm: **Bending systems for focusing x-ray optics *(Invited Paper),*** O. Hignette, European Synchrotron Radiation Facility (France) . . . [6317-08]

2:40 pm: **At-wavelength figure metrology of total reflection mirrors in hard x-ray region *(Invited Paper),*** H. Yumoto, H. Mimura, S. Matsuyama, S. Handa, A. Shibatani, K. Katagishi, Y. Sano, Osaka Univ. (Japan); M. Yabashi, Y. Nishino, K. Tamasaku, T. Ishikawa, The Institute of Physical and Chemical Research (RIKEN) (Japan); K. Yamauchi, Osaka Univ. (Japan) . . . . . [6317-09]

3:10 pm: **Positioning errors of pencil-beam interferometer for long trace profiler,** V. V. Yashchuk, Lawrence Berkeley National Lab. [6317-10]

Coffee Break . . . . . 3:30 to 4:00 pm

4:00 pm: **Surface gradient integrated profiler for x-ray and EUV optics,** Y. Higashi, High Energy Accelerator Research Organization (Japan) . . . . . [6317-11]

4:20 pm: **X-ray optics for Diamond beamlines,** S. G. Alcock, L. Alianelli, U. Wagner, K. J. S. Sawhney, Diamond Light Source Ltd. (United Kingdom) . . . . . [6317-12]

4:40 pm: **Air convection noise of pencil-beam interferometer for long-trace profiler,** V. V. Yashchuk, S. C. Irick, A. A. MacDowell, W. R. McKinney, Lawrence Berkeley National Lab.; P. Z. Takacs, Brookhaven National Lab. . . . . [6317-13]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Research of non-coaxial grazing reflective x-ray microscope,** J. Hu, Dalian Univ. of Technology (China); Y. Bai, Changchun Institute of Optics, Fine Mechanics and Physics (China) . . . . . [6317-41]

✔ **Development of Mg/SiC multilayer mirrors,** I. Yoshikawa, K. Yoshioka, G. Murakami, The Univ. of Tokyo (Japan) . . . . . [6317-43]

✔ **Parallel beam optics based on W/Si, Ni/C, and Mo/B_4C multilayers,** S. Braun, P. Gawlitza, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); T. Holz, AXO DRESDEN GmbH (Germany); M. Menzel, S. Schaedlich, A. Leson, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany) . . . . . [6317-44]

✔ **Narrow-band x-ray imaging for core temperature and density maps retrieval of direct-drive implosions,** R. Tommasini, J. A. Koch, Lawrence Livermore National Lab.; L. A. Welser, R. C. Mancini, Univ. of Nevada/Reno; J. Delettrez, S. Regan, V. Smalyuk, Univ. of Rochester . . . . . [6317-45]

✔ **Measurements of x-ray laser wavefront profile using single and stacked Hartmann arrays,** P. Homer, B. Rus, M. Stupka, J. Polan, M. Kozlova, T. Mocek, Institute of Physics (Czech Republic) . . . [6317-46]

✔ **Wave-optical simulations for designing and evaluating hard x-ray reflective optics,** H. Mimura, S. Matsuyama, H. Yumoto, S. Handa, A. Shibatani, K. Katagishi, Y. Sano, Osaka Univ. (Japan); Y. Nishino, K. Tamasaku, M. Yabashi, T. Ishikawa, The Institute of Physical and Chemical Research (RIKEN) (Japan); K. Yamauchi, Osaka Univ. (Japan) . . . . . [6317-47]

✔ **High-spatial-resolution scanning x-ray fluorescence microscope with Kirkpatrick-Baez mirrors,** S. Matsuyama, H. Mimura, Osaka Univ. (Japan); M. Shimura, International Medical Ctr. of Japan (Japan); H. Yumoto, K. Katagishi, S. Handa, A. Shibatani, Y. Sano, K. Yamamura, Osaka Univ. (Japan); Y. Nishino, K. Tamasaku, M. Yabashi, T. Ishikawa, The Institute of Physical and Chemical Research (RIKEN) (Japan); K. Yamauchi, Osaka Univ. (Japan) . . . . . [6317-48]

✔ **Evaluation of a modern soft x-ray monochromator with high resolving power over 10,000,** H. Ohashi, Y. Senba, Japan Synchrotron Radiation Research Institute (Japan); E. Ishiguro, Univ. of the Ryukyus (Japan); S. Goto, Japan Synchrotron Radiation Research Institute (Japan); S. Shin, T. Ishikawa, The Institute of Physical and Chemical Research (Japan) . . . . . [6317-49]

✔ **Focusing properties od aperiodic zone plates,** W. D. Furlan, Univ. de València (Spain); J. A. Monsoriu, Univ. Politècnica de València (Spain); G. Saavedra, Univ. de València (Spain) . . . . . [6317-51]

✔ **The optical constants of Al determined in experiments with thin film filters at wavelengths 17.1, 30.4, and 58.4 nm,** A. V. Mitrofanov, F. A. Pudonin, P.N. Lebedev Physical Institute (Russia); S. Y. Zuev, Institute for Physics of Microstructures (Russia) . . . . . [6317-52]

✔ **Design of an ultrahigh vacuum artificial channel cut monochromator for coherent scattering applications,** S. Narayanan, D. Shu, A. R. Sandy, Argonne National Lab. . . . . [6317-53]

✔ **Wavefront analysis and beam profiling from 40 eV up to 40 keV,** T. Nisius, D. Schäfer, T. Wilhein, Univ. of Applied Sciences Koblenz (Germany) . . . . . [6317-54]

Tuesday 15 August

SESSION 4

Conv. Ctr. Room 17B . . . . . Tues. 8:40 am to 12:00 pm

Optical Coatings and Multilayers

Chairs: **Alexei I. Erko**, BESSY GmbH (Germany); **Yuriy Y. Platonov**, Osmic, Inc.

8:40 am: **Multilayer Laue lens for hard x-ray nanofocusing optics *(Invited Paper)*,** H. C. Kang, J. Maser, G. B. Stephenson, C. Liu, R. Conley, A. T. Macrander, S. Vogt, Argonne National Lab. . . . . [6317-14]

9:10 am: **Graded multilayers for focusing hard x-rays below 50 nm,** C. Morawe, O. Hignette, P. Cloetens, W. Ludwig, C. Borel, P. Bernard, A. Rommeveaux, European Synchrotron Radiation Facility (France) [6317-15]

9:30 am: **Ion-beam sputter deposition of x-ray multilayer optics on large areas,** P. Gawlitza, S. Braun, A. Leson, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany) . . . . . [6317-16]

9:50 am: **Dual ion-beam sputter deposited Mo/Si multilayers with sub-nanometer barrier layers,** S. Braun, P. Gawlitza, S. Lipfert, S. Schaedlich, A. Leson, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany) . . . . . [6317-17]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **Reflectivity and stress responses of multilayers upon isothermal treatment,** C. Borel, C. Morawe, A. Rommeveaux, C. Huguenot, J. Peffen, European Synchrotron Radiation Facility (France) . . . . . [6317-18]

11:00 am: **Film stress studies and the multilayer Laue lens project,** C. Liu, R. Conley, A. T. Macrander, Argonne National Lab. . . . . [6317-19]

11:20 am: **EUV multilayer mirrors with enhanced stability,** N. Benoit, S. A. Yulin, T. Feigl, N. Kaiser, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) . . . . . [6317-20]

11:40 am: **Transmittance and reflective coatings for the 50-200 nm spectral range,** M. Fernandez-Perea, J. I. Larruquert, J. A. Aznárez, J. A. Méndez, Consejo Superior de Investigaciones Científicas (Spain)[6317-21]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 5

Conv. Ctr. Room 17B . . . . . Tues. 1:30 to 3:30 pm

Optics and Instruments

Chairs: **Christian Morawe**, European Synchrotron Radiation Facility (France); **Sultan B. Dabagov**, Istituto Nazionale di Fisica Nucleare (Italy)

1:30 pm: **Reflection zone plates with extended aperture for VUV and x-rays,** A. Erko, A. Firsov, BESSY GmbH (Germany) . . . . . [6317-22]

1:50 pm: **Measurement of zone plate efficiencies in the extreme ultraviolet and applications to radiation monitors for absolute spectral emission,** J. F. Seely, G. E. Holland, Naval Research Lab.; J. C. Bremer, T. J. Zukowski, Swales Aerospace; M. Feser, Y. Feng, Xradia, Inc.; B. Kjornrattanawancih, Brookhaven National Lab.; L. I. Goray, International Intellectual Group, Inc. . . . . [6317-23]

2:10 pm: **An efficient EUV spectral purity filter using blazed gratings with radial groove geometry designed for off-plane grazing incidence,** L. I. Goray, International Intellectual Group, Inc. . . . . [6317-24]

2:30 pm: **On an x-ray waveguiding in nanochannels,** S. B. Dabagov, Istituto Nazionale di Fisica Nucleare (Italy) and P.N. Lebedev Physical Institute (Russia) . . . . . [6317-25]

2:50 pm: **Beryllium and lithium x-ray lenses at the APS,** A. M. Khounsary, Argonne National Lab. . . . . [6317-26]

3:10 pm: **Tunable highly efficient crystal analyzer based on active optics,** K. Attenkofer, B. W. Adams, Argonne National Lab. . . . [6317-27]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 6

Conv. Ctr. Room 17B . . . . . Tues. 4:00 to 5:30 pm

Optical Constants and Measurement Techniques I

Chairs: **Regina Soufli**, Lawrence Livermore National Lab.; **John F. Seely**, Naval Research Lab.

4:00 pm: **The transmittance and the extinction coefficient of ytterbium films in the spectral range 20 to 1,600 eV *(Invited Paper)*,** J. I. Larruquert, M. Fernández-Perea, J. A. Aznárez, J. A. Méndez, Consejo Superior de Investigaciones Científicas (Spain); L. Poletto, D. Garoli, Univ. degli Studi di Padova (Italy); M. Malvezzi, Univ. degli Studi di Pavia (Italy); A. Giglia, S. Nannarone, Instituto Nazionale per la Fisica della Materia (Italy) . . . . . [6317-28]

4:30 pm: **Coated photodiode technique for the determination of the optical constants of reactive elements: La and Tb,** J. F. Seely, Naval Research Lab.; Y. A. Uspenskii, P.N. Lebedev Physical Institute (Russia); B. Kjornrattanawanich, Universities Space Research Association; D. L. Windt, Columbia Univ. . . . . [6317-29]

4:50 pm: **Optical constants determination of neodymium and gadolinium in the 3-nm to 100-nm wavelength range,** B. Kjornrattanawanich, Universities Space Research Association; D. L. Windt, Columbia Univ.; Y. A. Uspenskii, P.N. Lebedev Physical Institute (Russia); J. F. Seely, Naval Research Lab. . . . . [6317-30]

5:10 pm: **Transmittance and extinction coefficient of cerium films measured in situ in the extreme ultraviolet and soft x-rays,** M. Fernández-Perea, J. A. Aznárez, J. I. Larruquert, J. A. Méndez, Consejo Superior de Investigaciones Científicas (Spain); L. Poletto, D. Garoli, Istituto Nazionale per la Fisica della Materia (Italy); M. Malvezzi, Univ. degli Studi di Pavia (Italy) and Instituto Nazionale per la Fisica della Materia (Italy); A. Giglia, S. Nannarone, Instituto Nazionale per la Fisica della Materia (Italy) . . . . . [6317-31]

Workshop

Marriott Del Mar . . . . . Tues. 8:00 to 9:00 pm

X-Ray Mirror Optics

Chair: **Ali M. Khounsary,** Argonne National Lab.

See p. 17 for further information.

Wednesday 16 August

SESSION 7

Conv. Ctr. Room 17B . . . . . Wed. 8:40 to 10:00 am

Optical Constants and Measurement Techniques II

Chairs: **John F. Seely**, Naval Research Lab.; **Regina Soufli**, Lawrence Livermore National Lab.

8:40 am: **Recent measurement of the EUV and soft x-ray optical constants of zirconium,** E. M. Gullikson, A. L. Aquila, F. J. Dollar, F. H. Salmassi, Lawrence Berkeley National Lab.; F. R. Powell, Luxel Corp. . . . . [6317-32]

9:00 am: **Using reflection from coated diodes to help determine optical constants,** D. D. Allred, G. Acosta, N. F. Brimhall, J. Johnson, D. Muhlestein, R. S. Turley, Brigham Young Univ. . . . . [6317-33]

9:20 am: **Construction of an extreme ultraviolet polarimeter based on high-order harmonic generation,** N. F. Brimhall, A. Baker, R. S. Turley, J. Peatross, Brigham Young Univ. . . . . [6317-34]

9:40 am: **Optical constants measurement method of the uppermost layer on a reflection multilayer using reflection and total electron yield spectra,** T. Ejima, T. Harada, A. Yamazaki, Tohoku Univ. (Japan) [6317-35]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 8

Conv. Ctr. Room 17B . . . . . Wed. 10:30 to 11:50 am

Optical Constants and Measurement Techniques III

Chairs: **Regina Soufli**, Lawrence Livermore National Lab.; **John F. Seely**, Naval Research Lab.

10:30 am: **Thorium-based mirrors in the extreme ultraviolet,** N. F. Brimhall, E. Martin, R. S. Turley, Brigham Young Univ. . . . . [6317-36]

10:50 am: **Using spectroscopic ellipsometry (1.2 to 6.5 eV), AFM, and XRD to understand bias sputtered Thoria thin films,** W. R. Evans, M. Clemens, D. Muhlestein, D. D. Allred, Brigham Young Univ. . . . [6317-37]

11:10 am: **Optical constants in the EUV soft x-ray (50Å ÷1520 Å) spectral range of B4C thin films deposited by different deposition techniques,** G. Monaco, D. Garoli, Univ. degli Studi di Padova (Italy); V. Mattarello, Istituto Nazionale di Fisica Nucleare (Italy); P. Nicolosi, M. Pelizzo, R. Frison, Univ. degli Studi di Padova (Italy); V. Rigato, Istituto Nazionale di Fisica Nucleare (Italy); L. Armelao, Univ. degli Studi di Padova (Italy); A. Giglia, S. Nannarone, Istituto Nazionale per la Fisica della Materia (Italy) . . . . . [6317-38]

11:30 am: **Determination of the optical constants of amorphous carbon in the EUV spectral region 18-450 eV,** Y. A. Uspenskii, P.N. Lebedev Physical Institute (Russia); J. F. Seely, Naval Research Lab.; B. Kjornrattanawanich, Universities Space Research Association; D. L. Windt, Columbia Univ.; Y. A. Bugayev, V. V. Kondratenko, Kharkiv Polytechnic Institute (Ukraine); I. A. Artyukov, P.N. Lebedev Physical Institute (Russia); A. A. Titov, N.N. Semenov Institute of Chemical Physics (Russia); E. T. Kulatov, General Physics Institute (Russia); A. V. Vinogradov, P.N. Lebedev Physical Institute (Russia) . . . . . [6317-39]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC794 **X-ray microCT** (Micro Computed Tomography) (Stock) Mon. 14 Aug., 1:30 to 5:30 pm

Tuesday-Thursday 15-17 August 2006 • Proceedings of SPIE Vol. 6318

Developments in X-Ray Tomography V

Conference Chair: **Ulrich Bonse**, Univ. Dortmund (Germany)

Program Committee: **Felix Beckmann**, GKSS Forschungszentrum Geeshacht, GmbH (Germany); **Graham R. Davis**, Queen Mary Univ. of London (United Kingdom); **Bert Müller**, ETH Zürich (Switzerland); **Erik L. Ritman**, Mayo Clinic; **Mark L. Rivers**, The Univ. of Chicago; **Stuart R. Stock**, Northwestern Univ.; **Ge Wang**, The Univ. of Iowa; **Stephen W. Wilkins**, Commonwealth Scientific & Industrial Research Organisation (Australia)

Tuesday 15 August

SESSION 1

Conv. Ctr. Room 9 . . . . . Tues. 8:00 to 9:55 am

Micro-CT for Life Sciences I

Chair: **Graham R. Davis**, Queen Mary Univ. of London (United Kingdom)

8:00 am: **Micro-CT as a guide for clinical CT development *(Invited Paper)*,** E. L. Ritman, Mayo Clinic . . . . . [6318-01]

8:25 am: **Micro-CT of aortic valve calcification *(Invited Paper)*,** N. M. Rajamannan, Northwestern Univ. . . . . [6318-02]

8:50 am: **Three-dimensional assessment of brain tissue morphology combining optical microscopy and synchrotron-radiation-based microcomputed tomography *(Invited Paper)*,** B. Müller, M. Germann, ETH Zürich (Switzerland); A. Morel, Univ. Hospital Zürich (Switzerland) . . . . . [6318-03]

9:15 am: **Microtomography of the human tooth-alveolar bone complex,** M. Dalstra, P. M. Cattaneo, Åarhus Univ. (Denmark); M. T. Sakima, State Univ. of São Paulo (Brazil); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany); C. Lemor, M. G. Laursen, B. Melsen, Åarhus Univ. (Denmark) . . . . . [6318-04]

9:35 am: **The anatomy of the human cochlea unrevealed on the cellular level by synchrotron-radiation-based microcomputed tomography,** W. Freysinger, G. M. Diakov, F. Kral, F. Schwarm, R. Stoffner, A. R. Gunkel, R. Glueckert, A. Schrott-Fischer, Innsbruck Medical Univ. (Austria); J. Fischer, Medizinische Hochschule Hannover (Germany); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany); B. Müller, ETH Zürich (Switzerland) . . . . . [6318-05]

Coffee Break . . . . . 9:55 to 10:35 am

SESSION 2

Conv. Ctr. Room 9 . . . . . Tues. 10:35 am to 12:00 pm

Micro-CT for Life Sciences II

Chair: **Erik L. Ritman**, Mayo Clinic

10:35 am: **Microtomography of magnesium implants in bone and their degradation *(Invited Paper)*,** F. Witte, Medizinische Hochschule Hannover (Germany) . . . . . [6318-06]

11:00 am: **3D analysis of bone formation around titanium implants using microcomputed tomography (μCT),** R. Bernhardt, D. Scharnweber, Technische Univ. Dresden (Germany); B. Müller, ETH Zürich (Switzerland); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany); J. Goebbels, Bundesanstalt für Materialforschung und -prüfung (Germany); J. Jansen, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); H. Schliephake, Georg-August-Univ. Göttingen (Germany); H. Worch, Technische Univ. Dresden (Germany) . . . . . [6318-07]

11:20 am: **Simulation of trabecular mineralization measurements in micro-CT,** S. Prevrhal, A. Mukkananchery, M. Meta, Univ. of California/San Francisco . . . . . [6318-08]

11:40 am: **Image-based analysis of the internal microstructure of bone replacement scaffolds made by 3D printing,** S. H. Irsen, H. H. Seitz, C. Tille, Ctr. of Advanced European Studies and Research (Germany); B. Müller, ETH Zürich (Switzerland); B. Leukers, Ctr. of Advanced European Studies and Research (Germany); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany) . . . . . [6318-09]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 3

Conv. Ctr. Room 9 . . . . . Tues. 1:30 to 3:15 pm

Micro-CT for Life Sciences III

Chair: **Bert Müller**, ETH Zürich (Switzerland)

1:30 pm: **Structures, structural hierarchy, and function in sea urchin spines,** S. R. Stock, Northwestern Univ.; T. Ebert, Oregon State Univ.; K. I. Ignatiev, Stanford Synchrotron Radiation Lab.; F. De Carlo, Argonne National Lab. . . . . [6318-10]

1:50 pm: **Micro-CT of small insects by projection x-ray microscopy,** A. Tanisako, A. Hori, Meiji Univ. (Japan); T. Obi, Tokyo Institute of Technology (Japan); H. Yoshimura, Meiji Univ. (Japan) . . . . . [6318-11]

2:10 pm: **Ultrastructural phenotyping of the mouse skeleton using synchrotron light toward nanocomputed tomography,** P. Schneider, M. Stauber, R. Voide, ETH Zürich (Switzerland); M. Stampanoni, Paul Scherrer Institut (Switzerland); L. R. Donahue, The Jackson Lab.; P. Wyss, U. Sennhauser, EMPA (Switzerland); R. Müller, ETH Zürich (Switzerland) . . . . . [6318-12]

2:30 pm: **Adaptive plasticity in mammalian masticatory joints,** M. J. Ravosa, E. K. Nicholson, E. Kloop, J. Pinchoff, R. Kunwar, Northwestern Univ.; M. W. Hamrick, Medical College of Georgia; S. R. Stock, Northwestern Univ. . . . . [6318-13]

2:50 pm: **Development of bioluminescence tomography *(Invited Paper)*,** M. Jiang, Peking Univ. (China); G. Wang, The Univ. of Iowa . . . . . [6318-14]

Coffee Break . . . . . 3:15 to 3:55 pm

SESSION 4

Conv. Ctr. Room 9 . . . . . Tues. 3:55 to 5:25 pm

New CT-Related Algorithms I

Chair: **Mark A. Anastasio**, Illinois Institute of Technology

3:55 pm: **Approximate and exact cone-beam reconstruction with standard and nonstandard spiral scanning *(Invited Paper)*,** G. Wang, Y. Ye, H. Yu, The Univ. of Iowa . . . . . [6318-15]

4:20 pm: **Skew cone-beam lambda tomography *(Invited Paper)*,** Y. Ye, H. Yu, G. Wang, The Univ. of Iowa . . . . . [6318-16]

4:45 pm: **Cone beam reconstruction algorithm for PET-VCT,** J. Hsieh, GE Healthcare; A. Lonn, GE Healthcare Technologies; M. Nyka, GE Healthcare . . . . . [6318-17]

5:05 pm: **Modeling the forward problem based on the adaptive FEMs framework in bioluminescence tomography,** Y. Lv, J. Tian, Institute of Automation (China); H. Li, Capital Normal Univ. (China); J. Luo, Institute of Automation (China); W. Cong, G. Wang, The Univ. of Iowa . . . . [6318-18]

Wednesday 16 August

SESSION 5

Conv. Ctr. Room 9 . . . . . Wed. 8:00 to 10:00 am

CT Development at SR Beamlines

Chair: **Stuart R. Stock**, Northwestern Univ.

8:00 am: **Synchrotron-computed microtomography at extreme conditions *(Invited Paper)*,** M. L. Rivers, The Univ. of Chicago [6318-19]

8:25 am: **X-ray tomography system, automation, and remote access at beamline 2-BM of the Advanced Photon Source *(Invited Paper)*,** F. De Carlo, X. Xiao, B. Tieman, Argonne National Lab. . . . . [6318-20]

8:50 am: **A new apparatus for serial crystallography at the advanced light source *(Invited Paper)*,** D. A. Shapiro, Ctr. for Biophotonics Science and Technology; J. C. H. Spence, D. Starodub, R. B. Doak, U. Weierstall, Arizona State Univ.; H. N. Chapman, Lawrence Livermore National Lab. . . . . [6318-21]

9:15 am: **Trends in synchrotron-based tomographic imaging: the SLS experience *(Invited Paper)*,** M. Stampanoni, A. Groso, A. Isenegger, A. Bertrand, Q. Chen, S. Zelenika, R. Betemps, S. Henein, P. Böhler, D. Meister, M. Lange, R. Abela, Paul Scherrer Institut (Switzerland) [6318-22]

9:40 am: **High-resolution three-dimensional imaging by synchrotron-radiation-computed laminography,** L. Helfen, Forschungszentrum Karlsruhe (Germany) and European Synchrotron Radiation Facility (France); T. Baumbach, Forschungszentrum Karlsruhe (Germany); P. Rejmánková-Pernot, Forschungszentrum Karlsruhe (Germany) and European Synchrotron Radiation Facility (France); P. Mikulik, Masaryk Univ. (Czech Republic); M. Di Michiel, J. Baruchel, European Synchrotron Radiation Facility (France) . . . . . [6318-23]

Coffee Break . . . . . 10:00 to 10:40 am

SESSION 6

Conv. Ctr. Room 9 . . . . . Wed. 10:40 am to 12:00 pm

New CT-Related Algorithms II

Chair: **Ge Wang**, The Univ. of Iowa

10:40 am: **New algorithms for ring artifact removal,** R. A. Ketcham, The Univ. of Texas at Austin . . . . . [6318-24]

11:00 am: **Cone beam filtered backprojection (CB-FBP) image reconstruction by tracking resampled projection data,** X. Tang, J. Hsieh, R. A. Nilsen, S. M. McOlash, GE Healthcare . . . . . [6318-26]

11:20 am: **Phase-contrast CT: a fundamental theorem and fast image reconstruction algorithms,** A. V. Bronnikov, Bronnikov Algorithms (Netherlands) . . . . . [6318-27]

11:40 am: **Quantification of reconstruction quality in x-ray phase-contrast tomography,** B. D. Arhatari, A. G. Peele, La Trobe Univ. (Australia); K. A. Nugent, The Univ. of Melbourne (Australia) . . . [6318-32]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 7

Conv. Ctr. Room 9 . . . . . Wed. 1:30 to 3:35 pm

Optimizing Phase-Contrast

Chair: **Christoph Rau**, Univ. of Illinois at Urbana-Champaign

1:30 pm: **Tomography with grating interferometers at low-brilliance sources *(Invited Paper)*,** T. Weitkamp, Forschungszentrum Karlsruhe (Germany); O. Bunk, F. Pfeiffer, M. Stampanoni, A. Diaz, C. Gruenzweig, C. Kottler, C. David, Paul Scherrer Institut (Switzerland); E. Ziegler, P. Cloetens, L. Peverini, European Synchrotron Radiation Facility (France) . . . . . [6318-28]

1:55 pm: **Biomedical imaging by Talbot-type x-ray phase tomography *(Invited Paper)*,** A. Momose, W. Yashiro, M. Moritake, Y. Takeda, The Univ. of Tokyo (Japan); M. Tanaka, T. Hattori, Univ. of Hyogo (Japan) [6318-29]

2:20 pm: **Statistically optimal image reconstruction in propagation-based phase-contrast tomography *(Invited Paper)*,** M. A. Anastasio, C. Chou, D. Shi, Y. Huang, Illinois Institute of Technology . . . . . [6318-30]

2:45 pm: **Stability and locality of amplitude and phase contrast tomographies *(Invited Paper)*,** T. E. Gureyev, Commonwealth Scientific and Industrial Research Organisation (Australia); G. R. Myers, Monash Univ. (Australia); Y. I. Nesterets, Commonwealth Scientific and Industrial Research Organisation (Australia); D. M. Paganin, K. M. Pavlov, Monash Univ. (Australia); S. W. Wilkins, Commonwealth Scientific and Industrial Research Organisation (Australia) . . . . . [6318-31]

3:10 pm: **Progress in biomedical application of phase-contrast x-ray imaging and fluorescent x-ray CT *(Invited Paper)*,** T. Takeda, J. Wu, T. T. Lwin, Univ. of Tsukuba (Japan); A. Yoneyama, Y. Hirai, Hitachi, Ltd. (Japan); K. Hyodo, High Energy Acceleration Research Organization (Japan); N. Sunaguchi, T. Yuasa, Yamagata Univ. (Japan); M. Minami, K. Kose, Univ. of Tsukuba (Japan); T. Akatsuka, Yamagata Univ. (Japan) . . . . . [6318-33]

Coffee Break . . . . . 3:35 to 4:00 pm

SESSION 8

Conv. Ctr. Room 9 . . . . . Wed. 4:00 to 5:05 pm

Fluorescence and Scattering Contrast CT

Chair: **Atsushi Momose**, The Univ. of Tokyo (Japan)

4:00 pm: **Fluorescence tomography in earth and planetary sciences *(Invited Paper)*,** A. S. Simionovici, École Normale Supérieure de Lyon (France); P. Bleuet, European Synchrotron Radiation Facility (France); L. Lemelle, T. Ferroir, P. Soudant, École Normale Supérieure de Lyon (France) . . . . . [6318-34]

4:25 pm: **Fluorescence tomography at the ESRF beamline ID22: recent advances and future developments,** P. Bleuet, European Synchrotron Radiation Facility (France); A. S. Simionovici, P. Soudant, Ecole Normale Supérieure (France) . . . . . [6318-35]

4:45 pm: **Monotonic penalized-likelihood image reconstruction in x-ray fluorescence tomography,** P. J. La Rivière, P. Vargas, The Univ. of Chicago . . . . . [6318-36]

✔ Posters-Wednesday

Chairs: **Ge Wang**, The Univ. of Iowa; **Ulrich Bonse**, Univ. Dortmund (Germany)

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

CT-Related Algorithms

✔ **In-plane motion estimation for artifact reduction in fan-beam CT,** H. Yu, G. Wang, The Univ. of Iowa . . . . . [6318-57]

✔ **Exact and approximate image reconstruction via lambda tomography,** H. Yu, Y. Ye, G. Wang, The Univ. of Iowa . . . . . [6318-58]

✔ **Localizing the source distribution based on the adaptive finite element methods for bioluminescence tomography,** Y. Lv, J. Tian, J. Luo, Institute of Automation (China); H. Li, Capital Normal Univ. (China); W. Cong, G. Wang, The Univ. of Iowa; W. Yang, J. Shi, Institute of Automation (China) . . . . . [6318-59]

✔ **Geometrical study on two tilting arcs based exact cone-beam CT for breast imaging,** K. Zeng, H. Yu, L. L. Fajardo, G. Wang, The Univ. of Iowa . . . . . [6318-62]

✔ **Formula with a general open trajectory for fan-beam CT,** Y. Wei, The Univ. of Iowa; J. Hsieh, GE Healthcare; G. Wang, The Univ. of Iowa . . . . . [6318-65]

✔ **A number theory approach for discrete tomography,** J. Zhu, X. Li, Georgia Southern Univ.; Y. Ye, G. Wang, The Univ. of Iowa . . [6318-66]

✔ **Parallel iterative reconstruction for local CT,** J. Deng, G. Wang, J. Ni, L. Wang, The Univ. of Iowa . . . . . [6318-67]

✔ **Exact reconstruction for non-equally spaced triple-source helical cone-beam CT,** Y. Jin, J. Zhao, Shanghai Jiao Tong Univ. (China); M. Jiang, Peking Univ. (China); T. Zhuang, Shanghai Jiao Tong Univ. (China); G. Wang, The Univ. of Iowa . . . . . [6318-68]

✔ **Simulation studies for triple-source helical cone-beam CT,** J. Zhao, Y. Jin, Shanghai Jiao Tong Univ. (China); M. Jiang, Peking Univ. (China); T. Zhuang, Shanghai Jiao Tong Univ. (China); G. Wang, The Univ. of Iowa . . . . . [6318-69]

✔ **Practical cone-beam lambda tomography,** H. Yu, Y. Ye, G. Wang, The Univ. of Iowa . . . . . [6318-70]

✔ **Analytic simulation scheme for x-ray projections based on physical model,** S. Tang, Xi'an Jiaotong Univ. (China); H. Yu, The Univ. of Iowa; X. Mou, Xi'an Jiaotong Univ. (China) . . . . . [6318-71]

✔ **A beam hardening correction method with HL consistency,** X. Mou, S. Tang, Xi'an Jiaotong Univ. (China); H. Yu, The Univ. of Iowa [6318-73]

✔ **Comparison on beam hardening correction of CT-based HL consistency and normal water phantom experiment,** X. Mou, S. Tang, Xi'an Jiaotong Univ. (China); H. Yu, The Univ. of Iowa . [6318-74]

✔ **Selected source rotational velocity for cardiac CT,** J. Liu, The Univ. of Iowa and Beijing Jiaotong Univ. (China); C. Wang, Y. Liu, E. Bai, G. Wang, The Univ. of Iowa . . . . . [6318-75]

✔ **Experimental evaluation of low-resolution CT regulated tomosynthesis using a flat-panel detector,** K. Zeng, H. Yu, The Univ. of Iowa; M. Grasruck, B. T. Schmidt, Siemens Medical Solutions (Germany); G. Wang, The Univ. of Iowa . . . . . [6318-76]

✔ **Results from IMA workshop: new mathematics and algorithms for 3D image analysis,** K. G. Ham, H. A. Barnett, L. G. Butler, Louisiana State Univ. . . . . [6318-77]

Applications of μCT

✔ **Synchrotron x-ray microtomography combined to in situ mechanical testing of bone samples,** P. Bleuet, European Synchrotron Radiation Facility (France); J. Roux, INSERM (France); Y. Dabin, European Synchrotron Radiation Facility (France); G. Boivin, INSERM (France) . . . . . [6318-78]

✔ **In situ synchrotron x-ray microtomography studies of corrosion of aluminium alloys,** A. J. Davenport, The Univ. of Birmingham (United Kingdom); F. Eckermann, EMPA (Switzerland); M. H. Larsen, Norwegian Univ. of Science and Technology (Norway); B. J. Connolly, The Univ. of Birmingham (United Kingdom); T. Suter, EMPA (Switzerland); J. Mardalen, SINTEF (Norway); F. De Carlo, Argonne National Lab. . . . . [6318-79]

✔ **Masking and fiber analysis to determine 3D chemical distribution in a polymer blend,** H. A. Barnett, L. G. Butler, K. G. Ham, Louisiana State Univ. . . . . [6318-80]

✔ **Imaging tissue structures: assessment of absorption and phase-contrast x-ray tomography imaging at 2nd and 3rd generation synchrotrons,** K. Ham, H. A. Barnett, T. Ogunbakin, D. G. Homberger, H. H. Bragulla, A. R. Castille, K. L. Matthews II, C. S. Willson, L. G. Butler, Louisiana State Univ. . . . . [6318-81]

✔ **Quantitative analysis of mineral content in enamel using laboratory microtomography and microhardness analysis,** A. E. M. Vieira, A. C. B. Delbem, K. T. Sassaki, Univ. Estadual Paulista (Brazil); M. L. Cannon, Children's Memorial Hospital; S. R. Stock, Northwestern Univ.[6318-82]

✔ **Quantitative analysis of mineral content in enamel using synchrotron microtomography and microhardness analysis,** A. C. B. Delbem, A. E. M. Vieira, K. T. Sassaki, Univ. Estadual Paulista (Brazil); M. L. Cannon, Children's Memorial Hospital; S. R. Stock, Northwestern Univ.; X. Xiao, F. De Carlo, Argonne National Lab. . . . . [6318-83]

✔ **XRF microCT study of space objects at SSRL,** K. I. Ignatiev, Stanford Linear Accelerator Ctr.; K. Huwig, R. P. Harvey, Case Western Reserve Univ.; H. Ishii, J. Bradley, Lawrence Livermore National Lab.; K. Luening, S. Brennan, P. A. Pianetta, Stanford Linear Accelerator Ctr. . [6318-84]

μCT Development

✔ **Iterative method to reconstruct bioluminescence source based on photon transport equation,** W. Cong, K. D. Durairaj, H. Shen, X. Qian, G. Wang, The Univ. of Iowa . . . . . [6318-88]

✔ **A hard x-ray imaging beamline at ANKA,** T. Weitkamp, Forschungszentrum Karlsruhe (Germany); L. Helfen, Forschungszentrum Karlsruhe (Germany) and European Synchrotron Radiation Facility (France); A. Rack, R. Simon, D. Lübbert, T. Baumbach, Forschungszentrum Karlsruhe (Germany) . . . . . [6318-89]

✔ **Fusion imaging of fluorescent and phase-contrast x-ray computed tomography using synchrotron radiation in medical biology,** J. Wu, T. Takeda, T. T. Lwin, Univ. of Tsukuba (Japan); N. Sunaguchi, T. Yuasa, Yamagata Univ. (Japan); M. Minami, Univ. of Tsukuba (Japan); T. Akatsuka, Yamagata Univ. (Japan) . . . . . [6318-90]

✔ **Development of local tomography techniques at beamline 2-BM of the Advanced Photon Source,** X. Xiao, F. De Carlo, Argonne National Lab.; S. R. Stock, Northwestern Univ. . . . . [6318-91]

✔ **JEEP: a high-energy x-ray beamline for imaging at the Diamond Light Source, UK,** M. Drakopoulos, T. Hill, Diamond Light Source Ltd. (United Kingdom) . . . . . [6318-92]

✔ **Tomography of dental composites,** J. L. Drummond, Univ. of Illinois at Chicago; F. De Carlo, Argonne National Lab.; K. Sun, A. Bedran-Russo, P. Koin, M. Kotche, Univ. of Illinois at Chicago; B. J. Super, Motorola and Univ. of Illinois at Chicago . . . . . [6318-93]

Thursday 17 August

SESSION 9

Conv. Ctr. Room 9 . . . . . Thurs. 8:00 to 9:50 am

Micro-CT Applied to Materials Investigation

Chair: **Mark L. Rivers**, The Univ. of Chicago

8:00 am: **New developments for synchrotron-radiation-based microtomography at DESY *(Invited Paper)*,** F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany) . . . . . [6318-37]

8:25 am: **Quantitative properties of complex porous materials calculated from x-ray μCT images *(Invited Paper)*,** A. Sakellariou, M. A. Knackstedt, C. H. Arns, T. J. Senden, A. P. Sheppard, R. M. Sok, The Australian National Univ. (Australia) . . . . . [6318-38]

8:50 am: **Microstructural analysis of lignocellulosic fiber networks,** T. Walther, K. Terzic, Univ. Hamburg (Germany); T. Donath, GKSS-Forschungszentrum Geeshacht, GmbH (Germany); H. Meine, Univ. Hamburg (Germany); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany); H. Thoemen, Univ. Hamburg (Germany) . . . . [6318-40]

9:10 am: **Study of polymeric foam cell deformation during interrupted shock experiment,** E. Plougonven, Institut de Chimie de la Matière Condensée de Bordeaux (France); P. Viot, Univ. Bordeaux 1 (France); D. Bernard, Institut de Chimie de la Matière Condensée de Bordeaux (France) . . . . . [6318-41]

9:30 am: **High-spatial-resolution 3D local lambda-tomography of particle tracks and fragmentation in whole aerogel tiles,** D. S. Ebel, American Museum of Natural History; M. L. Rivers, The Univ. of Chicago . . . . . [6318-42]

Coffee Break . . . . . 9:50 to 10:30 am

SESSION 10

Conv. Ctr. Room 9 . . . . . Thurs. 10:30 to 11:40 am

New Advanced Techniques and Applications I

Chair: **Felix Beckmann**, GKSS-Forschungszentrum Geeshacht, GmbH (Germany)

10:30 am: **Combining absorption micro-CT and position-resolved x-ray scattering *(Invited Paper)*,** S. R. Stock, Northwestern Univ. . . [6318-43]

10:55 am: **Scintillator to CCD coupling in x-ray microtomography *(Invited Paper)*,** G. R. Davis, J. C. Elliott, Queen Mary Univ. of London (United Kingdom) . . . . . [6318-44]

11:20 am: **Image metrics for the automated alignment of microtomography data,** T. Donath, F. Beckmann, A. Schreyer, GKSS-Forschungszentrum Geeshacht, GmbH (Germany) . . . . . [6318-45]

Lunch Break . . . . . 11:40 am to 1:30 pm

SESSION 11

Conv. Ctr. Room 9 . . . . . Thurs. 1:30 to 3:10 pm

New Advanced Techniques and Applications II

Chair: **Stephen W. Wilkins**, Commonwealth Scientific and Industrial Research Organisation (Australia)

1:30 pm: **A comparison of a generalized DEI method with multiple-image radiography (MIR),** C. Chou, J. G. Brankov, M. N. Wernick, M. A. Anastasio, Illinois Institute of Technology . . . . . [6318-46]

1:50 pm: **Tomographic analysis and FE-simulations of MMC-microstructures under load,** H. Crostack, Univ. Dortmund (Germany); J. Nellesen, G. Fischer, RIF e.V. (Germany); S. Schmauder, U. Weber, Univ. of Stuttgart (Germany); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany) . . . . . [6318-47]

2:10 pm: **3D strain fields from tomographic measurements,** K. Haldrup, S. F. Nielsen, J. A. Wert, Risø National Lab. (Denmark); F. Beckmann, GKSS-Forschungszentrum Geeshacht, GmbH (Germany) . . . . [6318-48]

2:30 pm: **Advanced baggage inspection by energy-dispersive coherent scatter CT,** J. F. J. Schlomka, A. Thran, U. van Stevendaal, G. Martens, H. Barschdorf, R. Grewer, Philips Research Labs. (Germany) . . . . [6318-49]

2:50 pm: **High-resolution x-ray tomography using laboratory sources,** M. Feser, W. Yun, F. W. Duewer, H. Chang, A. Tkachuk, Xradia, Inc. . . . . [6318-50]

Coffee Break . . . . . 3:10 to 3:40 pm

SESSION 12

Conv. Ctr. Room 9 . . . . . Thurs. 3:40 to 5:30 pm

Micro-CT with Submicrometer Spatial Resolution

Chair: **Ulrich Bonse**, Univ. Dortmund (Germany)

3:40 pm: **Quantitative submicron phase-contrast CT using an SEM-based full-field x-ray microscope *(Invited Paper),*** S. W. Wilkins, S. C. Mayo, P. R. Miller, T. E. Gureyev, A. W. Stevenson, D. Gao, Commonwealth Scientific and Industrial Research Organisation (Australia); D. M. Paganin, Monash Univ. (Australia) . . . . . [6318-51]

4:05 pm: **Development of microtomography system with Fresnel zone plate optics at SPring-8 *(Invited Paper),*** K. Uesugi, A. Takeuchi, Y. Suzuki, Japan Synchrotron Radiation Research Institute (Japan) [6318-52]

4:30 pm: **A hard x-ray KB-FZP microscope for tomography with sub-100-nm resolution,** C. Rau, Univ. of Illinois at Urbana-Champaign and Argonne National Lab.; V. Crecea, Univ. of Illinois at Urbana-Champaign; K. M. Peterson, P. R. Jemian, Argonne National Lab.; C. Richter, Northwestern Univ.; U. Neuhäusler, Univ. Bielefeld (Germany); G. Schneider, BESSY GmbH (Germany); I. K. Robinson, Univ. of Illinois at Urbana-Champaign . . . . . [6318-53]

4:50 pm: **Full-field and scanning nanotomography based on parabolic refractive x-ray lenses,** C. G. Schroer, M. Kuhlmann, Deutsches Elektronen-Synchrotron (Germany); T. F. Günzler, B. M. Benner, O. Kurapova, J. Patommel, B. Lengeler, RWTH Aachen (Germany); S. Roth, R. Gehrke, Deutsches Elektronen-Synchrotron (Germany); A. A. Snigirev, I. I. Snigireva, European Synchrotron Radiation Facility (France); N. Stribeck, A. Almendarez-Camarillo, Technische Univ. Hamburg-Harburg (Germany) . . . . . [6318-54]

5:10 pm: **Chemically sensitive 3D imaging at 50-nm spatial resolution using tomography in a scanning transmission x-ray microscope,** G. A. Johansson, Lawrence Berkeley National Lab.; J. Dynes, McMaster Univ. (Canada); T. Tyliszczak, Lawrence Berkeley National Lab.; J. R. Lawrence, G. Swerhone, Environment Canada (Canada); A. P. Hitchcock, McMaster Univ. (Canada) . . . . . [6318-55]

Closing Remarks . . . . . Thurs. 5:30 to 5:40 pm

Chair: **Ulrich Bonse**, Univ. Dortmund (Germany)

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC794 **X-ray microCT** (Micro Computed Tomography) (Stock) Mon. 14 Aug., 1:30 to 5:30 pm

Monday-Wednesday 14-16 August 2006 • Part of Proceedings of SPIE Vol. 6319
X-Ray and Gamma-Ray Detector Physics and Penetrating Radiation Systems VIII

Hard X-Ray and Gamma-Ray Detector Physics VIII

Conference Chairs: **Larry A. Franks**, Consultant; **Arnold Burger**, Fisk Univ.; **Ralph B. James**, Brookhaven National Lab.

Program Committee: **Toru Aoki**, Shizuoka Univ. (Japan); **H. Bradford Barber**, The Univ. of Arizona; **Zane W. Bell**, Oak Ridge National Lab.; **Giuseppe Bertuccio**, Politecnico di Milano (Italy); **Lynn A. Boatner**, Oak Ridge National Lab.; **Aleksey E. Bolotnikov**, Brookhaven National Lab.; **Muren Chu**, Fermionics Corp.; **F. Patrick Doty**, Sandia National Labs.; **Waldes Dusi**, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); **Michael Fiederle**, Albert-Ludwigs-Univ. Freiburg (Germany); **Jonathan E. Grindlay**, Harvard-Smithsonian Ctr. for Astrophysics; **Yoshinori Hatanaka**, Aichi Univ. of Technology (Japan); **Zhong He**, Univ. of Michigan; **Richard B. Hoover**, NASA Marshall Space Flight Ctr.; **Warnick J. Kernan**, Bechtel Nevada; **Glenn F. Knoll**, Univ. of Michigan; **Longxia Li**, Yinnel Tech, Inc.; **Paul N. Luke**, Lawrence Berkeley National Lab.; **Kelvin G. Lynn**, Washington State Univ.; **Krishna C. Mandal**, EIC Labs., Inc.; **James L. Matteson**, Univ. of California/San Diego; **Douglas S. McGregor**, Kansas State Univ.; **Richard W. Olsen**, Consultant; **Alan Owens**, European Space Agency (Netherlands); **Ann M. Parsons**, NASA Goddard Space Flight Ctr.; **Bradley E. Patt**, Gamma Medica, Inc.; **Eugenio Perillo**, Univ. degli Studi di Napoli Federico II (Italy); **James M. Ryan**, Univ. of New Hampshire; **Michael M. Schieber**, The Hebrew Univ. of Jerusalem (Israel); **David P. Siddons**, Brookhaven National Lab.; **Paul Siffert**, Ctr. National de la Recherche Scientifique (France); **Michael R. Squillante**, Radiation Monitoring Devices, Inc.; **Csaba Szeles**, eV Products Corp.; **Gary C. Tepper**, Virginia Commonwealth Univ.; **Jacob I. Trombka**, NASA Goddard Space Flight Ctr.; **Tümay O. Tümer**, Nova R&D, Inc.; **Lodewijk van Den Berg**, Constellation Technology Corp.; **Peter E. Vanier**, Brookhaven National Lab.; **H. Walter Yao**, Advanced Micro Devices, Inc.; **Nikolay B. Zaletaev**, Orion Research and Production Association (Russia); **Klaus Ziock**, Oak Ridge National Lab.

Monday 14 August

Plenary Session

Conv. Ctr. Room 8 . . . . . Mon. 8:30 am to 9:50 am

8:30 am: **From Signals to Sudoku: Reconstructions from Partial Information, Veit Elser,** Cornell Univ.

9:10 am: **Opportunities and Challenges in Instrumentation Development for Biomedical X-Ray and Gamma-Ray Imaging, Lars R. Furenlid,** College of Optical Sciences/Univ. of Arizona

Coffee Break . . . . . 10:00 to 10:20 am

Introduction . . . . . Mon. 10:20 am to 10:30 am

Chairs: **Larry A. Franks**, Consultant; **Ralph B. James**, Brookhaven National Lab.; **Arnold Burger**, Fisk Univ.

SESSION 1

Conv. Ctr. Room 8 . . . . . Mon. 10:30 am to 12:00 pm

CZT I: Characterization

Chair: **Robert D. McLaren**, Consultant

10:30 am: **The effects of Te precipitates on measurable characteristics of CdZnTe detectors,** A. E. Bolotnikov, G. S. Camarda, G. A. Carini, Brookhaven National Lab.; L. Li, Yinnel Tech, Inc.; R. B. James, Brookhaven National Lab. . . . . [6319A-02]

10:50 am: **Growth of CdZnTe crystals for radiation detector applications using the Bridgman technique with a controlled overpressure of Cd,** C. Su, S. L. Lehoczky, G. J. Fishman, NASA Marshall Space Flight Ctr.; M. Groza, A. Burger, Fisk Univ. . . . . [6319A-03]

11:10 am: **CZT: recent progress and issues,** M. Chu, S. Terterian, D. Ting, Fermionics Corp.; G. A. Carini, G. S. Camarda, A. E. Bolotnikov, R. B. James, Brookhaven National Lab. . . . . [6319A-04]

11:30 am: **Effects of Te precipitates on the uniformity of CdZnTe detectors *(Invited Paper)*,** G. A. Carini, A. E. Bolotnikov, G. S. Camarda, R. B. James, Brookhaven National Lab. . . . . [6319A-05]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION D

Conv. Ctr. Room 8 . . . . . Mon. 1:30 to 2:00 pm

Keynote Presentation

1:30 pm: **DHS mission in nuclear detection and strategy for innovation *(Keynote Presentation)*,** A. Janos, U.S. Dept of Homeland Security . . . . . [6319A-70]

SESSION 2

Conv. Ctr. Room 8 . . . . . Mon. 2:00 to 3:00 pm

Scintillators

Chair: **Zane W. Bell**, Oak Ridge National Lab.

2:00 pm: **Cerium-doped mixed-alkali rare-earth double-phosphate scintillators for x- and gamma-ray detection,** J. Neal, L. A. Boatner, Oak Ridge National Lab.; M. Spurrier, The Univ. of Tennessee; P. Szupryczynski, Siemens Medical Solutions; C. L. Melcher, The Univ. of Tennessee . . . . . [6319A-06]

2:20 pm: **Position resolution obtained with waveshifter readout of lanthanum bromide scintillators,** G. L. Case, B. Budden, M. L. Cherry, Louisiana State Univ. . . . . [6319A-08]

2:40 pm: **The soft x-ray response of doped and undoped BC422 thin films,** M. J. Berninger, Bechtel Nevada; G. A. Rochau, Sandia National Labs.; K. P. Shelton, Ktech Corp. . . . . [6319A-09]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 3

Conv. Ctr. Room 8 . . . . . Mon. 3:30 to 5:10 pm

CZT II

Chair: **Douglas S. McGregor**, Kansas State Univ.

3:30 pm: **Fabrication of high-performance CdZnTe quasi-hemispherical gamma-ray CAPture™ plus detectors,** C. Szeles, D. S. Bale, G. L. Smith, M. Blostein, J. Eger, eV Products, Inc. . . . . [6319A-10]

3:50 pm: **Characterization of single-sided charge-sharing CZT strip detectors for gamma-ray astronomy,** B. Dönmez, J. R. Macri, J. M. Ryan, J. S. Legere, M. L. McConnell, M. Widholm, Univ. of New Hampshire; T. Narita, College of the Holy Cross; L. Hamel, Univ. de Montréal (Canada) . . . . . [6319A-11]

4:10 pm: **Design of high-performance CdZnTe quasi-hemispherical gamma-ray CAPture™ plus detectors,** D. S. Bale, C. Szeles, J. Grosholz, Jr., eV Products, Inc. . . . . [6319A-12]

4:30 pm: **Study of the variation of electron mobility-lifetime product and surface recombination velocity of Cd1-xZnxTe radiation detectors using direct current photoconductivity,** Y. Cui, M. Groza, U. N. Roy, A. Burger, Fisk Univ.; R. B. James, Brookhaven National Lab. . . . [6319A-13]

4:50 pm: **CZT in space-based hard x-ray astronomy background measurements from INTEGRAL and Swift: predictions for EXIST,** A. B. Garson III, H. S. Krawczynski, Washington Univ. in St. Louis; J. E. Grindlay, Harvard-Smithsonian Ctr. for Astrophysics; M. J. Harris, Max-Planck-Institut für extraterrestrische Physik (Germany); J. Hong, Harvard-Smithsonian Ctr. for Astrophysics; I. V. Jung, Washington Univ. in St. Louis; E. I. Novikova, Naval Research Lab.; D. M. Smith, Univ. of California/Santa Cruz; S. J. Sturner, NASA Goddard Space Flight Ctr. and Universities Space Research Association; B. J. Teegarden, NASA Goddard Space Flight Ctr.; K. Watanabe, NASA, Goddard Space Flight Ctr.; G. Weidenspointner, Ctr. d'Etude Spatiale des Rayonnements (France); C. A. Wilson, National Space Science and Technology Ctr. . . . . [6319A-14]

Tuesday 15 August

SESSION 4

Conv. Ctr. Room 8 . . . . . Tues. 8:30 to 10:00 am

Methodology

Chair: **Warnick J. Kernan**, Bechtel Nevada

8:30 am: **Analogies between neutron imaging and gamma-ray imaging *(Invited Paper)*,** P. E. Vanier, Brookhaven National Lab. . . . . [6319A-15]

9:00 am: **Hard x-ray devices for target detection at larger distances,** M. Gertsenshteyn, T. P. Jannson, Physical Optics Corp. . . . . [6319A-16]

9:20 am: **Evaluation of multisite rejection techniques in a highly segmented HPGe detector,** D. B. Campbell, Lawrence Livermore National Lab.; R. Henning, Lawrence Berkeley National Lab.; K. Vetter, Lawrence Livermore National Lab.; Y. Chan, Lawrence Berkeley National Lab.; M. Perry, Florida State Univ.; A. Poon, K. Lesko, Lawrence Berkeley National Lab. . . . . [6319A-18]

9:40 am: **An electronically collimated portable gamma-ray detector for locating environmental radiation sources,** K. L. Matthews II, B. Smith, A. Lackie, W. Hill, W. Wang, M. L. Cherry, Louisiana State Univ. . [6319A-19]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 5

Conv. Ctr. Room 8 . . . . . Tues. 10:30 to 11:40 am

Imaging

Chair: **Alan Janos**, U.S. Dept of Homeland Security

10:30 am: **Real-time magnification radiography utilizing a 100-μm-focus x-ray generator in conjunction with an image intensifier,** E. Sato, Iwate Medical Univ. (Japan); E. Tanaka, Tokyo Univ. of Agriculture and Technology (Japan); H. Mori, National Cardiovascular Ctr. Research Institute (Japan); T. Kawai, Hamamatsu Photonics K.K. (Japan); T. Inoue, A. Ogawa, M. Izumisawa, K. Takahashi, S. Sato, Iwate Medical Univ. (Japan); T. Ichimaru, Hirosaki Univ. (Japan); K. Takayama, Tohoku Univ. (Japan) . . . . . [6319A-20]

10:50 am: **Two-dimensional CdTe photon counting imager for hard x-ray *(Invited Paper)*,** T. Aoki, Shizuoka Univ. (Japan) . . . . . [6319A-21]

11:20 am: **Demonstration of enhanced K-edge angiography using a samarium target x-ray generator,** E. Sato, Iwate Medical Univ. (Japan); E. Tanaka, Tokyo Univ. of Agriculture and Technology (Japan); H. Mori, National Cardiovascular Ctr. Research Institute (Japan); T. Kawai, Hamamatsu Photonics K.K. (Japan); T. Inoue, A. Ogawa, M. Izumisawa, K. Takahashi, S. Sato, Iwate Medical Univ. (Japan); T. Ichimaru, Hirosaki Univ. (Japan); K. Takayama, Tohoku Univ. (Japan) . . . . . [6319A-23]

Lunch/Exhibition Break . . . . . 11:40 to 1:50 pm

SESSION 6

Conv. Ctr. Room 8 . . . . . Tues. 1:50 to 3:30 pm

Novel Methods

Chair: **Raulf M. Polichar**, Science Applications International Corp.

1:50 pm: **Characteristics of a super-fluorescent x-ray generator,** E. Sato, Iwate Medical Univ. (Japan); E. Tanaka, Tokyo Univ. of Agriculture and Technology (Japan); H. Mori, National Cardiovascular Ctr. Research Institute (Japan); T. Kawai, Hamamatsu Photonics K.K. (Japan); T. Inoue, A. Ogawa, M. Izumisawa, K. Takahashi, S. Sato, Iwate Medical Univ. (Japan); T. Ichimaru, Hirosaki Univ. (Japan); K. Takayama, Tohoku Univ. (Japan) . . . . . [6319A-24]

2:10 pm: **Ultrahigh-energy-resolution gamma-ray spectrometers for national security application,** S. Ali, T. R. Niedermayr, S. F. Terracol, O. B. Drury, I. D. Hau, S. Friedrich, Lawrence Livermore National Lab.[6319A-25]

2:30 pm: **CZT imaging detectors for ProtoEXIST,** J. Hong, J. E. Grindlay, A. Copete, Harvard-Smithsonian Ctr. for Astrophysics; R. G. Baker, S. D. Barthelmy, N. A. Gehrels, NASA Goddard Space Flight Ctr.; W. R. Cook III, J. A. Burnham, F. A. Harrison, California Institute of Technology; W. W. Craig, Lawrence Livermore National Lab. . . . . [6319A-26]

2:50 pm: **Modeling and experimental study of diamond detector radiation response,** N. B. Zaletaev, S. D. Sivachenko, Orion Research and Production Association (Russia) . . . . . [6319A-27]

3:10 pm: **In-orbit calibration of the hard x-ray detector (HXD-II) onboard Suzaku,** T. Kitaguchi, T. Enoto, S. Hirakuri, The Univ. of Tokyo (Japan); T. Itoh, The Univ. of Tokyo; M. Kawaharada, M. Kokubun, The Univ. of Tokyo (Japan); K. Makishima, The Univ. of Tokyo (Japan) and RIKEN (Japan); R. Miyawaki, M. Murashima, M. Sato, H. Takahashi, The Univ. of Tokyo (Japan); T. Takahashi, Japan Aerospace Exploration Agency (Japan); T. Yanagida, The Univ. of Tokyo (Japan) . . . . . [6319A-28]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 7

Conv. Ctr. Room 8 . . . . . Tues. 4:00 to 5:20 pm

CZT III

Chair: **Csaba Szeles**, eV Products, Inc.

4:00 pm: **CdTe and $Cd_{(0.9)}Zn_{(0.1)}Te$ crystal growth and characterization for nuclear spectrometers,** K. C. Mandal, S. H. Kang, M. Choi, R. D. Rauh, EIC Labs., Inc.; O. Savadogo, H. Tian, École Polytechnique de Montréal (Canada); G. W. Wright, D. E. Holcomb, G. E. Jellison, Jr., Oak Ridge National Lab. . . . . [6319A-29]

4:20 pm: **X-ray two-dimensional detector array hybridization technology,** Y. Zhou, N. Zhou, L. Zhang, J. Wang, A. Wan, MicroPho Corp . . . . . [6319A-30]

4:40 pm: **Deviations of CZT detector response caused by isolated Te precipitates,** G. S. Camarda, A. E. Bolotnikov, G. A. Carini, R. B. James, Brookhaven National Lab. . . . . [6319A-31]

5:00 pm: **Shaping the electric field inside CZT detectors with isolated steering grids,** I. V. Jung, A. B. Garson III, J. S. Perkins, Washington Univ. in St. Louis; A. Burger, M. Groza, Fisk Univ.; J. L. Matteson, R. T. Skelton, Univ. of California/San Diego; H. S. Krawczynski, Washington Univ. in St. Louis . . . . . [6319A-32]

Wednesday 16 August

SESSION 8

Conv. Ctr. Room 8 . . . . . Wed. 8:50 to 9:50 am

Materials

Chair: **Krishna C. Mandal**, EIC Labs., Inc.

8:50 am: **Conductivity variations in mercuric iodide detectors,** L. van Den Berg, Constellation Technology Corp. . . . . [6319A-33]

9:10 am: **$Cd_{0.55}Mn_{0.45}Te$ crystal growth, microstructure, and electrical resistivity,** M. A. Black, T. Orlova, F. Y. Lu, L. Li, Yinnel Tech, Inc. . . . . [6319A-34]

9:30 am: **Semiconductor polycrystalline alpha detectors,** M. M. Schieber, The Hebrew Univ. of Jerusalem (Israel) . . . . . [6319A-36]

Coffee Break . . . . . 9:50 to 10:20 am

SESSION 9

Conv. Ctr. Room 8 . . . . . Wed. 10:20 to 11:50 am

Alternative Methods

Chair: **Lodewijk van Den Berg**, Constellation Technology Corp.

10:20 am: **High-pressure xenon detector development at Constellation Technology Corporation,** R. A. Austin, L. F. Bastian, Constellation Technology Corp. . . . . [6319A-37]

10:40 am: **Application of xenon gamma-ray detectors in portal monitors for detection and identification of radioactive and fissile materials,** S. E. Ulin, V. V. Dmitrenko, A. M. Galper, K. F. Vlasik, Z. M. Uteshev, P. G. Dvornyak, A. D. Ischenko, N. A. Ivanova, V. Y. Gecha, A. K. Boyartchuk, Moscow Engineering Physics Institute (Russia) . . [6319A-38]

11:00 am: **Recent advances in API system performance *(Invited Paper)*,** P. Hurley, J. R. Tinsley, Bechtel Nevada . . . . . [6319A-39]

11:30 am: **TIGRE prototype gamma-ray balloon instrument,** A. D. Zych, T. J. O'Neill, D. Bhattacharya, C. Heman, Univ. of California/Riverside; C. Teichegaeber, M. Matthews, Riverside Community College; S. Wijeratne, Univ. of California/Riverside . . . . . [6319A-40]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Multi-energy ZnSe-based radiography against terrorism: theory and experiments,** S. V. Naydenov, Institute for Single Crystals (Ukraine); V. D. Ryzhikov, Institute for Scintillation Materials (Ukraine); C. F. Smith, Lawrence Livermore National Lab.; D. Wood, Rhyolite Technology Group, Inc. . . . . [6319A-41]

✔ **Ce-doped SiO_2 glass as scintillating material: variations on the synthesis procedure for the improvement of material properties,** N. Chiodini, A. G. Vedda, D. Di Martino, M. Fasoli, A. Lauria, F. Moretti, Univ. degli Studi di Milano-Bicocca (Italy) . . . . . [6319A-42]

✔ **ZnSe(Te)-based crystals and detectors for nondestructive testing and cargo inspection,** S. A. Kostyukevich, Institute of Semiconductors (Ukraine); V. Seminozhenko, Institute for Single Crystals (Ukraine); V. Ryzhikov, A. D. Opolonin, Institute of Scintillating Materials (Ukraine); S. Galkin, E. Voronkin, O. K. Lysetska, Institute for Single Crystals (Ukraine) . . . . . [6319A-43]

✔ **Design of a pixelated high-pressure xenon gamma-ray spectrometer,** Y. Feng, J. E. Baciak, Jr., Univ. of Florida . . [6319A-44]

✔ **Inelastic scattering measurements of low-energy x-ray photons by organics, soil, water, and metals,** P. Paki Amouzou, M. Gertsenshteyn, Physical Optics Corp. . . . . [6319A-45]

✔ **SONOS sensor for measurement of gamma-ray irradiation,** W. Hsieh, Ming Hsin Univ. of Science and Technology (Taiwan) [6319A-47]

✔ **Time-resolved hard x-ray spectrometer,** K. Moy, Bechtel Nevada; M. Cuneo, Sandia National Labs.; I. McKenna, T. L. Keenan, Bechtel Nevada . . . . . [6319A-48]

✔ **A triple-head solid state camera for cardiac single photon emission tomography (SPECT),** H. Babla, Digirad Corp. . . . . [6319A-50]

✔ **Amorphous selenium-based x-ray detectors for medical imaging devices,** K. C. Mandal, S. H. Kang, M. Choi, R. D. Rauh, EIC Labs., Inc.; O. Savadogo, H. Tian, École Polytechnique de Montréal (Canada); G. E. Jellison, Jr., Oak Ridge National Lab. . . . . [6319A-51]

✔ **Characterization of chemically deposited low-cost II-VI thin films: modifying effects with catalytic silicotungstic acid (STA),** O. Savadogo, E. N. Petuenju, École Polytechnique de Montréal (Canada); K. C. Mandal, S. H. Kang, M. Choi, EIC Labs., Inc. . . . . [6319A-52]

✔ **Field emitter type CdTe radiation detector for x-ray imager,** T. Sakata, Y. Ikeda, K. Shiozawa, Y. Neo, T. Aoki, H. Mimura, Shizuoka Univ. (Japan) . . . . . [6319A-53]

✔ **High-resolution imaging 1D and 2D solid state detector systems,** T. O. Tümer, V. B. Cajipe, M. Clajus, S. Hayakawa, Nova R&D, Inc. . . . . [6319A-54]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC794 **X-ray microCT** (Micro Computed Tomography) (Stock) Mon. 14 Aug., 1:30 to 5:30 pm

Wednesday-Thursday 16-17 August 2006 • Part of Proceedings of SPIE Vol. 6319
X-Ray and Gamma-Ray Detector Physics and Penetrating Radiation Systems VIII

Penetrating Radiation Systems and Applications VIII

Conference Chairs: **H. Bradford Barber**, The Univ. of Arizona; **F. Patrick Doty**, Sandia National Labs.; **Hans Roehrig**, The Univ. of Arizona

Tuesday 15 August

Penetrating Radiation Technical Group Meeting

Marriott Mission Hills . . . . . Tues. 8:00 to 10:00 pm

Chair: **Warnick J. Kernan,** Bechtel Nevada

See p. 19 for further information.

Wednesday 16 August

SESSION 10

Conv. Ctr. Room 15B . . . . . Wed. 1:30 to 3:25 pm

Medical Imaging Detectors I

1:30 pm: **Molecular breast imaging using a dedicated, high-performance instrument *(Invited Paper)*,** M. K. O'Connor, Mayo Clinic; G. Caravaglia, D. Wagenaar, Gamma Medica-Ideas, Inc. . . . . [6319B-55]

1:55 pm: **Feasibility studies of an EMCCD-based beta imaging probe for radioguided thyroid surgery *(Invited Paper)*,** I. Shestakova, V. V. Nagarkar, V. B. Gaysinskiy, G. Entine, Radiation Monitoring Devices, Inc. . . . . [6319B-56]

2:20 pm: **AEGIS: a prototype pixel readout integrated circuit for CdZnTe,** F. L. Augustine, Radiation Monitoring Devices, Inc.; H. B. Barber, The Univ. of Arizona; L. R. Furenlid, College of Optical Sciences/The Univ. of Arizona; C. M. Ingram, The Univ. of Arizona . . . . . [6319B-57]

2:40 pm: **DQE of imaging detectors for application in crystallography,** H. Roehrig, The Univ. of Arizona; W. V. Schempp, Rigaku Corp. [6319B-58]

3:00 pm: **New trends in dual modality imaging *(Invited Paper)*,** B. H. Hasegawa, Univ. of California/San Francisco . . . . . [6319B-59]

Coffee Break . . . . . 3:25 to 3:50 pm

SESSION 11

Conv. Ctr. Room 15B . . . . . Wed. 3:50 to 5:35 pm

Medical Imaging Detectors II

3:50 pm: **Stability, dark current, noise, and performance optimization of selenium detectors *(Invited Paper)*,** D. L. Y. Lee, dXray Digital Imaging Technology (Beijing) Inc. . . . . [6319B-60]

4:15 pm: **Consistent color presentation on color displays for medical application,** H. Roehrig, J. Fan, The Univ. of Arizona . . . . . [6319B-61]

4:35 pm: **Use of a color CCD as a colorimeter,** W. J. Dallas, H. Roehrig, The Univ. of Arizona . . . . . [6319B-62]

4:55 pm: **CdZnTe detectors in nuclear medicine imaging,** H. B. Barber, The Univ. of Arizona . . . . . [6319B-63]

Thursday 17 August

SESSION 12

Conv. Ctr. Room 15B . . . . . Thurs. 8:30 to 9:55 am

Radiation Detectors for Security Applications

8:30 am: **Active interrogation *(Invited Paper)*,** K. Leung, Lawrence Berkeley National Lab. . . . . [6319B-65]

8:55 am: **Experiences with radiation portal detectors for international rail transport,** D. C. Stromswold, K. McCormick, L. Todd, E. D. Ashbaker, J. C. Evans, Pacific Northwest National Lab. . . . . [6319B-66]

9:15 am: **Lanthanide halide scintillators,** R. M. Polichar, Science Applications International Corp. . . . . [6319B-68]

9:35 am: **Density and mean atomic number determined from diffraction profiles,** G. Harding, GE Security (Germany) . . . . . [6319B-69]

Course of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC794 **X-ray microCT** (Micro Computed Tomography) (Stock) Mon. 14 Aug., 1:30 to 5:30 pm

Nanophotonics

Program on **Nanotechnology**

Program Chairs: **David L. Andrews,** Univ. of East Anglia Norwich (United Kingdom); **James G. Grote,** Air Force Research Lab.

Sunday	Monday	Tuesday	Wednesday	Thursday

Conferences

6320 **Complex Photonic Media** *(Dewar/McCall/Noginov/Zheludev)*, p. 138

6321 **Nanophotonic Materials III** *(Gaburro/Cabrini)*, p. 142

6322 **Tuning the Optic Response of Photonic Bandgap Structures III** *(Braun/Weiss)*, p. 145

6324 **Plasmonics: Nanoimaging, Nanofabrication, and their Applications II** *(Kawata/Shalaev/Tsai)*, p. 151

6325 **Physical Chemistry of Interfaces and Nanomaterials V** *(Spitler/Willig)*, p. 154

6323 **Plasmonics: Metallic Nanostructures and their Optical Properties IV** *(Stockman)*, p. 147

6326 **Optical Trapping and Optical Micromanipulation III** *(Dholakia/Spalding)*, p. 157

6328 **Nanomodeling II** *(Lakhtakia/Maksimenko)*, p. 166

6327 **Nanoengineering: Fabrication, Properties, Optics, and Devices III** *(Dobisz/Eldada)*, p. 163

6329 **Optofluidics** *(Psaltis/Fainman)*, p.169

Courses

SC497 **Nanophotonics** (Prasad), 1:30 to 5:30 pm

SC496 **Fabrication and Processing of Nanostructures** (Cao), 8:30 am to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson), 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding), 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman), 8:30 am to 5:30 pm

Register for Courses onsites at the SPIE Registration Desk!

Special Events

Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7

Special Program: **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41

X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8

Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20

Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8

Solar Energy Plenary, 1:30 to 5:30 pm, p. 9

Poster Session, 6:00 to 7:30 pm, p. 6

All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6

Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17

Illumination Technical Group, 8:00 to 10:00 pm, p. 17

Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18

EXHIBITION, p. 24
10:00 am to 5:00 pm

Organic and Nanophotonics Plenary, 8:30 am to 12:00 pm, p. 11

Industry Perspectives: **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14

SPIEWorks Career Fair, 10:00 am to 5:00 pm, p. 20

Fellows Luncheon, 12:00 to 2:00 pm, p. 5

Industry Perspectives: **Solid State Lighting,** 12:30 to 1:15 pm, p. 15

Future of Imaging Plenary Session, 1:00 to 2:20 pm, p. 13

Annual General Meeting of the SPIE Corporation, 6:00 to 7:00 pm, p. 4

SPIE Members Reception, 7:00 to 8:30 pm, p.5

Workshop: **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17

Poster/Demo Session, 8:00 to 10:00 pm, p. 6

Lens Design Technical Group, 8:00 to 10:00 pm, p. 18

Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18

Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19

Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19

Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19

Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19

EXHIBITION, p. 24
10:00 am to 5:00 pm

Book Publishing for Engineers and Scientists, 8:30 to 11:00 am, p. 21

The Craft of Scientific Presentations: a Workshop on Technical Presentations, 8:30 am to 12:30 pm, p.22

Essential Interpersonal Skills for Technical Professionals, 8:30 am to 5:30 pm, p. 21

Industry Perspectives: **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16

Industry Perspectives: **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16

Industry Perspectives: **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15

SPIEWorks Career Fair, 10:00 am to 5:00 pm, p. 20

Special Program: Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42

The Craft of Scientific Writing: A Workshop On Technical Writing, 1:30 to 5:30 pm, p. 23

Poster Session, 5:30 to 7:00 pm, p. 6

SPIE's 2006 Annual Awards Banquet, Banquet and Awards presentations, 7:30 pm, p. 5

10:00 am to 2:00 pm

How to Start a Small High Tech Business Almost Anywhere, 8:30 am to 12:30 pm, p. 22

Special Panel/Workshop: **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19

SPIE Women in Optics Presentation and Reception, 4:00 to 5:30 pm, p.6

Sunday-Wednesday 13-16 August 2006 • Proceedings of SPIE Vol. 6320

Complex Photonic Media

Conference Chairs: **Graeme Dewar**, Univ. of North Dakota; **Martin W. McCall**, Imperial College London (United Kingdom); **Mikhail A. Noginov**, Norfolk State Univ.; **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

Program Committee: **David L. Andrews**, Univ. of East Anglia Norwich (United Kingdom); **Allan D. Boardman**, Univ. of Salford (United Kingdom); **Hui Cao**, Northwestern Univ.; **Nader Engheta**, Univ. of Pennsylvania; **Alexander L. Gaeta**, Cornell Univ.; **Javier Garcia de Abajo**, Consejo Superior de Investigaciones Científicas (Spain); **Sailing He**, Royal Institute of Technology (Sweden); **Joachim R. Krenn**, Karl-Franzens-Univ. Graz (Austria); **Akhlesh Lakhtakia**, The Pennsylvania State Univ.; **Andrey K. Sarychev**, Ethertronics Inc.; **Vladimir M. Shalaev**, Purdue Univ.; **Geoffrey B. Smith**, Univ. of Technology/Sydney (Australia); **Mark I. Stockman**, Georgia State Univ.; **Din Ping Tsai**, National Taiwan Univ. (Taiwan)

Sunday 13 August

Welcome and Introduction

Conv. Ctr. Room 4 . . . . . Sun. 9:00 to 9:10 am

Nikolay I. Zheludev, Univ. of Southampton (United Kingdom)

SESSION 1

Conv. Ctr. Room 4 . . . . . Sun. 9:10 to 10:10 am

Keynote Session I

Chair: **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

Keynote

9:10 am: **Empowering metamaterials: from low- to no-loss and from linear to nonlinear optics,** V. M. Shalaev, Purdue Univ. . . . . [6320-01]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 2

Conv. Ctr. Room 4 . . . . . Sun. 10:30 am to 12:10 pm

Nanoplasmonic Metamaterials I

Chair: **David L. Andrews**, Univ. of East Anglia Norwich (United Kingdom)

10:30 am: **Surface plasmon-polariton guiding, concentration, modulation, and diffraction *(Invited Paper)*,** M. L. Brongersma, Stanford Univ. . . . . [6320-02]

11:00 am: **Artificial high-frequency magnetism and left-handed metamaterials *(Invited Paper)*,** A. K. Sarychev, Ethertronics Inc.[6320-03]

11:30 am: **Free space microwave focusing by a negative-index gradient lens,** T. Driscoll, D. N. Basov, Univ. of California/San Diego; A. F. Starr, Sensormetrix, inc. and Univ. of California/San Diego; P. Rye, S. Nemat-Nasser, Univ. of California/San Diego; D. Schurig, Duke Univ.; D. R. Smith, Duke Univ. and Univ. of California/San Diego . . . . . [6320-04]

11:50 am: **Extraordinary light transmission through quasicrystal arrays of holes in a metal film,** F. J. Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain); Y. Chen, Rutherford Appleton Lab. (United Kingdom); V. A. Fedotov, N. Papasimakis, A. S. Schwanecke, N. I. Zheludev, Univ. of Southampton (United Kingdom) . . . . . [6320-05]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 3

Conv. Ctr. Room 4 . . . . . Sun. 1:30 to 3:20 pm

Complex Media with Gain

Chair: **Vladimir M. Shalaev**, Purdue Univ.

1:30 pm: **Random lasers as fascinating new light sources *(Invited Paper)*,** D. S. Wiersma, S. Gottardo, S. Cavalieri, S. Mujumdar, Univ. degli Studi di Firenze (Italy) . . . . . [6320-06]

2:00 pm: **Nanocrystals in coupled microresonator structures *(Invited Paper)*,** U. Woggon, Univ. Dortmund (Germany) . . . . . [6320-07]

2:30 pm: **Optical gain and surface plasmons in rhodamine 6G-Ag aggregate composite *(Invited Paper)*,** M. A. Noginov, Norfolk State Univ.; G. Venkov, Technical Univ. of Sofia (Bulgaria); D. Censor, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6320-08]

3:00 pm: **Magnetic plasmonic metamaterials in actively pumped host medium,** G. Tartakovsky, Cubic Defense Applications, Inc.; A. K. Sarychev, Ethertronics Inc. . . . . [6320-09]

Coffee Break . . . . . 3:20 to 3:40 pm

SESSION 4

Conv. Ctr. Room 4 . . . . . Sun. 3:40 to 5:10 pm

Nanoplasmonic Metamaterials II

Chair: **Andrey K. Sarychev**, Ethertronics Inc.

3:40 pm: **Nonlinear behavior of negative phase velocity metamaterials *(Invited Paper)*,** A. D. Boardman, N. J. King, Univ. of Salford (United Kingdom); Y. Rapoport, National Taras Shevchenko Univ. (Ukraine) . . . . . [6320-10]

4:10 pm: **Strategies for minimizing losses in negative phase velocity metamaterials,** G. Dewar, Univ. of North Dakota . . . . . [6320-11]

4:30 pm: **An adaptive Fourier Bessel split-step method snd variational techniques applied on negative index materials,** P. P. Banerjee, G. T. Nehmetallah, Univ. of Dayton . . . . . [6320-12]

4:50 pm: **Application of hardware-based simulation platforms to negative-index material analysis,** A. S. Sharkawy, J. P. Durbano, EM Photonics, Inc.; S. Shi, F. E. Ortiz, Univ. of Delaware; P. F. Curt, EM Photonics, Inc. . . . . [6320-14]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 4 . . . . . Mon. 8:30 to 10:10 am

Organic/Inorganic Complex Photonic Media

Chair: **Javier Garcia de Abajo**, Consejo Superior de Investigaciones Científicas (Spain)

8:30 am: **Theoretically-inspired nanoengineering of complex photonic media *(Invited Paper)*,** L. R. Dalton, Univ. of Washington . . . . . [6320-15]

9:00 am: **Photonic applications of the supermolecular nanostructures with photophysical processes controlled *(Invited Paper)*,** A. Otomo, S. Yokoyama, S. Mashiko, National Institute of Information and Communications Technology (Japan) . . . . . [6320-16]

9:30 am: **Charge relaxation and dynamics in organic semiconductors,** H. L. Kwok, Univ. of Victoria (Canada) . . . . . [6320-17]

9:50 am: **Luminescence and optical absorption of conjugated poly-phenylene-vinylene polymers,** C. E. Bonner, Jr., S. Charter, A. Lorts, V. I. Gavrilenko, Norfolk State Univ. . . . . [6320-18]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 6

Conv. Ctr. Room 4 . . . . . Mon. 10:30 am to 12:10 pm

Chiral Metamaterials

Chair: **Martin W. McCall**, Imperial College London (United Kingdom)

10:30 am: **Asymmetric propagation of light through planar chiral metamaterials *(Invited Paper)*,** N. I. Zheludev, V. A. Fedotov, S. Prosvirnin, Univ. of Southampton (United Kingdom) . . . . . [6320-19]

11:00 am: **Bragging electrically *(Invited Paper)*,** A. Lakhtakia, The Pennsylvania State Univ. . . . . [6320-20]

11:30 am: **Giant gyrotropy in bi-layered chiral structures,** A. V. Rogacheva, V. A. Fedotov, A. S. Schwanecke, N. I. Zheludev, Univ. of Southampton (United Kingdom) . . . . . [6320-21]

11:50 am: **Complex media characterized by chirality and negative refractive index,** E. Bahar, Univ. of Nebraska/Lincoln . . . . . [6320-22]

Lunch Break . . . . . 12:10 to 1:40 pm

SESSION 7

Conv. Ctr. Room 4 . . . . . Mon. 1:40 to 3:00 pm

Metamaterials Design and Engineering I

Chair: **Mark I. Stockman**, Georgia State Univ.

1:40 pm: **Multiscale metamaterials with extraordinary optical properties *(Invited Paper)*,** F. J. Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) . . . . . [6320-23]

2:10 pm: **Micro and nanolithography for photonic meta-materials *(Invited Paper)*,** Y. Chen, Rutherford Appleton Lab. (United Kingdom) . . . . . [6320-24]

2:40 pm: **Characterization of chemisorption on porous silicon by sum frequency generation,** K. W. Kolasinski, I. A. Harrison, Univ. of Virginia; A. V. Gavrilenko, C. E. Bonner, Jr., V. I. Gavrilenko, Norfolk State Univ. . . . . [6320-25]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 8

Conv. Ctr. Room 4 . . . . . Mon. 3:30 to 5:00 pm

Metamaterials Design and Engineering II

Chair: **Akhlesh Lakhtakia**, The Pennsylvania State Univ.

3:30 pm: **Electro-optic composite materials *(Invited Paper)*,** J. W. Haus, Univ. of Dayton; R. L. Nelson, Air Force Research Lab.; B. Birchfield, Univ. of Dayton; F. K. Hopkins, J. G. Grote, Air Force Research Lab. . [6320-27]

4:00 pm: **Directed pattern formation by self-inscribing guided waves in photosenstive compliant glasses,** M. P. Andrews, N. Belanger, McGill Univ. (Canada) . . . . . [6320-28]

4:20 pm: **From photonic crystals (via homogenization) to metamaterials: I,** P. P. Halevi, F. Perez-Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6320-30]

4:40 pm: **From photonic crystals (via homogenization) to metamaterials: II,** F. Perez-Rodriguez, P. P. Halevi, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6320-31]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Spectra of ZnO random lasers under nanosecond pumping,** M. V. Ryzhkov, V. M. Markushev, C. M. Briskina, Institute of Radio-engineering and Electronics (Russia); H. Cao, Northwestern Univ. . . . . [6320-47]

✔ **Mode and group velocity dispersion evolution in curved nanofiber,** G. Feng, X. Li, Sichuan Univ. (China) . . . . . [6320-50]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 9

Conv. Ctr. Room 4 . . . . . Tues. 1:30 to 3:20 pm

Propagation, Localization, and Scattering Phenomena

Chair: **Allan D. Boardman**, Univ. of Salford (United Kingdom)

1:30 pm: **Near-field propagation in planar nanostructured arrays *(Invited Paper)*,** D. L. Andrews, R. J. Crisp, Univ. of East Anglia Norwich (United Kingdom) . . . . . [6320-32]

2:00 pm: **Novel perspectives on low-frequency scattering,** M. W. McCall, Imperial College London (United Kingdom) . . . . . [6320-33]

2:20 pm: **Extraordinary localization of collective electronic states in random media,** D. A. Genov, Univ. of California/Berkeley; K. Seal, H. Cao, Northwestern Univ.; V. M. Shalaev, Purdue Univ.; A. K. Sarychev, Ethertronics Inc.; X. Zhang, Univ. of California/Berkeley; H. Noh, Northwestern Univ. . . . . [6320-34]

2:40 pm: **THz anomalous transmission through aperiodic subwavelength hole array,** T. Matsui, A. K. Agrawal, A. Nahata, V. Z. Vardeny, The Univ. of Utah . . . . . [6320-35]

3:00 pm: **Simulation study of surface plasmon excitation in metallic gratings with subwavelength aperture: using particle-in-cell plasma method,** Y. Lan, W. Chen, L. Wang, National Cheng Kung Univ. (Taiwan) [6320-36]

Coffee Break . . . . . 3:20 to 3:40 pm

SESSION 10

Conv. Ctr. Room 4 . . . . . Tues. 3:40 to 5:20 pm

Nanophotonics and Nanoplasmonics

Chair: **Graeme Dewar**, Univ. of North Dakota

3:40 pm: **Near-field optical measurements of metallic nanocomposite thin film *(Invited Paper)*,** D. P. Tsai, National Taiwan Univ. (Taiwan) [6320-37]

4:10 pm: **Giant Raman scattering in complex natural and engineered nanostructures *(Invited Paper)*,** M. I. Stockman, Georgia State Univ. [6320-38]

4:40 pm: **New material for nonlinear plasmonics: a gallium/aluminium nano-composite,** K. F. MacDonald, A. V. Krasavin, N. I. Zheludev, Univ. of Southampton (United Kingdom) . . . . . [6320-39]

5:00 pm: **Complex optical structure in the ribbon-like feathers of the African Open-bill Stork,** J. Vigneron, Facultes Univ. Notre Dame de la Paix (Belgium); V. M. P. Lousse, Stanford Univ. . . . . [6320-40]

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 11

Conv. Ctr. Room 4 . . . . . Wed. 8:30 to 10:20 am

Nanoplasmonic Metamaterials III

Chair: **Martin Moskovits**, Univ. of California/Santa Barbara

8:30 am: **What is the smallest volume into which light can be focused? *(Invited Paper)*,** J. Conway, S. Vedantam, H. Lee, E. Yablonovitch, Univ. of California/Los Angeles . . . . . [6320-41]

9:00 am: **Plasmonic and magneto-plasmonic structures at optical frequency *(Invited Paper)*,** X. Zhang, Univ. of California/Berkeley[6320-42]

9:30 am: **An all-optical SERS-based pH nanosensor *(Invited Paper)*,** N. J. Halas, Rice Univ. . . . . [6320-43]

10:00 am: **Point imaging by photonic-crystal structures without obvious negative refraction,** P. Luan, D. Changao, National Central Univ. (Taiwan) . . . . . [6320-44]

Coffee Break . . . . . 10:20 to 10:40 am

SESSION 12

Conv. Ctr. Room 4 . . . . . Wed. 10:40 to 11:40 am

Keynote Session II

Chair: **Mikhail A. Noginov**, Norfolk State Univ.

Keynote

10:40 am: **Engineering nanostructures for surface-enhanced Raman sensing,** M. Moskovits, S. Lee, I. Pavel, M. Schierhorn, Univ. of California/Santa Barbara . . . . . [6320-45]

Closing Remarks

Chair: **Mikhail A. Noginov**, Norfolk State Univ.

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Sunday-Monday 13-14 August 2006 • Proceedings of SPIE Vol. 6321

Nanophotonic Materials III

Conference Chairs: **Zeno Gaburro**, Univ. degli Studi di Trento (Italy); **Stefano Cabrini**, Lawrence Berkeley National Lab.

Program Committee: **David L. Andrews**, Univ. of East Anglia Norwich (United Kingdom); **Angus J. Bain**, Univ. College London (United Kingdom); **Mireille H. Blanchard-Desce**, Univ. de Rennes I (France); **Robert W. Boyd**, Univ. of Rochester; **Aaron W. Harper**, Univ. of Southern California; **Ghassan E. Jabbour**, Arizona State Univ.; **Francois Kajzar**, CEA Saclay (France); **Dmitri I. Kovalev**, Univ. of Bath (United Kingdom); **Paras N. Prasad**, SUNY/Univ. at Buffalo; **Younan Xia**, Univ. of Washington

Sunday 13 August

SESSION 1

Conv. Ctr. Room 7A . . . . . Sun. 1:40 to 3:00 pm

Nanocrystals and Nanoparticles

Chair: **Stefano Cabrini**, Lawrence Berkeley National Lab.

1:40 pm: **Controlling crystalline structure and crystallite size with surfactant and its effect in the upconversion emission of ZrO_2:Er^{3+} nanophosphor,** T. Lopez, Univ. Michoacana de San Nicolás de Hidalgo (Mexico); D. Solis, E. De La Rosa, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, C. Angeles-Chavez, A. Montoya, Instituto Mexicano del Petróleo (Mexico); S. Bribiesca, Univ. Michoacana de San Nicolás de Hidalgo (Mexico) . . . . . [6321-01]

2:00 pm: **Stepwise assembly of Europium sesquioxide nanocrystals and nanoneedles,** S. Mahajan, M. Redigolo, D. Koktysh, J. Dickerson, Vanderbilt Univ. . . . . [6321-02]

2:20 pm: **Semiconductor nanocrystals photosensitize C60 microcrystals,** T. A. Klar, A. Biebersdorf, R. Dietmüller, A. S. Susha, A. L. Rogach, Ludwig-Maximilians-Univ. München (Germany); S. K. Poznyak, Belarus State Univ. (Belarus); D. V. Talapin, H. Weller, Univ. Hamburg (Germany); J. Feldmann, Ludwig-Maximilians-Univ. München (Germany) . . . . . [6321-03]

2:40 pm: **Blue emission of YMO_4:Eu^{2+} (M=V, P) nanocrystals prepared through facile wet process,** M. Iwasaki, M. Yamashita, M. Taguchi, S. Ito, Kinki Univ. (Japan) . . . . . [6321-05]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 2

Conv. Ctr. Room 7A . . . . . Sun. 3:30 to 5:00 pm

Characterization Techniques

Chair: **Elder De La Rosa**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

3:30 pm: **Near-field optical probing of photonic materials using an AFM tip *(Invited Paper)*,** G. Lerondel, R. J. B. Bachelot, S. Blaize, B. Aurelien, I. Stefanon, S. Aubert, P. Royer, Univ. de Technologie de Troyes (France) . . . . . [6321-06]

4:00 pm: **Thermoluminescence and optically stimulated luminescence under b-irradiation of Eu, Dy and Lu doped ZrO2 nanocrystals,** R. A. Rodriguez, Univ. de Guadalajara (Mexico); V. H. Romero, L. A. Díaz-Torres, E. D. R. Cruz, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, Instituto Mexicano del Petróleo (Mexico); R. Melendrez, M. Barboza-Flores, Univ. de Sonora (Mexico) . . . . . [6321-08]

4:20 pm: **Nanostructure of GdF_3 thin film evaluated by variable angle spectroscopic ellipsometry,** J. Wang, R. L. Maier, Corning Tropel Corp. . . . . [6321-09]

4:40 pm: **Photoinduced electron-transfer in 2-tert-butyl-3-(anthracen-9-yl)-2,3-diazabicyclo[2.2.2]octane,** G. Valverde-Aguilar, J. A. Garcia-Macedo, Univ. Nacional Autónoma de México (Mexico); J. I. Zink, Univ. of California/Los Angeles . . . . . [6321-10]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 3

Conv. Ctr. Room 7A . . . . . Mon. 8:30 to 10:10 am

Photonic Systems I

Chair: **Dario Pisignano**, Univ. degli Studi di Lecce (Italy)

8:30 am: **Strong photoluminescence caused by optical transitions between electron and hole Tamm-like interface states in ZnSe/BeTe heterostructures,** A. S. Gurevich, V. P. Kochereshko, A. V. Platonov, B. A. Zyakin, A. F. Ioffe Physico-Technical Institute (Russia); A. Waag, Technische Univ. Braunschweig (Germany); G. Landwehr, Univ. Würzburg (Germany) . . . . . [6321-11]

8:50 am: **High-performance transparent flexible inorganic-organic hybrid thin-film transistors fabricated at room temperature using n-type In_2O_3 as semiconductor,** L. Wang, M. Yoon, A. F. Facchetti, Y. Yang, T. J. Marks, Northwestern Univ. . . . . [6321-12]

9:10 am: **The enhancement of light efficiency using modified phosphor which is coated sub-micro size sulfonated polystyrene beads,** H. Lee, Y. Park, M. Chang, K. Kim, S. Hong, SAMSUNG Electro-Mechanics Co., Ltd. (South Korea); K. Myong, Sungkyunkwan Univ. (South Korea); H. Won, J. Lee, Y. Oh, SAMSUNG Electro-Mechanics Co., Ltd. (South Korea) . . . . . [6321-13]

9:30 am: **Luminescence studies on PZT:Eu^{3+} sol-gel thin films,** J. A. Garcia-Macedo, J. A. Martinez-Zuñiga, F. Gonzalez, G. Valverde-Aguilar, Univ. Nacional Autónoma de México (Mexico) . . . . . [6321-14]

9:50 am: **Yb^{3+} luminescence quenching in nanocrystalline ZrO_2: dependence on pair concentration, crystalline phase, and energy transfer processes,** O. Meza, L. A. Diaz-Torres, E. De la Rosa, D. Solis, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, C. Angeles-Chavez, Instituto Mexicano del Petróleo (Mexico) . . . . . [6321-15]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 4

Conv. Ctr. Room 7A . . . . . Mon. 10:30 am to 12:10 pm

Fabrication Techniques

Chair: **Gilles Lérondel**, Univ. de Technologie de Troyes (France)

10:30 am: **Future technologies for the isolation of III-V based integrated photonics and nanotechnology applications,** A. Shuja, COMSATS Institute of Information Technology (Pakistan); P. Too, Univ. of Surrey (United Kingdom) . . . . . [6321-16]

10:50 am: **Nanophotonics by room-temperature imprinting and electrospinning,** D. Pisignano, F. Di Benedetto, E. Mele, A. Camposeo, L. Persano, G. Paladini, R. Cingolani, Univ. degli Studi di Lecce (Italy) . . . . . [6321-17]

11:10 am: **The complex optical response of arrays of aligned multiwalled carbon nanotubes,** B. R. Kimball, J. B. Carlson, K. Gregorczyk, A. Vidan, U.S. Army Soldier Systems Ctr.; K. Kempa, Z. Ren, Boston College; P. Wu, New Span Opto-Technology Inc.; Y. Wang, J. A. Rybczynski, T. Kempa, Boston College; G. Benham, MegaWave Corp.; C. Yelleswarapu, D. V. G. L. N. Rao, Univ. of Massachusetts . . . . . [6321-18]

11:30 am: **Structural and optical investigation of copper nanoparticles and microfibers produced by using carbon nanotube as templates,** Z. C. Feng, National Taiwan Univ. (Taiwan); B. Xue, P. Chen, J. Lin, National Univ. of Singapore (Singapore) . . . . . [6321-19]

11:50 am: **Narrow stripe selective growth of oxide-free InGaAlAs MQWs by ultra-low pressure MOVPE,** W. Feng, J. Pan, L. Zhao, H. Zhu, W. Wang, Institute of Semiconductors (China) . . . . . [6321-20]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 5

Conv. Ctr. Room 7A . . . . . Mon. 1:30 to 2:50 pm

Photonic Systems II

Chair: **Stefano Cabrini**, Lawrence Berkeley National Lab.

1:30 pm: **Optical and structural characterization of nanostructured Y_2O_3:Tb,** L. G. Jacobsohn, B. L. Bennett, R. E. Muenchausen, J. F. Smith, D. W. Cooke, Los Alamos National Lab. . . . . [6321-21]

1:50 pm: **Sol-gel processing of Er-doped silica wave-guides with single Er-ion precursors,** G. Westin, K. Lashgari, Uppsala Univ. (Sweden) . . . . . [6321-22]

2:10 pm: **Saturable SiO_2/PbTe Quntum Dots multilayers for the 1.3-1.5 μm region,** E. Rodriguez, E. Jimenez, C. L. Cesar, L. C. Barbosa, Univ. Estadual de Campinas (Brazil) . . . . . [6321-23]

2:30 pm: **Photoelectrical properties of the structures with nanodimensional inclusions Ge,** R. S. Udovitska, O. V. Vakulenko, S. V. Kondratenko, National Taras Shevchenko Univ. of Kyiv (Ukraine) [6321-24]

✔ Posters-Monday

Chair: **Gilles Lérondel**, Univ. de Technologie de Troyes (France)

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Perylene tetracarboxylic diimide (PTCDI) nanowires: synthesis and characterization,** A. M. C. Ng, W. Y. Tong, A. B. Djurišic, W. K. Chan, The Univ. of Hong Kong (Hong Kong China) . . . . . [6321-25]

✔ **Total photoluminescence spectroscopy of GaN nanocrystals,** A. P. Podhorodecki, M. Nyk, J. Misiewicz, Politechnika Wroclawska (Poland); W. Strek, Instytut Niskich Temperatur i Badan Strukturalnych (Poland) . . . . . [6321-26]

✔ **Coherent phenomena in a semiconductor quantum well system: effects of double dark states,** E. Voutsinas, Technological Educational Institute of Patras (Greece); A. Fountoulakis, Univ. of Patras (Greece); J. Boviatsis, Technological Educational Institute of Patras (Greece); A. F. Terzis, E. Paspalakis, Univ. of Patras (Greece) . . . . . [6321-27]

✔ **Fabrication of 2D silver nanostructures from a polystyrene opal,** S. M. Olaizola Izquierdo, N. Pérez, Ctr. de Estudios e Investigaciones Técnicas de Gipuzkoa (Spain) . . . . . [6321-28]

✔ **Structural and luminescence characterization of ZrO_2:$Dy^{3+}$and ZrO_2:Eu^{3+} nanophosphor,** V. H. Romero, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, A. Montoya, Instituto Mexicano del Petroleo (Mexico); M. Barboza-Flores, Univ. de Sonora (Mexico); E. De La Rosa, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . [6321-29]

✔ **Tuning color coordinate with the content of Tb^{3+} in YAG:Ce^{3+} nanophosphor,** M. Vallejo, Ctr. de Investigaciones en Óptica, A.C. (Mexico); R. A. Rodriguez, Univ. de Guadalajara (Mexico); L. A. Díaz-Torres, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, Instituto Mexicano del Petróleo (Mexico); E. De La Rosa, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6321-30]

✔ **Red emission by upconversion in ZnO:Er^{3+} nanophosphor,** S. Ruiz Berbena, M. Olmos, D. Solis, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, C. Angeles-Chavez, Instituto Mexicano del Petróleo (Mexico); E. De La Rosa, Ctr. de Investigaciones en Óptica, A.C. (Mexico) . . . . . [6321-31]

✔ **Er^{3+} and Yb^{3+} concentration effect in the upconversion emission in ZrO_2:Yb^{3+}-Er^{3+} nanophosphor,** D. Solis, E. De La Rosa, L. A. Díaz-Torres, Ctr. de Investigaciones en Óptica, A.C. (Mexico); P. Salas, Instituto Mexicano del Petróleo (Mexico) . . . . . [6321-32]

✔ **Conversion of commercial titania nanoparticles to titanate nanotubes by electrophoretic deposition and their application to dye-sensitized solar cells,** H. Shin, G. Kim, M. A. Dar, S. G. Ansari, H. Kim, Chonbuk National Univ. (South Korea) . . . . . [6321-33]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . Tues. 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Courses of Related Interest

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SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm
SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm
SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm
SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm
SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Monday 14 August 2006 • Proceedings of SPIE Vol. 6322

Tuning the Optic Response of Photonic Bandgap Structures III

Conference Chairs: **Paul V. Braun**, Univ. of Illinois at Urbana-Champaign; **Sharon M. Weiss**, Vanderbilt Univ.

Program Committee: **Shanhui Fan**, Stanford Univ.; **Stephen H. Foulger**, Clemson Univ.; **Rachel Jakubiak**, Air Force Research Lab.; **Michal F. Lipson**, Cornell Univ.; **Michael J. Sailor**, Univ. of California/San Diego; **Henry M. van Driel**, Univ. of Toronto (Canada); **Ralf B. Wehrspohn**, Univ. Paderborn (Germany); **Pierre Wiltzius**, Univ. of Illinois at Urbana-Champaign

Monday 14 August

SESSION 1

Conv. Ctr. Room 7B . . . . . Mon. 8:10 to 10:10 am

Tunable Organic and Composite Photonic Crystals

Chair: **Ryan J. Kershner**, Univ. of Illinois at Urbana-Champaign

8:10 am: **Tunable porous photonic bandgap structures for chemical and biological sensing *(Invited Paper)*,** A. N. Cartwright, K. Firdous, E. Hopkins, V. P. Chodavarapu, S. J. Kim, SUNY/Univ. at Buffalo; V. K. S. Hsiao, SUNY/Univ. at Buffalo and The Pennsylvania State Univ.; M. T. Swihart, F. V. Bright, P. N. Prasad, SUNY/Univ. at Buffalo; T. J. Bunning, Air Force Research Lab. . . . . [6322-01]

8:40 am: **Fabrication of electrochromically tunable photonic crystals,** P. V. Ashrit, S. Kuai, Univ. de Moncton (Canada) . . . . . [6322-02]

9:00 am: **A compact hybrid silicon/electro-optic polymer resonant cavity modulator design,** K. A. Kleven, S. T. Dunham, Univ. of Washington . . . . . [6322-03]

9:20 am: **Complete 3D gap photonic crystals in the near-infrared and visible wavelengths for sensing applications *(Invited Paper)*,** G. S. Subramania, Sandia National Labs. . . . . [6322-04]

9:50 am: **InP-based planar photonic crystals infiltrated with solid polymers and liquid crystals,** R. van der Heijden, C. Kjellander, C. Carlström, J. Snijders, H. Kicken, R. W. van der Heijden, C. W. M. Bastiaansen, D. J. Broer, F. Karouta, R. Nötzel, Technische Univ. Eindhoven (Netherlands); E. van der Drift, Technische Univ. Delft (Netherlands); H. W. Salemink, Technische Univ. Eindhoven (Netherlands) . . . . . [6322-05]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 2

Conv. Ctr. Room 7B . . . . . Mon. 10:30 am to 12:10 pm

Fabrication of Tunable Photonic Crystals

Chair: **Ganapathi S. Subramania**, Sandia National Labs.

10:30 am: **High refractive index woodpile photonic crystals by direct writing *(Invited Paper)*,** F. García-Santamaría, M. Xu, J. A. Lewis, P. V. Braun, Univ. of Illinois at Urbana-Champaign . . . . . [6322-06]

11:00 am: **Tunable defect states in 1D photonic bandgap nanostructures,** K. V. Tabunshchyk, M. M. Hawkeye, A. Kovalenko, M. J. Brett, Univ. of Alberta (Canada) . . . . . [6322-07]

11:20 am: **The effect of disorder on photonic crystal lattices and waveguides,** L. L. Lima, D. P. Caetano, M. A. R. C. Alencar, Univ. Federal de Estado de Alagoas (Brazil); D. R. Solli, Univ. of California/Los Angeles; J. M. Hickmann, Univ. Federal de Estado de Alagoas (Brazil) . . [6322-08]

11:40 am: **Template-directed growth of colloidal crystals on large-area patterned substrates *(Invited Paper)*,** R. J. Kershner, S. Rhodes, F. García-Santamaría, P. V. Braun, J. A. Lewis, P. Wiltzius, Univ. of Illinois at Urbana-Champaign . . . . . [6322-09]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 3

Conv. Ctr. Room 7B . . . . . Mon. 1:30 to 3:10 pm

Tunable Photonic Crystal Devices and Sensors I

Chair: **Florencio García-Santamaría**, Univ. of Illinois at Urbana-Champaign

1:30 pm: **Influence of morphology on the optical properties of holographic polymer dispersed liquid crystals *(Invited Paper)*,** R. Jakubiak, D. P. Brown, Air Force Research Lab.; L. V. Natarajan, V. P. Tondiglia, R. L. Sutherland, Science Applications International Corp.; R. A. Vaia, T. J. Bunning, Air Force Research Lab. . . . . [6322-10]

2:00 pm: **A 2D silicon-based photonic crystal microcavity biosensor,** M. R. Lee, P. M. Fauchet, Univ. of Rochester . . . . . [6322-11]

2:20 pm: **Optical transduction methodology for studying fundamental properties of responsive hydrogels in confined geometries,** E. Segal, L. A. Perelman, M. J. Sailor, Univ. of California/San Diego . . . . . [6322-12]

2:40 pm: **Design and implementation of novel photonic crystal tunable devices *(Invited Paper)*,** E. J. Kelmelis, A. S. Sharkawy, EM Photonics, Inc.; S. Shi, EM Photonics, Inc. and Univ. of Delaware; D. W. Prather, Univ. of Delaware . . . . . [6322-13]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 4

Conv. Ctr. Room 7B . . . . . Mon. 3:30 to 5:30 pm

Tunable Photonic Crystal Devices and Sensors II

Chair: **Rachel Jakubiak**, Air Force Research Lab.

3:30 pm: **One-dimensional porous Si photonic crystals as sensors for biomolecules and cells *(Invited Paper)*,** M. J. Sailor, M. P. Schwartz, S. D. Alvarez, M. M. Orosco, A. M. Derfus, B. J. Migliori, L. Chao, Univ. of California/San Diego; S. N. Bhatia, Massachusetts Institute of Technology . . . . . [6322-14]

4:00 pm: **Microfabrication of magneto-optic photonic crystals using gold-coated ferromagnetic arrays,** J. D. Williams, A. Rowen, Sandia National Labs.; C. L. Arrington, L&M Technologies and Sandia National Labs.; W. C. Sweatt, D. W. Peters, I. F. El-Kady, F. B. McCormick, Jr., Sandia National Labs. . . . . [6322-15]

4:20 pm: **Photonic crystal fiber-based broadly tunable femtosecond laser sources and applications *(Invited Paper)*,** Y. Deng, F. Lu, W. H. Knox, Univ. of Rochester . . . . . [6322-16]

4:50 pm: **Integrated optical chemical sensor using a dispersion-guided photonic crystal structure,** R. Martin, A. S. Sharkawy, E. J. Kelmelis, EM Photonics, Inc. . . . . [6322-17]

5:10 pm: **Electrical conduction through a 2D InP-based photonic crystal,** A. Berrier, M. Mulot, G. Malm, M. Östling, A. Srinivasan, Kungliga Tekniska Högskolan (Sweden) . . . . . [6322-18]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Local heating of discrete droplets using magnetic porous silicon-based photonic crystals,** J. Park, A. M. Derfus, E. Segal, K. S. Vecchio, Univ. of California/San Diego; S. N. Bhatia, Massachusetts Institute of Technology; M. J. Sailor, Univ. of California/San Diego . . . . . [6322-19]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;* ***Zakya H. Kafafi****, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . Tues. 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

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SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Sunday-Wednesday 13-16 August 2006 • Proceedings of SPIE Vol. 6323

Plasmonics: Metallic Nanostructures and their Optical Properties IV

Conference Chair: **Mark I. Stockman**, Georgia State Univ.

Program Committee: **David J. Bergman**, Tel Aviv Univ. (Israel); **Sergey I. Bozhevolnyi**, Aalborg Univ. (Denmark); **Jochen Feldmann**, Ludwig-Maximilians-Univ. München (Germany); **Naomi J. Halas**, Rice Univ.; **Teruya Ishihara**, The Institute of Physical and Chemical Research - RIKEN (Japan) and Tohoku Univ. (Japan); **Satoshi Kawata**, Osaka Univ. (Japan); **Fritz Keilmann**, Max-Planck-Institut für Biochemie (Germany); **Victor I. Klimov**, Los Alamos National Lab.; **Aaron Lewis**, The Hebrew Univ. of Jerusalem (Israel); **Olivier J. Martin**, École Polytechnique Fédérale de Lausanne (Switzerland); **Martin Moskovits**, Univ. of California/Santa Barbara; **Peter J. Nordlander**, Rice Univ.; **Masaya Notomi**, NTT Basic Research Labs. (Japan); **Lukas Novotny**, Univ. of Rochester; **Motoichi Ohtsu**, The Univ. of Tokyo (Japan); **John B. Pendry**, Imperial College London (United Kingdom); **Joseph W. Perry**, Georgia Institute of Technology; **Lewis J. Rothberg**, Univ. of Rochester; **Vahid Sandoghdar**, ETH Zürich (Switzerland); **George C. Schatz**, Northwestern Univ.; **Tigran V. Shahbazyan**, Jackson State Univ.; **Vladimir M. Shalaev**, Purdue Univ.; **Yung Doug Suh**, Korea Research Institute of Chemical Technology (South Korea); **Din Ping Tsai**, National Taiwan Univ. (Taiwan); **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

Sunday 13 August

SESSION 1

Conv. Ctr. Room 3 . . . . . Sun. 8:10 to 10:10 am

Special Invited Session: Trends in Nanoplasmonics

Chair: **Mark I. Stockman**, Georgia State Univ.

8:10 am: **Tunable plasmonic nanostructures for improving near-field optics, sensing, diagnostics *(Invited Paper)*,** N. J. Halas, Rice Univ. . . . . [6323-01]

8:40 am: **Exploiting interactions between molecules and metallic nano-objects *(Invited Paper)*,** J. Feldmann, Ludwig-Maximilians-Univ. München (Germany) . . . . . [6323-02]

9:10 am: **Nanoscale plasmonics and applications *(Invited Paper)*,** X. Zhang, Univ. of California/Berkeley . . . . . [6323-03]

9:40 am: **Active plasmonics: light emission, modulation, and sensing in metal/dielectric nanostructures *(Invited Paper)*,** H. A. Atwater, California Institute of Technology . . . . . [6323-04]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 2

Conv. Ctr. Room 3 . . . . . Sun. 10:30 am to 12:10 pm

Single Nanoparticle/Molecule Plasmonics I

Chair: **Jochen Feldmann**, Ludwig-Maximilians-Univ. München (Germany)

10:30 am: **Design and realization of strong coupling between a single emitter and a plasmonic nano-antenna *(Invited Paper)*,** V. Sandoghdar, ETH Zürich (Switzerland) . . . . . [6323-05]

11:00 am: **Resonant metal nanoantennas for luminescence enhancement,** O. L. Muskens, FOM Institute for Atomic and Molecular Physics (Netherlands); O. T. Janssen, H. P. Urbach, Philips Research (Netherlands); J. Gómez Rivas, FOM Institute for Atomic and Molecular Physics (Netherlands) . . . . . [6323-06]

11:20 am: **Visualization of plasmons in metallic nanostructures using cathodo-luminescence,** M. Bashevoy, F. Jonsson, N. I. Zheludev, Univ. of Southampton (United Kingdom); F. J. Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) . . . . . [6323-07]

11:40 am: **Enhancement and quenching of single molecule fluorescence *(Invited Paper)*,** L. Novotny, P. Bharadwaj, P. Anger, Univ. of Rochester . . . . . [6323-08]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 3

Conv. Ctr. Room 3 . . . . . Sun. 1:30 to 3:10 pm

Ultrafast Nanoplasmonics

Chair: **Harry A. Atwater**, California Institute of Technology

1:30 pm: **Optical nonlinearities of metal nanoparticles: single-particle measurements and correlation to structure *(Invited Paper)*,** N. F. Scherer, M. A. Pelton, R. Jin, J. E. Jureller, M. Liu, H. Y. Kim, S. Park, P. Guyot-Sionnest, The Univ. of Chicago . . . . . [6323-09]

2:00 pm: **Extreme nanoplasmonics: spatial and temporal limits in metal nanoplasmonics,** M. I. Stockman, Georgia State Univ. . [6323-10]

2:20 pm: **Ultrafast microscopy of plasmonic nanostructures *(Invited Paper)*,** H. Petek, Univ. of Pittsburgh; A. Kubo, Univ. of Pittsburgh and Japan Science and Technology Agency (Japan) . . . . . [6323-11]

2:50 pm: **Femtosecond microscopy and coherent control of surface plasmon propagation,** A. Kubo, H. Petek, Univ. of Pittsburgh . [6323-12]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 4

Conv. Ctr. Room 3 . . . . . Sun. 3:30 to 5:50 pm

Single Nanoparticle/Molecule Plasmonics II

Chair: **Xiang Zhang**, Univ. of California/Berkeley

3:30 pm: **Femtosecond spectroscopy of a single identified metal nanoparticle *(Invited Paper)*,** N. Del Fatti, O. L. Muskens, F. Vallee, Univ. Bordeaux I (France) . . . . . [6323-13]

4:00 pm: **Optical trapping and alignment of single gold nanorods using plasmon resonances,** M. A. Pelton, M. Liu, H. Y. Kim, G. Smith, P. Guyot-Sionnest, N. F. Scherer, The Univ. of Chicago . . . . . [6323-14]

4:20 pm: **Active manipulation of surface plasmons in metal-molecule-metal devices,** R. Pala, K. Shimizu, N. A. Melosh, M. L. Brongersma, Stanford Univ. . . . . [6323-15]

4:40 pm: **Plasmon resonant molecular sensing with single gold nanostars,** C. Nehl, H. Liao, J. Hafner, Rice Univ. . . . . [6323-16]

5:00 pm: **Surface plasmon characteristics of tunable photoluminescence from single gold nanorods *(Invited Paper)*,** A. Bouhelier, Argonne National Lab.; R. J. B. Bachelot, G. Lérondel, S. Kostcheev, P. Royer, Univ. de Technologie de Troyes (France); G. P. Wiederrecht, Argonne National Lab. . . . . [6323-17]

5:30 pm: **Plasmonic properties of the metallic nanoparticle/thin film system,** F. Le, P. J. Nordlander, Rice Univ. . . . . [6323-18]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 3 . . . . . Mon. 8:10 to 10:00 am

Periodic and Complex Nanoplasmonic Structures I

Chair: **Gennady Shvets**, The Univ. of Texas at Austin

8:10 am: **Ultrafast dynamics of surface plasmon polaritons in subwavelength nanohole array *(Invited Paper)*,** T. V. Shahbazyan, A. S. Kirakosyan, Jackson State Univ.; M. Tong, V. Z. Vardeny, The Univ. of Utah . . . . . [6323-19]

8:40 am: **Role of cylindrical surface plasmons in enhanced transmission,** M. I. Haftel, Naval Research Lab.; C. Schlockermann, Munich Univ. of Applied Science (Germany); G. Blumberg, Lucent Technologies/Bell Labs. . . . . [6323-20]

9:00 am: **Experimental study of enhanced transmission through subwavelength linear apertures flanked by periodic corrugations,** I. C. Schick, J. M. Yarbrough, C. G. Allen, P. D. Flammer, R. T. Collins, Colorado School of Mines; R. E. Hollingsworth, G. Nuebel, ITN Energy Systems, Inc. . . . . [6323-21]

9:20 am: **Plasmon-enhanced optical waveguide biosensors constructed with subwavelength gold grating,** F. Chien, National Central Univ. (Taiwan); S. Chen, National Cheng Kung Univ. (Taiwan) . . [6323-22]

9:40 am: **Fluorescence enhancement by periodic surface gratings,** Y. Hung, H. Wu, I. I. Smolyaninov, C. C. Davis, Univ. of Maryland/College Park . . . . . [6323-23]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 3 . . . . . Mon. 10:30 to 11:40 am

Fundamentals of Nanoplasmonic Devices

Chair: **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

10:30 am: **Plasmonic circuits for nanophotonic devices *(Invited Paper)*,** T. Yatsui, Japan Science and Technology Agency (Japan); M. Naruse, National Institute of Information and Communications Technology (Japan); M. Ohtsu, The Univ. of Tokyo (Japan) and Japan Science and Technology Agency (Japan) . . . . . [6323-25]

11:00 am: **Laser-based rapid prototyping of plasmonic components,** C. Reinhardt, S. Passinger, R. V. Kiyan, Laser Zentrum Hannover e.V. (Germany); A. Stepanov, Karl-Franzens-Univ. Graz (Austria); B. N. Chichkov, Laser Zentrum Hannover e.V. (Germany) . . . . . [6323-26]

11:20 am: **Nanophotonic networking in metallic and slot plasmon waveguides,** J. A. Dionne, California Institute of Technology; H. J. Lezec, CNRS (France) and California Institute of Technology; H. A. Atwater, California Institute of Technology . . . . . [6323-27]

Lunch Break . . . . . 11:40 am to 1:30 pm

SESSION 7

Conv. Ctr. Room 3 . . . . . Mon. 1:30 to 3:10 pm

Nonlinear and Active Nanoplasmonics

Chair: **Tigran V. Shahbazyan**, Jackson State Univ.

1:30 pm: **Toward implementation of a SPASER: increasing the chances for success *(Invited Paper)*,** D. J. Bergman, U. Evra, Tel Aviv Univ. (Israel) . . . . . [6323-28]

2:00 pm: **All-optical modulation in subwavelength apertures in metallic films,** L. A. Sweatlock, D. Pacifici, H. J. Lezec, H. A. Atwater, California Institute of Technology . . . . . [6323-29]

2:20 pm: **The role of multipole contributions to the second-order response of gold nanoparticles *(Invited Paper)*,** B. K. Canfield, S. Kujala, Tampereen Teknillinen Yliopisto (Finland); K. Jefimovs, Y. Svirko, J. P. Turunen, Joensuu Yliopisto (Finland); M. Kauranen, Tampereen Teknillinen Yliopisto (Finland) . . . . . [6323-30]

2:50 pm: **Effects of hotspots and resonances on second-harmonic generation in gold nanoparticle arrays,** M. D. McMahon, R. Lopez, R. F. Haglund, Jr., Vanderbilt Univ. . . . . [6323-31]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 8

Conv. Ctr. Room 3 . . . . . Mon. 3:30 to 5:50 pm

Superlenses and Nanolenses

Chair: **David J. Bergman**, Tel Aviv Univ. (Israel)

3:30 pm: **Spatial dispersion in metallic meta-materials *(Invited Paper)*,** G. Shvets, D. V. Korobkin, The Univ. of Texas at Austin; M. Shapiro, Massachusetts Institute of Technology; Y. A. Urzhumov, The Univ. of Texas at Austin . . . . . [6323-32]

4:00 pm: **Spectroscopy of nano-holes in polaritonic films: theory and experiment,** Y. A. Urzhumov, The Univ. of Texas at Austin . . . . [6323-33]

4:20 pm: **Focusing surface plasmons with a plasmonic lens,** Z. Liu, Univ. of California/Berkeley; J. M. Steele, Trinity Univ.; H. Lee, C. Sun, X. Zhang, Univ. of California/Berkeley . . . . . [6323-34]

4:40 pm: **Direct near-field optical verification of mid-infrared superlensing,** T. Taubner, Max-Planck-Institut für Biochemie (Germany) and Stanford Univ.; R. Hillenbrand, Max-Planck-Institut für Biochemie (Germany); D. V. Korobkin, Y. A. Urzhumov, G. Shvets, The Univ. of Texas at Austin . . . . . [6323-35]

5:00 pm: **Nanorod array as a nanolens *(Invited Paper)*,** S. Kawata, Osaka Univ. (Japan) . . . . . [6323-36]

5:30 pm: **Study the enhancement of near electro-magnetic field via plasmonic effects using finite-difference time-domain method and near-field scanning optical microscopy,** C. Hwang, S. Chen, National Cheng Kung Univ. (Taiwan) . . . . . [6323-37]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Enhanced electroluminescence of organic/metal nanostructure with symmetric dielectric layers for long-range surface plasmon polaritons,** N. Chiu, L. Chien, S. Chiu, J. Lee, C. Lin, National Taiwan Univ. (Taiwan) . . . . . [6323-69]

✔ **Near and far-field investigation of annular aperture nanophotonic metamaterials,** S. M. Orbons, The Univ. of Melbourne (Australia); D. Freeman, The Australian National Univ. (Australia); B. C. Gibson, S. T. Huntington, The Univ. of Melbourne (Australia); B. Luther-Davies, The Australian National Univ. (Australia); D. N. Jamieson, A. Roberts, The Univ. of Melbourne (Australia) . . . . . [6323-70]

✔ **Nonlinear optical interactions in mixed-state metal nanoparticles undergoing a structural transformation,** B. F. Soares, F. Jonsson, K. F. MacDonald, A. I. Denisyuk, N. I. Zheludev, Univ. of Southampton (United Kingdom) . . . . . [6323-71]

✔ **Angular spectrum model for plasmon fields,** H. H. Sanchez, G. M. Niconoff, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6323-74]

✔ **Theoretical study of enhanced transmission through single subwavelength linear apertures flanked by periodic corrugations,** P. D. Flammer, R. T. Collins, I. C. Schick, Colorado School of Mines; R. E. Hollingsworth, ITN Energy Systems, Inc. . . . . [6323-75]

✔ **Frequency dependence of the magnetic response of split-ring resonators in the optical frequency region,** A. Ishikawa, The Institute of Physical and Chemical Research (Japan) and Osaka Univ. (Japan); T. Tanaka, The Institute of Physical and Chemical Research (Japan); S. Kawata, The Institute of Physical and Chemical Research (Japan) and Osaka Univ. (Japan) . . . . . [6323-76]

✔ **FDTD/TDSE study on surface-enhanced infrared absorption by metal nanoparticles,** S. Chang, National Cheng Kung Univ. (Taiwan); S. K. Gray, Argonne National Lab. . . . . [6323-77]

✔ **Surface plasmon amplification in planar metal films,** M. S. Ambati, D. A. Genov, D. Wu, J. Yao, C. Sun, X. Zhang, Univ. of California/ Berkeley . . . . . [6323-78]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:40 pm

SESSION 9

Conv. Ctr. Room 3 . . . . . Tues. 1:30 to 3:10 pm

Fundamentals and Theory of Nanoplasmonics

Chair: **Norbert F. Scherer**, The Univ. of Chicago

1:30 pm: **Plasmons in nanostructures with reduced symmetry *(Invited Paper)*,** P. J. Nordlander, Rice Univ. . . . . [6323-38]

2:00 pm: **Enhanced second harmonic generation in nanosphere nanolens,** K. Li, M. I. Stockman, Georgia State Univ. . . . . [6323-39]

2:20 pm: **Simulating electromagnetic response in nanoscale microscopy and spectroscopy,** J. Aizpurua, I. Romero, F. J. García de Abajo, Consejo Superior de Investigaciones Científicas (Spain); G. W. Bryant, National Institute of Standards and Technology . . . . . [6323-41]

2:40 pm: **Cloaking: a new phenomenon in electromagnetism *(Invited Paper),*** G. W. Milton, The Univ. of Utah; N. P. Nicorovici, The Univ. of Sydney (Austrailia) . . . . . [6323-79]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 10

Conv. Ctr. Room 3 . . . . . Tues. 3:30 to 5:50 pm

Periodic and Complex Nanoplasmonic Structures II

Chair: **Vasily V. Klimov**, P.N. Lebedev Physical Institute (Russia)

3:30 pm: **Nanostructured surfaces as photonic band structures of zero dimension *(Invited Paper)*,** N. I. Zheludev, V. A. Fedotov, A. S. Schwanecke, Univ. of Southampton (United Kingdom); Y. Chen, Rutherford Appleton Lab. (United Kingdom) . . . . . [6323-42]

4:00 pm: **Enhanced THz transmission through subwavelength annular apertures,** A. J. Gallant, Durham Univ. (United Kingdom) and Consultant (United Kingdom); J. A. Levitt, M. Kaliteevski, J. M. Chamberlain, D. Wood, M. C. Petty, S. Brand, R. A. Abram, Durham Univ. (United Kingdom) . . . . . [6323-43]

4:20 pm: **Anomalous transmission through heavily doped conducting polymer films with periodic subwavelength hole array,** T. Matsui, V. Z. Vardeny, A. K. Agrawal, A. Nahata, The Univ. of Utah; R. Menon, Indian Institute of Science (India) . . . . . [6323-44]

4:40 pm: **Subwavelength optical imaging by plasmonic nanorod array,** A. Ono, J. Kato, The Institute of Physical and Chemical Research (Japan); S. Kawata, Osaka Univ. (Japan) . . . . . [6323-45]

5:00 pm: **Dielectric optical devices for plasmon polariton optics *(Invited Paper)*,** I. I. Smolyaninov, Y. Hung, C. C. Davis, Univ. of Maryland/ College Park . . . . . [6323-46]

5:30 pm: **Simulation study on light extraction and spontaneous emission enhancements with surface plasmonic crystals on InGaN/ GaN quantum-well light-emitting diodes,** J. Y. Wang, F. Tsai, Y. Kiang, C. Yang, National Taiwan Univ. (Taiwan) . . . . . [6323-47]

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 11

Conv. Ctr. Room 3 . . . . . Wed. 8:20 to 10:00 am

Nanosensors and Related Phenomena

Chair: **Brian K. Canfield**, Tampereen Teknillinen Yliopisto (Finland)

8:20 am: **Localized surface plasmon and molecular resonance: fundamental study and application *(Invited Paper)*,** J. Zhao, G. C. Schatz, R. P. Van Duyne, Northwestern Univ. . . . . [6323-48]

8:50 am: **Optimized SERS substrates produced by tailormade metal nanoparticles using laser irradiation,** F. Hubenthal, D. Blázquez Sánchez, Univ. Kassel (Germany); L. Gallasch, H. G. Schmidt, H. Kronfeldt, Technische Univ. Berlin (Germany); F. Träger, Univ. Kassel (Germany) . . . . . [6323-50]

9:10 am: **Surface-enhanced Raman effect on arrays of metal-coated dielectric hemispheres,** R. Lopez, J. Ziegler, D. Ferrara, R. F. Haglund, Jr., Vanderbilt Univ. . . . . [6323-51]

9:30 am: **Conformations of single chains of conjugated polymers by SERS *(Invited Paper)*,** Z. Wang, L. J. Rothberg, Univ. of Rochester . . . . . [6323-52]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 12

Conv. Ctr. Room 3 . . . . . Wed. 10:30 am to 12:10 pm

Developments in Nanoplasmonics Theory

Chair: **Kuiru Li**, Georgia State Univ.

10:30 am: **Mechanisms of surface plasmon launching *(Invited Paper)*,** F. J. Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) . . . . . [6323-53]

11:00 am: **Plasmon modes of nanoparticle clusters,** D. W. Brandl, P. J. Nordlander, Rice Univ. . . . . [6323-54]

11:20 am: **Theory of optical imaging below the diffraction limit with a far-field superlens,** S. P. Durant, Z. Liu, Univ. of California/Berkeley; N. Fang, Univ. of Illinois at Urbana-Champaign; X. Zhang, Univ. of California/Berkeley . . . . . [6323-55]

11:40 am: **Gap plasmon waveguides: a new option for nano-optical interconnectors and devices *(Invited Paper)*,** D. K. Gramotnev, Queensland Univ. of Technology (Australia); D. F. P. Pile, Univ. of Tokushima (Japan); K. C. Vernon, Queensland Univ. of Technology (Australia)[6323-56]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 13

Conv. Ctr. Room 3 . . . . . Wed. 1:30 to 3:00 pm

Surface Plasmon Polaritonics

Chair: **F. Javier Garcia de Abajo**, Consejo Superior de Investigaciones Científicas (Spain)

1:30 pm: **Emission of s-polarized waves by surface plasmons *(Invited Paper)*,** F. Marquier, J. Greffet, École Centrale Paris (France) . . [6323-57]

2:00 pm: **Surface plasmon beats formed on thin metal films,** J. Yao, Y. Liu, Z. Liu, C. Sun, X. Zhang, Univ. of California/Berkeley . . . . . [6323-58]

2:20 pm: **Characterization of metallic nanohole array based on evaluation of Mueller matrices,** L. Pang, K. A. Tetz, Y. Fainman, Univ. of California/San Diego . . . . . [6323-59]

2:40 pm: **The negative group velocity of surface plasmons on thin metallic films,** Y. Liu, Z. Liu, D. Wu, C. Sun, X. Zhang, Univ. of California/Berkeley . . . . . [6323-60]

Coffee Break . . . . . 3:00 to 3:20 pm

SESSION 14

Conv. Ctr. Room 3 . . . . . Wed. 3:20 to 6:00 pm

Fundamentals of Applications of Nanoplasmonics

Chair: **Zhenjia Wang**, Univ. of Rochester

3:20 pm: **Plasmonic netallodielectric nanostructures with reduced symmetry,** H. Wang, Y. Wu, B. Lassiter, D. W. Brandl, F. Le, P. J. Nordlander, N. J. Halas, Rice Univ. . . . . [6323-61]

3:40 pm: **Investigating the secondary structures of long oligonucleotides using attenuated-total-reflection surface-enhanced Raman spectroscopy,** K. C. Chiu, S. Chen, National Cheng Kung Univ. (Taiwan) . . . . . [6323-62]

4:00 pm: **Effects of vicinal tunable plasmonic nanostructures on the fluorescence emission of indocyanine green,** F. Tam, Rice Univ.; G. P. Goodrich, Nanospectra Biosciences, Inc.; N. J. Halas, Rice Univ.[6323-63]

4:20 pm: **Angle-dependent optical extinction of anisotropic metal-shell colloids,** J. Penninkhof, A. Polman, FOM Institute for Atomic and Molecular Physics (Netherlands); C. M. Graf, Univ. Würzburg (Germany); A. Moroz, A. van Blaaderen, Univ. Utrecht (Netherlands); L. A. Sweatlock, H. A. Atwater, California Institute of Technology . . . . . [6323-64]

4:40 pm: **Plasmonic nanostructures on silicon,** S. P. Sundararajan, N. J. Halas, Rice Univ. . . . . [6323-65]

5:00 pm: **Synthesis and optical properties of different colloidal systems of gold nanoparticles in a chiral dispersant agent,** M. R. Meneghetti, M. G. A. da Silva, M. A. R. C. Alencar, J. M. Hickmann, Univ. Federal de Estado de Alagoas (Brazil) . . . . . [6323-66]

5:20 pm: **Thermal optical nonlinearity enhanced by gold nanoparticles,** C. M. Nascimento, R. F. Souza, M. A. R. C. Alencar, M. G. A. da Silva, M. R. Meneghetti, J. M. Hickmann, Univ. Federal de Estado de Alagoas (Brazil) . . . . . [6323-67]

5:40 pm: **Quantum and classical aspects of near-field optics of metallic nanostructures,** Y. Xue, SUNY/Univ. at Albany . . . . . [6323-68]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

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Plasmonics: Nanoimaging, Nanofabrication, and their Applications II

Conference Chairs: **Satoshi Kawata**, Osaka Univ. (Japan); **Vladimir M. Shalaev**, Purdue Univ.; **Din Ping Tsai**, National Taiwan Univ. (Taiwan)

Program Committee: **David J. Bergman**, Tel Aviv Univ. (Israel); **Sergey I. Bozhevolnyi**, Aalborg Univ. (Denmark); **Jochen Feldmann**, Ludwig-Maximilians-Univ. München (Germany); **Naomi J. Halas**, Rice Univ.; **Teruya Ishihara**, The Institute of Physical and Chemical Research - RIKEN (Japan) and Tohoku Univ. (Japan); **Fritz Keilmann**, Max-Planck-Institut für Biochemie (Germany); **Victor I. Klimov**, Los Alamos National Lab.; **Aaron Lewis**, The Hebrew Univ. of Jerusalem (Israel); **Olivier J. Martin**, École Polytechnique Fédérale de Lausanne (Switzerland); **Martin Moskovits**, Univ. of California/Santa Barbara; **Peter J. Nordlander**, Rice Univ.; **Masaya Notomi**, NTT Basic Research Labs. (Japan); **Lukas Novotny**, Univ. of Rochester; **Motoichi Ohtsu**, The Univ. of Tokyo (Japan); **John B. Pendry**, Imperial College London (United Kingdom); **Joseph W. Perry**, Georgia Institute of Technology; **Marie-Paule Pileni**, Univ. Pierre et Marie Curie (France); **Lewis J. Rothberg**, Univ. of Rochester; **Vahid Sandoghdar**, ETH Zürich (Switzerland); **George C. Schatz**, Northwestern Univ.; **Tigran V. Shahbazyan**, Jackson State Univ.; **Mark I. Stockman**, Georgia State Univ.; **Yung Doug Suh**, Korea Research Institute of Chemical Technology (South Korea); **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 1

Conv. Ctr. Room 5A . . . . . Wed. 8:00 to 10:10 am

Plasmonic Guiding

Chair: **Satoshi Kawata**, Osaka Univ. (Japan)

8:00 am: **Characteristics of plasmonic waveguides and nonlinear metallic particles *(Invited Paper)*,** M. Fukui, T. Okamoto, T. Ogawa, M. Haraguchi, D. F. P. Pile, The Univ. of Tokushima (Japan); D. K. Gramotnev, Queensland Univ. of Technology (Australia) . . . . . [6324-01]

8:30 am: **Wavelength selective components based on long-range surface plasmon polariton waveguides *(Invited Paper)*,** A. Boltasseva, Danmarks Tekniske Univ. (Denmark); S. I. Bozhevolnyi, Aalborg Univ. (Denmark) . . . . . [6324-02]

9:00 am: **Adiabatic propagation and nano-guiding of 2D optical waves in wedged negative dielectric waveguides *(Invited Paper)*,** J. Takahara, N. Miyoshi, Y. Matsui, Osaka Univ. (Japan); F. Kusunoki, Technology Research Institute of Osaka Prefecture (Japan) . . . . . [6324-03]

9:30 am: **LRSPP waveguides with TE and TM guiding,** K. Leosson, Univ. of Iceland (Iceland); A. Boltasseva, Danmarks Tekniske Univ. (Denmark); T. Nikolajsen, Crystal Fibre A/S (Denmark); S. I. Bozhevolnyi, Aalborg Univ. (Denmark) . . . . . [6324-04]

9:50 am: **Characteristics of plasmonic waveguides for coupled wedge plasmons,** M. Haraguchi, The Univ. of Tokushima (Japan); D. F. P. Pile, The Univ. of Tokushima (Japan) and Queensland Univ. of Technology (Australia); Y. Matsuzaki, The Univ. of Tokushima (Japan); D. K. Gramotnev, Queensland Univ. of Technology (Australia); M. Fukui, T. Okamoto, The Univ. of Tokushima (Japan) . . . . . [6324-05]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 2

Conv. Ctr. Room 5A . . . . . Wed. 10:30 am to 2:30 pm

Imaging and Sensing

Chair: **Vladimir M. Shalaev**, Purdue Univ.

10:30 am: **Narrowing of nonlinear enhancements in near-field images *(Invited Paper)*,** A. Boccara, L. Williame, École Supérieure de Physique et de Chimie Industrielles (France); S. Gresillon, Univ. Pierre et Marie Curie (France); E. Fort, Univ. Denis Diderot (France); J. Rivoal, Univ. Pierre et Marie Curie (France) . . . . . [6324-06]

11:00 am: **Plasmonic near-field scanning optical microscopy,** Y. Wang, W. Srituravanich, C. Sun, X. Zhang, Univ. of California/Berkeley [6324-07]

11:20 am: **A far-field optical superlens imaging goes beyond diffraction limit,** Z. Liu, S. P. Durant, H. Lee, Y. Pikus, Univ. of California/Berkeley; N. Fang, Univ. of Illinois at Urbana-Champaign; Y. Xiong, C. Sun, X. Zhang, Univ. of California/Berkeley . . . . . [6324-08]

11:40 am: **Imaging the cell membrane with surface plasmon resonance phase microscopy,** R. Y. He, S. Chen, National Cheng Kung Univ. (Taiwan) . . . . . [6324-09]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

1:30 pm: **Spectrally resolved cathodoluminescence imaging of plasmonic annular nanoresonators,** C. E. Ross, H. A. Atwater, H. J. Lezec, California Institute of Technology; J. T. van Wijngaarden, A. Polman, FOM Institute for Atomic and Molecular Physics (Netherlands) . [6324-10]

1:50 pm: **Goos-Hänchen surface plasmon resonance sensor,** X. Yin, L. Hesselink, Stanford Univ. . . . . [6324-11]

2:10 pm: **Direct detection of C-reactive proteins in human serum using nanoparticle-enhanced surface plasmon resonance biosensing,** H. Y. Lin, S. Chen, National Cheng Kung Univ. (Taiwan) . . . . . [6324-12]

SESSION 3

Conv. Ctr. Room 5A . . . . . Wed. 2:30 to 5:20 pm

Manipulation of Plasmonic Effects

Chair: **Alexandra Boltasseva**, Danmarks Tekniske Univ. (Denmark)

2:30 pm: **Negative index metamaterials in the optical range *(Invited Paper)*,** T. A. Klar, Ludwig-Maximilians-Univ. München (Germany) and Purdue Univ.; A. V. Kildishev, V. M. Shalaev, Purdue Univ. . . . . [6324-13]

3:00 pm: **Continuous tuning of localized surface plasmon resonance of metal nanoparticules by anisotropic nanoscale photopolymerization,** H. Ahrach, A. Grimault, R. J. B. Bachelot, G. Lerondel, A. Vial, P. Royer, Univ. de Technologie de Troyes (France); O. Soppera, École Nationale Supérieure de Chimie de Mulhouse (France) . . . . . [6324-14]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Extending plasmon hybridization to general curvilinear nanoparticles,** D. W. Brandl, P. J. Nordlander, Rice Univ. . . . . [6324-15]

4:10 pm: **Tailoring colloidal gold nanoparticles in solution with ns-pulsed laser light,** F. Hubenthal, F. Vogel, F. Träger, Univ. Kassel (Germany) . . . . . [6324-16]

4:30 pm: **Lifetime of nano-plasmonic states,** U. Evra, D. J. Bergman, Tel Aviv Univ. (Israel) . . . . . [6324-17]

4:50 pm: **Linear and nonlinear optical responses in metallic periodic structures *(Invited Paper)*,** T. Ishihara, Tohoku Univ. (Japan) and RIKEN (Japan) . . . . . [6324-18]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Study of TiO_2 nano thin film coated optical fibers of photocatalyst recator,** H. J. Huang, T. C. Chu, J. C. Wu, D. P. Tsai, National Taiwan Univ. (Taiwan) . . . . . [6324-33]

✔ **Conceptual design of a plamsonic immersion nanolithography system,** J. W. Hahn, S. Park, Yonsei Univ. (South Korea) . . . [6324-34]

✔ **Optical properties of tips for apertureless near-field microscopy,** R. D. Hartschuh, N. Lee, D. Mehtani, A. Kisliuk, M. D. Foster, A. P. Sokolov, I. Tsukerman, Univ. of Akron; J. F. Maguire, Air Force Research Lab . . . . . [6324-35]

✔ **Interference lithography based on surface-plasmon polariton (SPP),** X. Guo, J. Du, M. Chen, L. Wang, Sichuan Univ. (China); C. Du, Institute of Optics and Electronics (China); J. Yao, Durham Univ. (United Kingdom) . . . . . [6324-37]

✔ **Enhance transmission through a nano-slit bordered by both trenches and bumps nanostructures,** C. Wang, C. Chao, J. Chang, National Central Univ. (Taiwan) . . . . . [6324-38]

✔ **Modes of plasmonic resonance on Au nanoparticles,** H. J. Huang, Y. H. Fu, National Taiwan Univ. (Taiwan); H. P. Chiang, National Taiwan Ocean Univ. (Taiwan); D. P. Tsai, National Taiwan Univ. (Taiwan)[6324-39]

✔ **Behavior of surface plasmon resonance at a left-handed material nano slab,** K. P. Chiu, D. P. Tsai, National Taiwan Univ. (Taiwan)[6324-40]

✔ **Resolution beyond diffraction limits with Sb nanostructures,** T. C. Chu, National Taiwan Univ. (Taiwan); W. Liu, National Taiwan Normal Univ. (Taiwan); D. P. Tsai, National Taiwan Univ. (Taiwan) . . . . [6324-42]

✔ **A gap sensing technique based on surface plasmon resonance,** P. Wu, C. Wu, M. Wu, National Tsing Hua Univ. (Taiwan) . . . . . [6324-44]

Thursday 17 August

SESSION 4

Conv. Ctr. Room 5A . . . . . Thurs. 8:20 am to 12:00 pm

Enhanced Raman and Spectroscopy

Chair: **Thomas A. Klar**, Ludwig-Maximilians-Univ. München (Germany)

8:20 am: **Intrinsic vibrational coherence in FCC supra-crystals of silver nanocrystals: Raman scattering measurements *(Invited Paper)*,** M. Pileni, Univ. Pierre et Marie Curie (France) . . . . . [6324-19]

8:50 am: **Tip-enhanced near-field Raman scattering and imaging of carbon nanostructures *(Invited Paper)*,** P. Verma, T. Yano, Y. Inouye, S. Kawata, Osaka Univ. (Japan) . . . . . [6324-20]

9:20 am: **Nanoscale characterization of localized strain in crystals by tip-enhanced Raman spectroscope in reflection mode,** N. Hayazawa, Y. Saito, M. Motohashi, The Institute of Physical and Chemical Research (Japan); M. Iyoki, SII NanoTechnology Inc (Japan); S. Kawata, The Institute of Physical and Chemical Research (Japan) and Osaka Univ. (Japan) . . . . . [6324-21]

9:40 am: **Silver nanorod array as high-sensitive SERS substrates for viral detection,** Y. Zhao, S. Shanmukh, S. B. Chaney, L. P. Jones, R. A. Dluhy, R. A. Tripp, The Univ. of Georgia . . . . . [6324-22]

Coffee Break . . . . . 10:00 to 10:20 am

10:20 am: **Scanning nano-Raman spectroscopy of semiconducting structures,** R. D. Hartschuh, N. Lee, D. Mehtani, A. Kisliuk, M. D. Foster, A. P. Sokolov, Univ. of Akron; J. F. Maguire, Air Force Research Lab. . . . . [6324-23]

10:40 am: **Plasmonic substrates for surface-enhanced spectroscopies *(Invited Paper)*,** P. J. Nordlander, Rice Univ. . . . . [6324-25]

11:10 am: **Enhanced Raman scattering on arrays of silver nanoparticles with sub-10-nm gaps: effect of collective plasmon coupling *(Invited Paper)*,** H. Wang, National Taiwan Univ. (Taiwan); C. Liu, Academia Sinica (Taiwan); J. Wang, National Taiwan Univ. (Taiwan); Y. Wang, Academia Sinica (Taiwan) . . . . . [6324-26]

Lunch Break . . . . . 11:40 am to 1:00 pm

SESSION 5

Conv. Ctr. Room 5A . . . . . Thurs. 1:00 to 3:20 pm

Nano Fabrication and Lithography

Chair: **Din Ping Tsai**, National Taiwan Univ. (Taiwan)

1:00 pm: **Three-dimensional metallic micro/nanostructures fabricated by two-photon-induced reduction of metal ions *(Invited Paper)*,** T. Tanaka, A. Ishikawa, S. Kawata, The Institute of Physical and Chemical Research (Japan) . . . . . [6324-27]

1:30 pm: **AFM-based nanofabrication with femtosecond pulse laser radiation,** S. Kim, S. Kim, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6324-28]

1:50 pm: **Three-dimensional fabrication of metallic micro/ nanostructures by two-photon polymerization for metamaterials,** F. Formanek, N. Takeyasu, T. Tanaka, K. Chiyoda, A. Ishikawa, S. Kawata, The Institute of Physical and Chemical Research (Japan) . . . . . [6324-29]

2:10 pm: **Multiphoton laser lithography for the fabrication of plasmonic components,** S. Passinger, J. Koch, C. Reinhardt, B. N. Chichkov, Laser Zentrum Hannover e.V. (Germany) . . . . . [6324-30]

2:30 pm: **High-throughput nanolithography using plasmonic lens,** W. Srituravanich, L. Pan, C. Sun, X. Zhang, Univ. of California/ Berkeley . . . . . [6324-31]

2:50 pm: **Site-selective metal deposition on 3D micro/ nanostructures fabricated by two-photon polymerization *(Invited Paper)*,** N. Takeyasu, F. Formanek, K. Chiyoda, T. Tanaka, A. Ishikawa, The Institute of Physical and Chemical Research (Japan); S. Kawata, The Institute of Physical and Chemical Research (Japan) and Osaka Univ. (Japan) . . . . . [6324-32]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Tuesday-Thursday 15-17 August 2006 • Proceedings of SPIE Vol. 6325

Physical Chemistry of Interfaces and Nanomaterials V

*Acknowledgement is made to the **Donors of the American Chemical Society Petroleum Research Fund**, for partial support of this conference.*

*SPIE also wishes to thank **ChemMotif** for their generous sponsorship to this conference.*

Conference Chairs: **Mark Spitler**, National Renewable Energy Lab.; **Frank Willig**, Hahn-Meitner-Institut Berlin (Germany)

Program Committee: **Randy J. Ellingson**, National Renewable Energy Lab.; **David F. Kelley**, Univ. of California/Merced; **Tianquan Lian**, Emory Univ.

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote**, Air Force Research Lab.;*
***Zakya H. Kafafi**, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

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11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:20 pm

SESSION 1

Conv. Ctr. Room 2 . . . . . Tues. 1:20 to 3:20 pm

Nanotubes and Nanoparticles I

Chair: **Oleg V. Prezhdo**, Univ. of Washington

1:20 pm: **Shedding light onto carbon nanotubes *(Invited Paper)*,** T. Hertel, Vanderbilt Univ. . . . . [6325-01]

1:50 pm: **Single carbon nanotube photonics and the role of excitons,** T. D. Krauss, L. Huang, H. N. Pedrosa, Z. Wang, L. J. Rothberg, Univ. of Rochester . . . . . [6325-02]

2:20 pm: **Molecular-resolved imaging of conductive polymer self-organization at single-walled carbon nanotube interfaces,** E. R. Waclawik, A. W. Musumeci, R. G. S. Goh, N. Motta, J. M. Bell, Queensland Univ. of Technology (Australia) . . . . . [6325-03]

2:50 pm: **Exact studies of charge orbital separation and particle pairing thermodynamics in small nanoclusters,** A. Kocharian, California State Univ./Northridge; G. Fernando, K. Palandage, Univ. of Connecticut . . . . . [6325-04]

Coffee Break . . . . . 3:20 to 3:40 pm

SESSION 2

Conv. Ctr. Room 2 . . . . . Tues. 3:40 to 5:40 pm

Nanotubes and Nanoparticles II

Chair: **Todd D. Krauss**, Univ. of Rochester

3:40 pm: **Photoexcitation dynamics in carbon nanotubes and quantum dots,** O. V. Prezhdo, Univ. of Washington . . . . . [6325-05]

4:10 pm: **Stochastic approach to exciton dynamics in nanoparticles and nanotubes *(Invited Paper)*,** M. Tachiya, A. V. Barzykin, National Institute of Advanced Industrial Science and Technology (Japan) [6325-06]

4:40 pm: **Vibrational spectroscopy and energy relaxation of nanoparticles of different sizes and shapes,** H. A. Petrova, G. V. Hartland, Univ. of Notre Dame; M. Hu, J. Chen, J. McLellan, A. Siekkinen, Y. Xia, Univ. of Washington; M. Marquez, Philip Morris USA; X. Li, Univ. of Washington . . . . . [6325-07]

5:10 pm: **Physical constraints on the redox growth of nanoparticles in solution,** M. Spitler, National Renewable Energy Lab. . . . . [6325-08]

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 3

Conv. Ctr. Room 2 . . . . . Wed. 8:10 to 10:10 am

Spectroscopy of Nanostructures I

Chair: **David F. Kelley**, Univ. of California/Merced

8:10 am: **Photoconductivity and multiple exciton generation in arrays of coupled semiconductor nanoparticles,** M. C. Beard, National Renewable Energy Lab.; J. E. Murphy, National Renewable Energy Lab. and Univ. of Colorado; R. J. Ellingson, National Renewable Energy Lab.; A. J. Nozik, National Renewable Energy Lab. and Univ. of Colorado [6325-09]

8:40 am: **Reduced and oxidized colloidal quantum dots *(Invited Paper)*,** P. Guyot-Sionnest, The Univ. of Chicago . . . . . [6325-10]

9:10 am: **Magnetically doped oxide and chalcogenide semiconductor nanocrystals related to spintronics *(Invited Paper)*,** D. R. Gamelin, Univ. of Washington . . . . . [6325-11]

9:40 am: **Concentration, manipulation, and detection of analytes using porous photonic crystals based on silicon,** M. J. Sailor, A. Ruminski, M. Moore, B. H. King, S. Vinson, A. Gramada, Univ. of California/San Diego [6325-12]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 4

Conv. Ctr. Room 2 . . . . . Wed. 10:30 am to 12:00 pm

Spectroscopy of Nanostructures II

Chair: **Hrvoje Petek**, Univ. of Pittsburgh

10:30 am: **Ultrafast optical studies of highly efficient multiple exciton generation in semiconductor nanocrystals *(Invited Paper)*,** R. J. Ellingson, M. C. Beard, J. C. Johnson, K. K. Knutsen, J. E. Murphy, National Renewable Energy Lab.; A. Shabaev, A. L. Efros, Naval Research Lab.; A. J. Nozik, National Renewable Energy Lab. . . . . [6325-13]

11:00 am: **Coherent superposition of multi-exciton complexes in semiconductor nanocrystals *(Invited Paper)*,** A. L. Efros, Naval Research Lab. . . . . [6325-14]

11:40 am: **Electron and hole dynamics in GaSe nanoparticles and GaSe-InSe nanoparticle heterojunctions,** D. F. Kelley, H. Tu, K. Mogyorosi, Univ. of California/Merced . . . . . [6325-15]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 5

Conv. Ctr. Room 2 . . . . . Wed. 1:30 to 3:30 pm

Spectroscopy at Surfaces and Interfaces I

Chair: **Toshiaki Munakata**, Osaka Univ. (Japan)

1:30 pm: **In situ infrared absorption spectroscopy for thin film growth by atomic layer deposition *(Invited Paper)*,** Y. J. Chabal, Rutgers Univ. . . . . [6325-16]

2:00 pm: **Study of silicon-oxide interfaces and self-assembled monolayers by FTIR spectroscopy and IR-UV ellipsometry *(Invited Paper)*,** P. Hess, P. Patzner, Ruprecht-Karls-Univ. Heidelberg (Germany); A. V. Osipov, Russian Academy of Sciences (Russia); Z. Hu, P. Prunici, Ruprecht-Karls-Univ. Heidelberg (Germany) . . . . . [6325-17]

2:30 pm: **FT-RAIRS of adsorbates on TiO_2(110) *(Invited Paper)*,** B. E. Hayden, Univ. of Southampton (United Kingdom) . . . . . [6325-18]

3:00 pm: **Novel semiconducting chalcogenide buffer layer for oxide heteroepitaxy on Si(001),** D. A. Schmidt, Univ. of Washington and National Institute for Materials Science (Japan); T. Ohta, A. Bostwick, Lawrence Berkeley National Lab.; C. Lu, Q. Yu, Univ. of Washington; E. Rotenberg, Lawrence Berkeley National Lab.; F. Ohuchi, M. Olmstead, Univ. of Washington . . . . . [6325-19]

Coffee Break . . . . . 3:30 to 3:50 pm

SESSION 6

Conv. Ctr. Room 2 . . . . . Wed. 3:50 to 5:50 pm

Spectroscopy at Surfaces and Interfaces II

Chair: **Brian E. Hayden**, Univ. of Southampton (United Kingdom)

3:50 pm: **Spectroscopic studies of compound semiconductor surfaces as it relates to the growth of nanomaterials *(Invited Paper)*,** R. F. Hicks, Univ. of California/Los Angeles . . . . . [6325-20]

4:20 pm: **P-H bonds in the reconstruction of InP(100) measured with FTIR *(Invited Paper)*,** F. Willig, T. Letzig, Hahn-Meitner-Institut Berlin (Germany) . . . . . [6325-21]

4:50 pm: **One- and two-photon photoemission microspectroscopy for organic films *(Invited Paper)*,** T. Munakata, Osaka Univ. (Japan); T. Sugiyama, Y. Sonoda, The Institute of Physical and Chemical Research (Japan) . . . . . [6325-22]

5:20 pm: **Nanoplasmonic waveguide Raman spectroscopy of silica interfaces,** M. P. Andrews, B. Glasspoole, McGill Univ. (Canada) [6325-23]

Thursday 17 August

SESSION 7

Conv. Ctr. Room 2 . . . . . Thurs. 8:10 to 10:10 am

Theory of Electron Transfer Dynamics at Surfaces I

Chair: **Frank Willig**, Hahn-Meitner-Institut Berlin (Germany)

8:10 am: **Ultrafast heterogeneous electron transfer in nanohybrid systems: computational studies on perylene at TiO_2 clusters *(Invited Paper)*,** V. May, Humboldt-Univ. zu Berlin (Germany) . . . . . [6325-24]

8:40 am: **Quantum chemical calculations of dye-sensitized semiconductor nanocrystals *(Invited Paper)*,** P. Persson, Uppsala Univ. (Sweden) . . . . . [6325-25]

9:10 am: **Time-dependence and optimal control of charge transfer through nanostructures *(Invited Paper)*,** E. K. U. Gross, Freie Univ. Berlin (Germany) . . . . . [6325-26]

9:40 am: **Model study of coherent quantum dynamics of hole states in functionalized semiconductor nanostructures *(Invited Paper)*,** V. S. Batista, Yale Univ. . . . . [6325-27]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 8

Conv. Ctr. Room 2 . . . . . Thurs. 10:30 am to 12:00 pm

Theory of Electron Transfer Dynamics at Surfaces II

Chair: **Tijana Rajh**, Argonne National Lab.

10:30 am: **Ab initio nonadiabatic molecular dynamics of the ultrafast electron injection from molecular donors into the TiO_2 surface *(Invited Paper)*,** O. V. Prezhdo, Univ. of Washington . . . . . [6325-28]

11:00 am: **Dynamics of electron injection from the excited state of anchored molecules into semiconductors,** F. Willig, L. Gundlach, R. Ernstorfer, A. Neubauer, J. Szarko, L. Socaciu-Siebert, R. Eichberger, S. Felber, Hahn-Meitner-Institut Berlin (Germany) . . . . . [6325-29]

11:30 am: **Mechanisms of ultrafast electron injection and recombination in dye-sensitized nanostructured semiconductors,** M. Pellnor, G. Benko, F. Trif, R. Smith, A. P. Yartsev, V. Sundstrom, Lunds Univ. (Sweden) . . . . . [6325-30]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 9

Conv. Ctr. Room 2 . . . . . Thurs. 1:30 to 3:00 pm

Experimental Aspects of Electron Transfer at TiO_2 I

Chair: **Anders Hagfeldt**, Royal Institute of Technology (KTH) (Sweden)

1:30 pm: **Dynamics of light-induced interfacial electron transfer in the dye-sensitization of nanocrystalline oxide semiconductors,** J. E. Moser, Ecole Polytechnique Federale de Lausanne (Switzerland) [6325-31]

2:00 pm: **Ultrafast proton-coupled electron transfer in heterogenous photocatalysis *(Invited Paper)*,** H. Petek, Univ. of Pittsburgh . [6325-32]

2:30 pm: **Inhomogeneity of electron injection rates in dye-sensitized TiO_2: continuous mesoporous films and individual particle behavior *(Invited Paper)*,** P. Piotrowiak, Rutgers Univ.; J. Hofkens, Katholieke Univ. Leuven (Belgium) . . . . . [6325-33]

Coffee Break . . . . . 3:00 to 3:20 pm

SESSION 10

Conv. Ctr. Room 2 . . . . . Thurs. 3:20 to 5:20 pm

Experimental Aspects of Electron Transfer at TiO_2 II

Chair: **Piotr Piotrowiak**, Rutgers Univ.

3:20 pm: **A transient molecular probe for characterizing the surface properties of TiO_2 nanoparticle in colloidal solution *(Invited Paper)*,** Y. Weng, Institute of Physics (China) . . . . . [6325-34]

3:50 pm: **Effect of strong coupling through catecholate binding on interfacial electron transfer dynamics in ruthenium polypyridyl complexes and porphyrin sensitized TiO_2 semiconductor nanoparticles *(Invited Paper)*,** H. N. Ghosh, Bhabha Atomic Research Ctr. (India) . . . . . [6325-35]

4:20 pm: **Bioinorganic hybrid systems for light energy conversion,** T. Rajh, N. M. Dimitrijevic, Z. Saponjic, J. Liu, B. M. Rabatic, Argonne National Lab. . . . . [6325-36]

4:50 pm: **Studies of oxide/dye/electrolyte interfaces for solar cell applications *(Invited Paper)*,** A. Hagfeldt, Kungliga Tekniska Högskolan (Sweden) . . . . . [6325-37]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Sunday-Thursday 13-17 August 2006 • Proceedings of SPIE Vol. 6326

Optical Trapping and Optical Micromanipulation III

Conference Sponsor: HAMAMATSU

Conference Chairs: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom); **Gabriel C. Spalding**, Illinois Wesleyan Univ.

Program Committee: **Carlos L. Cesar**, Univ. Estadual de Campinas (Brazil); **Arthur E. T. Chiou**, National Yang Ming Univ. (Taiwan); **Jesper Glückstad**, Risø National Lab. (Denmark); **Min Gu**, Swinburne Univ. of Technology (Australia); **Philippe J. Marchand**, Celula, Inc.; **Jens-Christian D. Meiners**, Univ. of Michigan; **Lene B. Oddershede**, Univ. of Copenhagen (Denmark); **H. Daniel Ou-Yang**, Lehigh Univ.; **Rubén Ramos García II**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); **Alexander Rohrbach**, Univ. of Freiburg (Germany); **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia)

Sunday 13 August

SESSION 1

Conv. Ctr. Room 6D . . . . . Sun. 3:30 to 4:30 pm

Keynote Session

Chairs: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom); **Gabriel C. Spalding**, Illinois Wesleyan Univ.

Keynote

3:30 pm: **Laser tweezers after 20 years,** S. Chu, Lawrence Berkeley National Lab. . . . . [6326-01]

Conference Social Hour

Conv. Ctr. Room 6D . . . . . Sun. 4:30 to 5:30 pm

Attendees of the conference on Optical Trapping and Optical Micromanipulation are invited to meet and greet their colleagues during this special social hour.

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 2

Conv. Ctr. Room 6D . . . . . Mon. 8:20 to 10:10 am

Basic Science I

Chair: **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia)

8:20 am: **Optical trapping of atomic fermi gases *(Invited Paper)*,** J. E. Thomas, Duke Univ. . . . . [6326-02]

8:50 am: **Rotating a Bose-Einstein condensate using photons with orbital angular momentum *(Invited Paper)*,** K. Helmerson, M. Andersen, P. Clade, C. Ryu, V. Natarajan, W. D. Phillips, National Institute of Standards and Technology . . . . . [6326-03]

9:20 am: **Optical interference fields: an excellent tool kit to study Brownian dynamics *(Invited Paper)*,** P. Zemanek, T. Cizmar, M. ·iler, Institute of Scientific Instruments (Czech Republic) . . . . . [6326-05]

9:50 am: **Molecular translational diffusion under optical force potential in solution,** S. Ito, T. Sugiyama, N. Toitani, G. Katayama, Osaka Univ. (Japan); L. Pan, N. Tamai, Kwansei Gakuin (Japan); H. Miyasaka, Osaka Univ. (Japan) . . . . . [6326-06]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 3

Conv. Ctr. Room 6D . . . . . Mon. 10:30 am to 12:10 pm

Fournier/Optical Binding

Chair: **David McGloin**, Univ. of St. Andrews (United Kingdom)

10:30 am: **Multiple optical trapping in high gradient interference fringes,** J. Rohner, J. R. Fournier, P. M. Jacquot, F. Merenda, R. Salathé, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [6326-07]

10:50 am: **Collective oscillations in optical matter,** F. J. Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) . . . . . [6326-04]

11:10 am: **Optical binding in non-diffracting beams,** V. Karasek, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) . . . . . [6326-09]

11:30 am: **Enhancement mechanisms for optical forces in integrated optics,** M. L. Povinelli, Stanford Univ.; M. Loncar, E. J. Smythe, Harvard Univ.; M. Ibanescu, S. G. Johnson, Massachusetts Institute of Technology; F. Capasso, Harvard Univ.; J. D. Joannopoulos, Massachusetts Institute of Technology . . . . . [6326-10]

11:50 am: **Optically induced forces between photonic waveguides,** M. Loncar, Harvard Univ.; M. L. Povinelli, Stanford Univ.; E. J. Smythe, Harvard Univ.; M. Ibanescu, Massachusetts Institute of Technology; M. Hochberg, T. Baehr-Jones, A. Scherer, California Institute of Technology; S. G. Johnson, J. D. Joannopoulos, Massachusetts Institute of Technology; F. Capasso, Harvard Univ. . . . . [6326-11]

Lunch Break . . . . . 12:10 to 1:40 pm

SESSION 4

Conv. Ctr. Room 6D . . . . . Mon. 1:40 to 3:00 pm

Near-Field Optical Micromanipulation

Chair: **Gabriel C. Spalding**, Illinois Wesleyan Univ.

1:40 pm: **An evanescently trapped microsphere as a microfluidic particle router,** V. G. Garcés-Chávez, Univ. of St. Andrews (United Kingdom); S. Kuriakose, Swinburne Univ. of Technology (Australia); P. J. Reece, Univ. of St. Andrews (United Kingdom); M. Gu, Swinburne Univ. of Technology (Australia); K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-12]

2:00 pm: **Dielectric resonator: cavity-enhanced optical manipulation in the near field,** P. J. Reece, V. G. Garcés-Chávez, K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-13]

2:20 pm: **Enhanced whispering gallery modes induced by evanescent two-photon absorption,** S. Kuriakose, D. Morrish, X. Gan, J. W. M. Chon, M. Gu, Swinburne Univ. of Technology (Australia) . . . . . [6326-14]

2:40 pm: **Optical forces on a lensless trap,** V. Ruiz-Cortes, J. P. Vite-Frías, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . . . [6326-16]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 5

Conv. Ctr. Room 6D . . . . . Mon. 3:30 to 5:50 pm

Basic Science II

Chair: **Ewan M. Wright**, The Univ. of Arizona

3:30 pm: **Subwavelength trapping volumes created using negative refraction,** M. Mazilu, K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-17]

3:50 pm: **Single-beam trapping of microbeads in polarized light: dependence of trap stiffness on polarization state,** M. Mansuripur, A. R. Zakharian, J. V. Moloney, College of Optical Sciences/The Univ. of Arizona . . . . . [6326-18]

4:10 pm: **Fundamental electromagnetics and optical tweezers,** R. N. C. Pfeifer, T. A. Nieminen, The Univ. of Queensland (Australia) . . . . [6326-19]

4:30 pm: **Optomechanical forces and electrostriction in laser optical materials,** D. L. Andrews, Univ. of East Anglia Norwich (United Kingdom) . . . . . [6326-20]

4:50 pm: **Exact partial wave expansion of optical beams with respect to arbitrary origin,** A. Á. R. Neves, A. Fontes, W. L. Moreira, A. A. d. Thomaz, D. B. d. Almeida, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) . . . . . [6326-21]

5:10 pm: **Calculation of optical trapping landscapes and application to refractive index measurements,** G. G. Knöner, T. A. Nieminen, S. J. W. Parkin, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) . . . . . [6326-22]

5:30 pm: **Double optical tweezers for 3D photonic force: measurements of Mie scatterers,** A. Á. R. Neves, A. Fontes, W. L. Moreira, A. A. d. Thomaz, D. B. d. Almeida, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) . . . . . [6326-23]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Calibration and performance of dual-beam force-measuring optical tweezers,** D. E. Smith, A. L. Schweitzer, J. P. Rickgauer, Univ. of California/San Diego . . . . . [6326-78]

✔ **DNA looping and cleavage properties of restriction endonucleases studied by optical tweezers manipulation of single DNA molecules,** D. E. Smith, G. J. Gemmen, R. Millin, Univ. of California/San Diego . . . . . [6326-79]

✔ **Manipulation of yeast chromosomal DNA using optically driven microstructures,** K. Terao, The Univ. of Tokyo (Japan); H. Kabata, Kyoto Univ. (Japan); H. Oana, M. Washizu, The Univ. of Tokyo (Japan) . . . . . [6326-80]

✔ **Precise determination of object position in 1D optical lattice,** T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) . . . . . [6326-81]

✔ **Combining confocal microscopy with precise force-scope optical tweezers,** A. C. Richardson, L. B. Oddershede, Niels Bohr Institute (Denmark) . . . . . [6326-82]

✔ **Growth of single yeast cells in an optical trap monitored by Rayleigh and Raman scattering,** G. P. Singh, G. Volpe, R. Alcaide, D. Petrov, Institut de Ciències Fotòniques (Spain) . . . . . [6326-84]

✔ **Chemotaxis study using optical tweezers to observe the strength and directionality of forces of Leishmania amazonensis,** L. d. Y. Pozzo, A. Fontes, A. A. de Thomaz, L. C. Barbosa, D. C. Ayres, C. B. C. Lima, S. Giorgio, C. L. Cesar, Univ. Estadual de Campinas (Brazil) . . . . . [6326-85]

✔ **Optically guided neuronal growth at near-infrared wavelengths,** D. J. Stevenson, Univ. of St. Andrews (United Kingdom); T. Lake, Edinburgh Instruments Ltd. (United Kingdom); B. Agate, F. Gunn-Moore, K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-86]

✔ **Mitotic spindle studied using picosecond laser scissors,** N. M. Baker, Univ. of California/San Diego; E. L. Botvinick, M. W. Berns, Univ. of California/Irvine . . . . . [6326-87]

✔ **Effects of optically driven helical bacteria,** H. Schmitzer, D. A. Tierney, Xavier Univ.; J. R. Robbins, Saint Mary's College of California . . . . . [6326-88]

✔ **RBC under optical tweezers as cellular motors and rockers: microfluidic applications,** S. K. Mohanty, Ctr. for Advanced Technology (India); K. S. Mohanty, Maharaja Sayajirao Univ. of Baroda (India); P. K. Gupta, Ctr. for Advanced Technology (India) . . . . . [6326-89]

✔ **A novel laser tweezers for big size particles,** J. Chen, Beijing Univ. of Technology (China) . . . . . [6326-90]

✔ **Observation and simulation of optical diffraction pattern of a rotating microgear,** L. Kelemen, P. Ormos, Biological Research Ctr. (Hungary); N. K. Metzger, W. Sibbett, K. Dholakia, Univ. of St Andrews (United Kingdom) . . . . . [6326-91]

✔ **Narrow polymer fibers obtained as a combination of photopolymerization and optical confinement,** J. Jezek, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) [6326-93]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 6

Conv. Ctr. Room 6D . . . . . Tues. 1:30 to 3:00 pm

Bio I

Chair: **John C. Butler**, Univ. of Illinois at Urbana-Champaign

1:30 pm: **The dual-beam laser trap: current applications in biophysics and biomedicine *(Invited Paper)*,** J. R. Guck, S. Ebert, B. Lincoln, F. Wottawah, S. Schinkinger, M. Kreysing, K. Travis, Univ. Leipzig (Germany) . . . . . [6326-24]

2:00 pm: **Measuring electrical and mechanical properties of red blood cells with a double optical tweezers,** A. Fontes, H. P. Fernandes, M. d. L. Barjas-Castro, A. A. de Thomaz, L. d. Y. Pozzo, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) . . . . . [6326-25]

2:20 pm: **A microfluidic system for studies of stress response in single cells using optical tweezers,** A. C. V. Granéli, E. Eriksson, J. Enger, K. K. Ramser, M. F. Goksör-Ericsson, D. Hanstorp, Göteborg Univ. (Sweden) . . . . . [6326-26]

2:40 pm: **Optical trapping dynamics for cell identification,** G. Volpe, G. P. Singh, F. Büttner, A. Morales, D. Petrov, Institut de Ciències Fotòniques (Spain) . . . . . [6326-27]

Coffee Break . . . . . 3:00 to 3:20 pm

SESSION 7

Conv. Ctr. Room 6D . . . . . Tues. 3:20 to 5:20 pm

Bio II

Chair: **John C. Butler**, Univ. of Illinois at Urbana-Champaign

3:20 pm: **Elastic light scattering studies from single cells in optical trap,** D. A. Watson, La Jolla Bioengineering Institute . . . . . [6326-28]

3:40 pm: **Interactive space-time controlled application of different stimuli for cells dynamics study,** F. Belloni, S. Monneret, Institut Fresnel (France); D. D. Marguet, Ctr. National de la Recherche Scientifique (France) . . . . . [6326-29]

4:00 pm: **Ultra-localized flow fields applied to the cell surface,** E. L. Botvinick, Univ. of California/Irvine; G. G. Knöner, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia); M. W. Berns, Univ. of California/Irvine . . . . . [6326-30]

4:20 pm: **The influence of extract of Reishi polysaccharides on the binding/uptake of lipopolysaccharide-coated polystyrene particle on macrophage measured by optical tweezers,** M. Wei, K. Hua, J. Hsu, A. V. Karmenyan, H. Hsu, A. E. T. Chiou, National Yang Ming Univ. (Taiwan) . . . . . [6326-31]

4:40 pm: **Raman imaging of neoplastic cells in suspension,** C. M. Creely, S. Mercadal, G. Volpe, D. Petrov, Institut de Ciències Fotòniques (Spain) . . . . . [6326-32]

5:00 pm: **Real-time single sperm tracking, laser trapping, and fluorescence imaging system,** L. Z. Shi, Univ. of California/San Diego; E. L. Botvinick, Univ. of California/Irvine; J. Nascimento, Univ. of California/San Diego; M. W. Berns, Univ. of California/Irvine . . . . . [6326-33]

Introduction to Optical Tweezers and Optical Manipulation

Tuesday 15 August . . . . . 6:00 to 10:00 pm

Don't miss this opportunity to learn more about the use and implementation of optical micromanipulation systems. In addition to valuable background knowledge, the course provides "hands-on" experience using a real optical tweezers system. The course is taught by conference co-chairs Kishan Dholakia and Gabe Spalding.

SC655 - Tuesday 15 August, 6:00 to 10:00 pm

$270 SPIE Members / $310 Non-Members

To register go to the SPIE Registration Desk.

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 8

Conv. Ctr. Room 6D . . . . . Wed. 8:10 to 10:10 am

Microfluidics I

Chair: **Philippe J. Marchand**, Celula, Inc.

8:10 am: **An optically driven pump for microfluidics,** H. M. Mushfique, J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, Univ. of Glasgow (United Kingdom) and INFM-CRS SOFT (Italy); M. J. Padgett, J. M. Cooper, Univ. of Glasgow (United Kingdom) . . . . . [6326-34]

8:30 am: **Single shot and highly parallel photopolymerisation with complex light patterns generated by diffrative optical elements,** L. Kelemen, L. Fábián, S. Valkai, P. Ormos, Biological Research Ctr. (Hungary) . . . . . [6326-35]

8:50 am: **Grasping microscopic objects by multiple tools actuated by optical tweezers,** S. Sung, I. Park, J. Lee, Y. Lee, Gwangju Institute of Science and Technology . . . . . [6326-36]

9:10 am: **An optical trapped nanohand for manipulating micron-sized particles,** L. Baron, F. Beck, G. M. Gibson, G. Whyte, M. J. Padgett, Univ. of Glasgow (United Kingdom) . . . . . [6326-37]

9:30 am: **Snap-fit assembly of microscopic components by optical tweezers,** J. Baek, S. Hwang, J. Lee, Y. Lee, Gwangju Institute of Science and Technology . . . . . [6326-38]

9:50 am: **Optically controlled flow pattern in microfluidic devices,** L. Oroszi, A. Dér, H. Kirei, Biological Research Ctr. (Hungary); V. Rakovics, Muszaki Fizikai es Anyagtudomanyi Kutatointezet (Hungary); P. Ormos, Biological Research Ctr. (Hungary) . . . . . [6326-39]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 9

Conv. Ctr. Room 6D . . . . . Wed. 10:30 am to 12:10 pm

Microfluidics II: Sorting

Chair: **Michael P. MacDonald**, Univ. of St. Andrews (United Kingdom)

10:30 am: **Optical chromatography for concentration of biological samples,** S. J. Hart, Naval Research Lab.; A. V. Terray, SAIC; T. A. Leski, J. Arnold, Naval Research Lab. . . . . [6326-40]

10:50 am: **Static particle sorting in 1D optical lattice,** P. Jakl, T. Cizmar, M. ·er˘, P. Zemanek, Institute of Scientific Instruments (Czech Republic) . . . . . [6326-41]

11:10 am: **The response of particles with anisotropic shape within an optical landscape and laminar flow,** B. L. Conover, M. J. Escuti, North Carolina State Univ. . . . . [6326-42]

11:30 am: **Optical separation of particles based on a dynamic interferometer,** W. Mu, Northwestern Univ.; G. Wang, Indiana Univ.-Purdue Univ. Fort Wayne; G. C. Spalding, Illinois Wesleyan Univ.; L. Luan, J. B. Ketterson, Northwestern Univ. . . . . [6326-43]

11:50 am: **Characterization of an interferometric optical sieve for particle sorting,** I. Ricardez-Vargas, P. Rodriguez-Montero, R. Ramos García II, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); K. P. Volke-Sepulveda, Univ. Nacional Autónoma de México (Mexico) . . . . . [6326-44]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 10

Conv. Ctr. Room 6D . . . . . Wed. 1:30 to 3:00 pm

Ensembles

Chair: **Jesper Gluckstad**, Risø National Lab. (Denmark)

1:30 pm: **Optically-controlled manipulation of live cells using incoherent light-driven optoelectronic tweezers *(Invited Paper),*** A. T. Ohta, P. Chiou, A. Jamshidi, H. Hsu, M. C. Wu, Univ. of California/Berkeley . . . . . [6326-45]

2:00 pm: **Size resolution with light-induced dielectrophoresis (LIDEP),** S. L. Neale, M. P. MacDonald, M. Mazilu, K. Dholakia, T. F. Krauss, Univ. of St. Andrews (United Kingdom) . . . . . [6326-46]

2:20 pm: **Optical micromanipulation of synthetic macromolecules,** W. Singer, T. A. Nieminen, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) . . . . . [6326-47]

2:40 pm: **Optical trapping and two-photon fluorescence analysis of pseudoisocyanine J-aggregates in solution,** H. Yoshikawa, Y. Tanaka, H. M. Masuhara, Osaka Univ. (Japan) . . . . . [6326-48]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 11

Conv. Ctr. Room 6D . . . . . Wed. 3:30 to 5:50 pm

Novel Beams

Chair: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom)

3:30 pm: **Optical measurement of the total angular momentum of light,** S. J. W. Parkin, G. G. Knöner, T. A. Nieminen, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) . . . [6326-49]

3:50 pm: **An intuitive view of the origin of orbital angular momentum in optical vortices,** S. Tseng, L. Hsu, National Chiao Tung Univ. (Taiwan) . . . . . [6326-50]

4:10 pm: **Optical design for generating Bessel beams for micromanipulation,** J. G. Smith, A. Stockham, MEMS Optical, Inc. . . . . [6326-51]

4:30 pm: **Optical guiding of aerosols,** M. D. Summers, D. McGloin, Univ. of St. Andrews (United Kingdom); J. P. Reid, Univ. of Bristol (United Kingdom) . . . . . [6326-52]

4:50 pm: **Tunable acoustic gradient index of refraction lenses for generating rapidly changing Bessel beams,** C. B. Arnold, A. B. Hopkins, E. J. R. B. McLeod, Princeton Univ. . . . . [6326-53]

5:10 pm: **Enhanced particle guiding using supercontinuum radiation,** P. Fischer, A. E. Carruthers, H. Little, C. T. A. Brown, W. Sibbett, Univ. of St. Andrews (United Kingdom); E. M. Wrigth, The Univ. of Arizona and Univ. of St. Andrews (United Kingdom); K. Dholakia, Univ. of St. Andrews (United Kingdom) and College of Optical Sciences/Univ. of Arizona . . . . . [6326-54]

5:30 pm: **Single-particle optical scattering spectroscopy in white light supercontinuum optical tweezers,** P. Li, K. Shi, Z. Liu, The Pennsylvania State Univ. . . . . [6326-55]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Phase conjugation and four-wave mixing in a colloidal crystal,** C. López-Mariscal, J. C. Gutiérrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); D. McGloin, K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-94]

✔ **Cyanine dye J-aggregation in optical trapping,** Y. Tanaka, H. Yoshikawa, H. M. Masuhara, Osaka Univ. (Japan) . . . . . [6326-95]

✔ **Submicron-scale Brownian swimmer or surfer in 1D standing wave optical traps,** M. Siler, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) . . . . . [6326-96]

✔ **Manipulating and probing the spatio-temporal dynamics of nanoparticles,** M. Kyoung, E. D. Sheets, The Pennsylvania State Univ. . . . . [6326-97]

✔ **Patterning surfaces using optical tweezers,** A. van der Horst, FOM Institute for Atomic and Molecular Physics (Netherlands) and Univ. Utrecht (Netherlands); A. I. Campbell, E. C. M. Vermolen, Univ. Utrecht (Netherlands); M. Dogterom, FOM Institute for Atomic and Molecular Physics (Netherlands); A. van Blaaderen, Univ. Utrecht (Netherlands) . . . . . [6326-98]

✔ **Sorting with a translating optical lattice,** R. L. Smith, G. C. Spalding, Illinois Wesleyan Univ.; M. P. MacDonald, S. L. Neale, K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-99]

✔ **Continuous microfluidic sorting using sol-gel microlens array,** Y. Sun, X. Yuan, L. S. Ong, S. Tao, M. He, Nanyang Technological Univ. (Singapore) . . . . . [6326-100]

✔ **Visualization of optical binding,** N. K. Metzger, W. Sibbett, K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [6326-101]

✔ **Design of a low-cost interactive holographic optical tweezer system,** E. Pleguezuelos, J. Andilla, A. Carnicer, E. Martin-Badosa, S. Vallmitjana, M. Montes-Usategui, Univ. de Barcelona (Spain) [6326-102]

✔ **A simple technique for dynamic optical tweezers using mirror on a vibrating membrane,** C. F. Cheong, National Univ. of Singapore (Singapore) . . . . . [6326-103]

✔ **Multiple trap Laguerre-Gaussian holographic optical tweezers using a multiplexed ferroelectric SLM,** A. Lafong, W. J. Hossack, J. Arlt, T. J. Nowakowski, N. D. Read, Univ. of Edinburgh (United Kingdom) . . . . . [6326-104]

✔ **Real-time optical dragging of particles using a phase shift method,** T. Iwai, Tokyo Univ. of Agriculture and Technology (Japan); J. Yamamoto, Hokkaido Univ. (Japan) . . . . . [6326-105]

✔ **Optical tweezing beam control using liquid crystal adaptive optical elements,** P. J. W. Hands, S. A. Tatarkova, A. K. Kirby, G. D. Love, Univ. of Durham (United Kingdom) . . . . . [6326-106]

✔ **Force trapping gradient using diffractive optical elements,** A. Moradi, Institute for Advanced Studies in Basic Sciences (Iran); E. Ferrari, V. Garbin, E. M. Di Fabrizio, D. A. Cojoc, Lab. Nazionale TASC/INFM (Italy) . . . . . [6326-107]

✔ **Spatial light modulator considerations for beam control in optical manipulation applications,** S. A. Serati, Boulder Nonlinear Systems Inc. . . . . [6326-109]

✔ **Algorithm for computing holographic optical tweezers at video rates,** M. Montes-Usategui, E. Pleguezuelos, J. Andilla, E. Martin-Badosa, I. P. Juvells, Univ. de Barcelona (Spain) . . . . . [6326-110]

✔ **Holographic optical tweezers aberration correction using adaptive,** K. D. Wulff, D. G. Cole, R. L. Clark, Jr., Duke Univ.; R. Di Leonardo, Univ. degli Studi di Roma/La Sapienza (Italy); J. Leach, J. M. Cooper, G. M. Gibson, M. J. Padgett, Univ. of Glasgow (United Kingdom) [6326-111]

✔ **GPC-based counterpropagating-beam traps with unequally sized intensity profiles,** P. J. L. Rodrigo, I. R. Perch-Nielsen, J. Gluckstad, Risø National Lab. (Denmark) . . . . . [6326-112]

✔ **Laser manipulation and characterization of liquid crystal droplets,** H. Misawa, N. Murazawa, S. Juodkazis, Hokkaido Univ. (Japan) . . . . . [6326-113]

✔ **Brownian motion in an optical trap with modulated intensity,** Y. Deng, J. Bechhoefer, N. R. Forde, Simon Fraser Univ. (Canada) . . . . . [6326-114]

Thursday 17 August

SESSION 12

Conv. Ctr. Room 6D . . . . . Thurs. 8:10 to 10:20 am

Opto-Fluidics

Chair: **H. Daniel Ou-Yang**, Lehigh Univ.

8:10 am: **Controlled aerosol manipulation using holographic optical tweezers,** D. McGloin, Univ. of St. Andrews (United Kingdom) and Univ. of Washington; D. R. Burnham, Univ. of St. Andrews (United Kingdom) . . . . . [6326-56]

8:30 am: **Multipoint holographic optical velocimetry in microfluidic systems,** J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, Univ. of Glasgow (United Kingdom) and INFM-CRS SOFT (Italy); H. M. Mushfique, J. M. Cooper, M. J. Padgett, Univ. of Glasgow (United Kingdom) . . . . . [6326-57]

8:50 am: **Interparticle hydrodynamic couplings in optical tweezers,** S. Keen, J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, Univ. of Glasgow (United Kingdom) and Univ. di Roma La Sapienza (Italy); G. M. Gibson, M. J. Padgett, Univ. of Glasgow (United Kingdom) . . . . [6326-58]

9:10 am: **Shape dynamics of lipid vesicles forced by holographic optical tweezers,** W. Losert, J. Meszaroz, C. Poole, Univ. of Maryland/College Park . . . . . [6326-59]

9:30 am: **Combined laser trapping and small-angle x-ray scattering experiment for the study of liposome colloidal microparticles,** D. A. Cojoc, Lab. Nazionale TASC/INFM (Italy); H. Amenitsch, Institute of Biophysics and X-Ray Structure Research (Austria); C. Riekel, European Synchrotron Radiation Facility (France); E. Ferrari, Lab. Nazionale TASC/INFM (Italy); M. Rappolt, Institute of Biophysics and X-Ray Structure Research (Austria); V. Garbin, Lab. Nazionale TASC/INFM (Italy); B. Sartori, Institute of Biophysics and X-Ray Structure Research (Austria); M. Burghammer, European Synchrotron Radiation Facility (France); E. M. Di Fabrizio, Lab. Nazionale TASC/INFM (Italy) . . . . . [6326-60]

9:50 am: **Opto-bio-fluidic modeling of bioanalytical and biomedical microdevices *(Invited Paper),*** A. J. Przekwas, Z. Sikorski, CFD Research Corp. . . . . [6326-61]

Coffee Break . . . . . 10:20 to 10:40 am

SESSION 13

Conv. Ctr. Room 6D . . . . . Thurs. 10:40 am to 12:20 pm

Materials Science I

Chair: **Carlos L. Cesar**, Univ. Estadual de Campinas (Brazil)

10:40 am: **The design and biological applications of dual-beam oscillating optical tweezers-based imaging cytorheometer,** H. D. Ou-Yang, J. Wang, Lehigh Univ. . . . . [6326-62]

11:00 am: **Linear and nonlinear microrheology of dense colloidal suspensions,** L. Wilson, J. Arlt, R. Besseling, W. C. K. Poon, Univ. of Edinburgh (United Kingdom) . . . . . [6326-63]

11:20 am: **Defects, structures, and elasticity-mediated colloidal interactions in liquid crystals studied using laser tweezers,** I. I. Smalyukh, Kent State Univ.; G. C. L. Wong, Univ. of Illinois at Urbana-Champaign; B. I. Senyuk, O. D. Lavrentovich, Kent State Univ.; A. N. Kuzmin, A. V. Kachynski, P. N. Prasad, SUNY/Univ. at Buffalo . [6326-64]

11:40 am: **Measuring femtonewton forces between charged colloidal particles,** E. R. Dufresne, S. Sainis, V. Germain, Yale Univ. . . . . [6326-65]

12:00 pm: **Optical manipulation of nanoparticles within torturously constrained geometries,** R. J. Kershner, W. Chae, P. V. Braun, Univ. of Illinois at Urbana-Champaign; G. C. Spalding, Illinois Wesleyan Univ. . . . . [6326-66]

Lunch/Exhibition Break . . . . . 12:20 to 1:30 pm

SESSION 14

Conv. Ctr. Room 6D . . . . . Thurs. 1:30 to 3:00 pm

Materials Science II

Chair: **Ryan J. Kershner**, Univ. of Illinois at Urbana-Champaign

1:30 pm: **High-index particles in counter-propagating traps *(Invited Paper),*** A. van der Horst, FOM Institute for Atomic and Molecular Physics (Netherlands) and Univ. Utrecht (Netherlands); A. van Blaaderen, Univ. Utrecht (Netherlands); M. Dogterom, FOM Institute for Atomic and Molecular Physics (Netherlands) . . . . . [6326-67]

2:00 pm: **Holographic optical tweezers for manipulations on an air/liquid interface,** A. Jesacher, S. Fürhapter, C. Maurer, S. Bernet, M. A. Ritsch-Marte, Innsbruck Medical Univ. (Austria) . . . . . [6326-68]

2:20 pm: **Time-resolved nanoseconds dynamics of ultrasound contrast agent microbubbles manipulated and controlled by optical tweezers,** V. Garbin, D. A. Cojoc, E. Ferrari, Lab. Nazionale TASC/INFM (Italy); E. M. Di Fabrizio, Univ. degli studi Magna Græcia di Catanzaro (Italy); M. L. J. Overvelde, M. Versluis, S. M. van der Meer, Univ. Twente (Netherlands); N. de Jong, Erasmus Univ. Medical Ctr. (Netherlands); D. Lohse, Univ. Twente (Netherlands) . . . . . [6326-69]

2:40 pm: **The 3D manipulation of a microsphere for nano-CMM probe using single fiber optical trapping,** S. I. Eom, Y. Takaya, T. Miyoshi, T. Hayashi, Osaka Univ. (Japan) . . . . . [6326-70]

Coffee Break . . . . . 3:00 to 3:20 pm

SESSION 15

Conv. Ctr. Room 6D . . . . . Thurs. 3:20 to 5:50 pm

Bio III

Chair: **Arthur E. T. Chiou**, National Yang-Ming Univ. (Taiwan)

3:20 pm: **An autonomous and adapting system for long-term optical trapping of yeast in a microfluidic system,** I. R. Perch-Nielsen, Risø National Lab. (Denmark); E. Eriksson, M. F. Goksör-Ericsson, J. Enger, Göteborg Univ. (Sweden); P. J. L. Rodrigo, Risø National Lab. (Denmark); D. Hanstorp, Göteborg Univ. (Sweden); J. Glückstad, Risø National Lab. (Denmark) . . . . . [6326-71]

3:40 pm: **Artificially patterned bacterial biofilms,** J. C. Butler, I. Smalyukh, Univ. of Illinois at Urbana-Champaign; J. Shrout, The Univ. of Iowa; G. C. Spalding, Illinois Wesleyan Univ.; M. J. Parsek, Univ. of Washington; G. C. L. Wong, Univ. of Illinois at Urbana-Champaign . . . . . [6326-72]

4:00 pm: **Stable and robust nanotubes formed from self-assembled polymer membranes,** K. Helmerson, J. E. Reiner, R. Kishore, A. Jofre, National Institute of Standards and Technology; C. Pfefferkorn, Gettysburg College . . . . . [6326-73]

4:20 pm: **Optical tweezers for single molecule force spectroscopy on bacterial adhesion organelles *(Invited Paper)*,** M. J. Andersson, O. Axner, B. E. Uhlin, E. G. Fällman, Umeå Univ. (Sweden) . . . . . [6326-74]

4:50 pm: **Optical stretching of a short nucleic acid polymer,** N. Reihani, L. Bosanac, T. M. Hansen, L. B. Oddershede, Niels Bohr Institute (Denmark) . . . . . [6326-75]

5:10 pm: **Dependence of bacteriophage ø29 DNA packaging on ionic conditions studied by optical tweezers manipulation of single DNA molecules,** D. N. Fuller, J. P. Rickgauer, Univ. of California/San Diego; S. Grimes, P. J. Jardine, D. L. Anderson, Univ. of Minnesota; D. E. Smith, Univ. of California/San Diego . . . . . [6326-76]

5:30 pm: **Initiation of bacteriophage ø29 DNA packaging studied by optical tweezers manipulation of single DNA molecules,** J. P. Rickgauer, D. N. Fuller, Univ. of California/San Diego; S. Grimes, P. J. Jardine, D. L. Anderson, Univ. of Minnesota; D. E. Smith, Univ. of California/San Diego . . . . . [6326-77]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Tuesday-Thursday 15-17 August 2006 • Proceedings of SPIE Vol. 6327

Nanoengineering: Fabrication, Properties, Optics, and Devices III

Conference Chairs: **Elizabeth A. Dobisz**, Hitachi Global Storage Technologies; **Louay A. Eldada**, DuPont Photonics Technologies

Program Committee: **Takashi Ando**, Hitachi Research Lab. (Japan); **Gregory J. Exarhos**, Pacific Northwest National Lab.; **Ghassan E. Jabbour**, Arizona State Univ.; **Miguel Levy**, Michigan Technological Univ.; **Robert Magnusson**, Univ. of Connecticut; **Juan R. Maldonado**, Stanford Univ.; **Derrick C. Mancini**, Argonne National Lab.; **Jun Tanida**, Osaka Univ. (Japan); **Yuli Vladimirsky**, ASML Netherlands B.V.; **Chee Wei Wong**, Columbia Univ.

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 1

Conv. Ctr. Room 5B . . . . . Tues. 1:30 to 3:10 pm

Integrated Nanophotonics

Chair: **Elizabeth A. Dobisz**, Hitachi Global Storage Technologies

1:30 pm: **Optical communication subsystems using microphotonic integrated circuits based on nanoengineered materials *(Invited Paper)*,** L. A. Eldada, DuPont Photonics Technologies . . . . . [6327-01]

2:10 pm: **3D photonic crystal microcircuits *(Invited Paper)*,** P. V. Braun, Univ. of Illinois at Urbana-Champaign . . . . . [6327-02]

2:50 pm: **Successful commercial exploitation of nanophotonic technology,** S. L. Jaiswal, S. C. W. Hyde, The Technology Partnership (United Kingdom) . . . . . [6327-03]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 2

Conv. Ctr. Room 5B . . . . . Tues. 3:30 to 5:50 pm

Photonic Crystals

Chair: **Louay A. Eldada**, DuPont Photonics Technologies

3:30 pm: **Negative refraction and nonlinearities in photonic bandgap nanostructures *(Invited Paper)*,** C. W. Wong, R. Chatterjee, K. Liu, C. Chen, C. Husko, Columbia Univ. . . . . [6327-04]

4:10 pm: **Design, fabrication, and integration of micro/nanoscale photonic crystal devices and plasmonic devices for VLSI photonic integration application *(Invited Paper)*,** E. Lee, Inha Univ. (South Korea) . . . . . [6327-05]

4:50 pm: **Superprism phenomenon in photonic crystals based on holographic polymer dispersed liquid crystal films,** Y. Fuh, S. Wu, M. Li, National Cheng Kung Univ. (Taiwan) . . . . . [6327-06]

5:10 pm: **Feature size effects in chemically assisted ion-beam etching of InP-based photonic crystals,** A. Berrier, M. Mulot, Kungliga Tekniska Högskolan (Sweden); A. Talneau, Lab. de Photonique et de Nanostructures (France); R. Ferrini, R. Houdré, Ecole Polytechnique Fédérale de Lausanne (Switzerland); S. Anand, Kungliga Tekniska Högskolan (Sweden) [6327-07]

5:30 pm: **Fabrication of autocloned photonic crystals by using electron-beam gun with ion-assisted deposition,** T. Chang, National Central Univ (Taiwan); S. Chen, C. Kuo, C. Lee, National Central Univ. (Taiwan) . . . . . [6327-08]

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 3

Conv. Ctr. Room 5B . . . . . Wed. 8:30 to 10:10 am

Micro/Nano Optics Fabrication

Chair: **Louay A. Eldada**, DuPont Photonics Technologies

8:30 am: **All 14 Bravais lattices can be fabricated by triple exposure of two-beam interference fringes,** Y. Ono, T. Ochi, Ritsumeikan Univ. (Japan) . . . . . [6327-09]

8:50 am: **Deep quartz and silicon etching technology for nano-optics divides fabrication,** Y. Morikawa, S. Koukou, ULVAC, Inc. (Japan) . . . . . [6327-10]

9:10 am: **Microlens fabrication using HEBS glass for compact high-resolution IR imaging system,** T. E. Dillon, E. Marchena, C. Chen, Univ. of Delaware; D. J. Brady, Duke Univ.; D. W. Prather, Univ. of Delaware . . . . . [6327-11]

9:30 am: **Micro-optical elements for beam shaping and optical manipulation,** X. Yuan, Nanyang Technological Univ. (Singapore)[6327-12]

9:50 am: **Multiple vortex with different topological charge generated by means of diffractive optical elements,** A. A. Kovalev, V. V. Kotlyar, Image Processing Systems Institute (Russia); D. A. Cojoc, Consiglio Nazionale delle Ricerche (Italy) . . . . . [6327-13]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 4

Conv. Ctr. Room 5B . . . . . Wed. 10:30 to 11:50 am

DUV Lithography

Chair: **Juan R. Maldonado**, Stanford Univ.

10:30 am: **Optical lithography for nanotechnology *(Invited Paper)*,** D. G. Flagello, ASML US, Inc. . . . . [6327-15]

11:10 am: **Periodic nanostructures realized with hyper-NA immersion interferometric lithography,** A. Lagrange, Commissariat à l'Energie Atomique (France); A. L. Charley, STMicroelectronics (France) . [6327-16]

11:30 am: **The influence of exposure and development parameters on the shape of periodic structure fabricated by interferometric lithography,** C. Chien, J. Chen, Y. Wu, National Central Univ. (Taiwan) . . . . . [6327-18]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 5

Conv. Ctr. Room 5B . . . . . Wed. 1:30 to 3:10 pm

Nanosensors and Nanoprobes

Chair: **Elizabeth A. Dobisz**, Hitachi Global Storage Technologies

1:30 pm: **InP-based MEMS and NEMS devices for biosensing *(Invited Paper)*,** R. Ghodssi, Univ. of Maryland/College Park . . . . . [6327-19]

2:10 pm: **A novel nanoprobe design in silicon and gallium-based alloys using photonic crystals,** T. E. Dillon, A. S. Sharkawy, R. Martin, EM Photonics, Inc.; S. Shi, D. W. Prather, Univ. of Delaware . . . . . [6327-20]

2:30 pm: **A novel fiber optic Fabry-Perot structure with a micrometric diameter tip,** X. Wang, J. Xu, Z. Wang, K. L. Cooper, A. Wang, Virginia Polytechnic Institute and State Univ. . . . . [6327-21]

2:50 pm: **Tailorable polymer waveguides for miniaturized biophotonic devices via two-polymer microtransfer molding,** J. Lee, K. Constant, K. Ho, Iowa State Univ. and Ames Lab. . . . . [6327-22]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 6

Conv. Ctr. Room 5B . . . . . Wed. 3:30 to 5:10 pm

Nanostructures

Chair: **Chee Wei Wong**, Columbia Univ.

3:30 pm: **Synthesis and regular array formation of nanoparticles assisted by protein,** H. Yoshimura, M. Okuda, Y. Kobayashi, T. Kondoh, T. Konishi, Meiji Univ. (Japan) . . . . . [6327-23]

3:50 pm: **1.33-μm electroluminescence of multilayer InAs/InGaAs quantum dot laser structure grown by MOVPE,** Q. Wang, B. Noharet, S. Almqvist, L. Höglund, E. Petrini, C. Asplund, H. Malm, J. Y. Andersson, Acreo AB (Sweden) . . . . . [6327-24]

4:10 pm: **Two-photon absorption in direct band gap semiconductors quantum dots,** L. A. Padilha, J. Fu, G. Nootz, D. J. Hagan, E. W. Van Stryland, College of Optics and Photonics/Univ. of Central Florida; D. Buso, A. Martucci, Univ. degli Studi di Padova; C. L. Cesar, L. C. Barbosa, C. H. Brito Cruz, Univ. Estadual de Campinas (Brazil) . . . . . [6327-25]

4:30 pm: **Heat transfer nanogreases based on carbon nanotube,** H. Hong, SDSMT; A. Waynick, Southwest Research Inst.; W. Roy, Army Research Lab. . . . . [6327-27]

4:50 pm: **Reduction of metal linewidths through a combination of low-temperature and ultrasonic development of poly(methylmethacrylate) using electron-beam lithography,** Z. Lu, A. N. Cartwright, SUNY/Univ. at Buffalo . . . . . [6327-28]

✔ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Photo-stimulated changes in metal-amorphous chalcogenide layered nanocomposites,** S. J. Kokenyesi, V. Takats, The Univ. of Debrecen (Hungary); I. Vojnarovich, V. Cheresnya, M. Shipljak, Uzhgorod National Univ. (Ukraine) . . . . . [6327-42]

✔ **Consecutive four-wave nonlinear parametric interaction in nonlinear photonic crystals,** H. Guo, S. H. Tang, National Univ. of Singapore (Singapore) . . . . . [6327-44]

✔ **Fabrication of photonic structure on lithium niobate by means of interferometric lithography and wet etching,** C. Chiang, National Central Univ.; C. Chien, J. Chen, National Central Univ. (Taiwan) . . . . . [6327-45]

✔ **Three-dimensional memory using photoreduction of Eu ions,** M. Trinh, K. Lim, S. Lee, J. Nam, Chungbuk National Univ. (South Korea); E. Kim, Yonsei Univ. (South Korea) . . . . . [6327-48]

✔ **Two-dimensional InP photonic crystal fabrication process development,** B. Rong, E. van der Drift, H. W. Salemink, Technische Univ. Delft (Netherlands) . . . . . [6327-49]

✔ **Complex studies of properties of nanostructured silicon,** A. I. Luchenko, M. Melnichenko, National Taras Shevchenko Univ. of Kyiv (Ukraine); K. Svezhentsova, Institute for Semiconductor Physics (Ukraine); O. Shmyryeva, Kiev Polytechnic Univ. (Ukraine) . . [6327-50]

✔ **PLZT thick films for multimode optical waveguide prepared by aerosol deposition,** M. Inoue, T. Yamaguchi, P. Lim, Toyohashi Univ. of Technology (Japan); K. Shin, Toyohashi Univ. of Technology (Japan) and Kyungsung Univ. (South Korea) . . . . . [6327-51]

✔ **The overlapping effects of step exposure by laser interferometric lithography system,** H. Hsieh, C. Chien, J. Chen, National Central Univ. (Taiwan); Y. Huang, National Changhua Univ. of Education (Taiwan) . . . . . [6327-53]

Thursday 17 August

SESSION 7

Conv. Ctr. Room 5B . . . . . Thurs. 8:10 to 10:10 am

Nanofabricated and Nanopatterned Optical Films

Chair: **Gregory J. Exarhos**, Pacific Northwest National Lab.

8:10 am: **30-nm wide aluminum nanowire grid for ultrahigh-contrast and transmittance visible polarizers *(Invited Paper)*,** J. J. Wang, L. Chen, F. Liu, X. Deng, X. Liu, P. F. Sciortino, Jr., NanoOpto Corp. [6327-30]

8:50 am: **Optical design and simulation for nanoscale distributed Bragg reflector for high-brightness LED,** D. M. Wang, I. T. Ferguson, J. A. Buck, Georgia Institute of Technology . . . . . [6327-31]

9:10 am: **Integrating aligned nanorod array onto optical fibers,** Y. Zhao, The Univ. of Georgia; J. Fan, Univ. of Georgia . . . . . [6327-32]

9:30 am: **Fabrication of subwavelength optical elements on fluoride thin films for UV-DUV regime applications,** C. Lee, D. L. Wang, M. J. Liu, C. Lee, National Central Univ. (Taiwan) . . . . . [6327-33]

9:50 am: **Double and triple layer antireflection coating for silicon solar cells based on porous silicon,** K. S. Martirosyan, V. M. Aroutiounian, A. S. Hovhannisyan, Yerevan State Univ. (Armenia); P. G. Soukiassian, Univ. de Paris-Sud (France) . . . . . [6327-34]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 8

Conv. Ctr. Room 5B . . . . . Thurs. 10:30 am to 12:10 pm

Nanodevices

Chair: **Louay A. Eldada**, DuPont Photonics Technologies

10:30 am: **Fabrication of superconductive nanowire *(Invited Paper)*,** K. K. Berggren, V. Anant, E. A. Dauler, Massachusetts Institute of Technology; G. N. Gol'tsman, Moscow State Pedadgogical Univ. (Russia); A. J. Kerman, MIT Lincoln Lab.; K. M. Rosfjord, Massachusetts Institute of Technology; B. M. Voronov, Moscow State Pedadgogical Univ. (Russia); J. K. Yang, Massachusetts Institute of Technology . . . . . [6327-35]

11:10 am: **Photonic translation of DNAs between microscopic beads and a substrate for a photonic DNA memory *(Invited Paper)*,** Y. Ogura, T. Beppu, R. Shogenji, J. Tanida, Osaka Univ. (Japan) . . . . . [6327-36]

11:50 am: **Stimulated interdiffusion and optical recording in amorphous chalcogenide nanomultilayers,** S. J. Kokenyesi, Univ. of Debrecen (Hungary); I. Ivan, Atommagkutato Intezete (Hungary); A. Csik, Univ. of Debrecen (Hungary); D. L. Beke, The Univ. of Debrecen (Hungary) . . . . . [6327-37]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

SESSION 9

Conv. Ctr. Room 5B . . . . . Thurs. 1:30 to 2:50 pm

Nanocasting and Nanoimprint Lithography

Chair: **Derrick C. Mancini**, Argonne National Lab.

1:30 pm: **Nanofabrication for patterned media *(Invited Paper)*,** E. A. Dobisz, T. Wu, T. R. Albrecht, Z. Z. Bandic, M. E. Best, D. S. Kercher, H. Yang, T. Thomson, O. Hellwig, B. D. Terris, E. Fullerton, Hitachi Global Storage Technologies . . . . . [6327-38]

2:10 pm: **Fabrication of antirefraction structures by nanocasting method,** Y. Hirai, K. Sogo, M. Nakajima, Osaka Prefecture Univ. (Japan) . . . . . [6327-39]

2:30 pm: **Morpho blue reproduced by nanocasting lithography,** A. Saito, RIKEN Harima Institute (Japan) and Osaka Univ. (Japan) and Consultant (Japan); Y. Miyamura, Osaka Univ. (Japan); M. Nakajima, Osaka Prefecture Univ. (Japan); Y. Ishikawa, Osaka Univ. (Japan); K. Sogo, Y. Hirai, Osaka Prefecture Univ. (Japan) . . . . . [6327-41]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm
SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm
SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm
SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm
SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

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Nanomodeling II

Conference Chairs: **Akhlesh Lakhtakia**, The Pennsylvania State Univ.; **Sergey A. Maksimenko**, Belarusian State Univ. (Belarus)

Program Committee: **Richard A. Abram**, Univ. of Durham (United Kingdom); **Nicolaos G. Alexopoulos**, Univ. of California/Irvine; **John M. Arnold**, Univ. of Glasgow (United Kingdom); **Tom G. Mackay**, Univ. of Edinburgh (United Kingdom); **Mikhail E. Portnoi**, Univ. of Exeter (United Kingdom); **Slava V. Rotkin**, Lehigh Univ.; **Mark I. Stockman**, Georgia State Univ.

Sunday 13 August

SESSION 1

Conv. Ctr. Room 5A . . . . . Sun. 8:10 to 10:05 am

THz Technology and Nanodevice Modeling

Chair: **Mikhail E. Portnoi**, The Univ. of Exeter (United Kingdom)

Keynote

8:10 am: **Modeling of THz plasma wave electronics devices,** M. S. Shur, Rensselaer Polytechnic Institute . . . . . [6328-01]

8:55 am: **Magnetic field effects on intersubband transitions in quantum cascade structures *(Invited Paper)*,** V. Apalkov, Georgia State Univ.; T. Chakraborty, A. Bagga, Univ. of Manitoba (Canada) . . . . . [6328-02]

9:25 am: **Optical generation of THz radiation with semiconductor components: nanomodelling aspects and challenges.,** E. A. Avrutin, The Univ. of York (United Kingdom); V. Nikolaev, E. L. Portnoi, A.F. Ioffe Physico-Technical Institute (Russia); C. Xing, D. C. Hutchings, J. M. Arnold, Univ. of Glasgow (United Kingdom) . . . . . [6328-03]

9:45 am: **Modeling and simulation of nanoscale devices with a desktop supercomputer,** E. J. Kelmelis, J. P. Durbano, J. R. Humphrey, EM Photonics, Inc.; F. E. Ortiz, Univ. of Delaware; P. F. Curt, EM Photonics, Inc. . . . . [6328-04]

Coffee Break . . . . . 10:05 to 10:30 am

SESSION 2

Conv. Ctr. Room 5A . . . . . Sun. 10:30 am to 12:05 pm

THz Radiation in Carbon Nanotubes

Chair: **Richard A. Abram**, Durham Univ. (United Kingdom)

Keynote

10:30 am: **Terahertz emitters and detectors based on carbon nanotubes,** M. E. Portnoi, Univ. of Exeter (United Kingdom) and Univ. de Brasília (Brazil); O. V. Kibis, Novosibirsk State Technical Univ. (Russia) and Univ. de Brasília (Brazil); M. Rosenau da Costa, V. L. Campo, Jr., Univ. de Brasília (Brazil) . . . . . [6328-05]

11:15 am: **Nanotube antennas *(Invited Paper)*,** P. J. Burke, C. Rutherglen, Univ. of California/Irvine . . . . . [6328-06]

11:45 am: **Optical scattering by achiral carbon nanotubes and application as nanoantennas and composite mediums,** S. A. Maksimenko, G. Y. Slepyan, M. V. Shuba, Belarusian State Univ. (Belarus); A. Lakhtakia, The Pennsylvania State Univ. . . . . [6328-07]

Lunch Break . . . . . 12:05 to 1:30 pm

SESSION 3

Conv. Ctr. Room 5A . . . . . Sun. 1:30 to 3:05 pm

Theory of Optical Processes in Nanotubes I

Chair: **Slava V. Rotkin**, Lehigh Univ.

Keynote

1:30 pm: **Modeling of carbon nanotube-based devices: from nanoFET to THz emitter,** A. Di Carlo, A. Pecchia, Univ. degli Studi di Roma/Tor Vergata (Italy) . . . . . [6328-08]

2:15 pm: **Optical and transport properties of carbon nanotubes *(Invited Paper)*,** V. Perebeinos, J. Tersoff, P. Avouris, IBM Thomas J. Watson Research Ctr. . . . . [6328-09]

2:45 pm: **Atomic-scale theory and simulation of electronic and fluidic transport in quasi-1D nanostructures,** Y. Xue, SUNY/Univ. at Albany . . . . . [6328-10]

Coffee Break . . . . . 3:05 to 3:30 pm

SESSION 4

Conv. Ctr. Room 5A . . . . . Sun. 3:30 to 5:20 pm

Theory of Optical Processes in Nanotubes II

Chair: **Sergey A. Maksimenko**, Belarusian State Univ. (Belarus)

3:30 pm: **Optical absorption in transition metal disulfide nanotubes *(Invited Paper)*,** I. Milosevic, B. Nikolic, E. Dobardzic, Univ. of Belgrade (Serbia and Montenegro); I. Popov, G. Seifert, Technische Univ. Dresden (Germany); M. Damnjanovic, Univ. of Belgrade (Serbia and Montenegro) . . . . . [6328-11]

4:00 pm: **Many body effects in nanotube fluorescence spectroscopy *(Invited Paper)*,** E. J. Mele, Univ. of Pennsylvania . . . . . [6328-12]

4:30 pm: **Optical chirality of armchair single-wall carbon nanotube induced by DNA wrap,** V. Puller, S. V. Rotkin, Lehigh Univ. . . . [6328-13]

4:50 pm: **Relaxation of photoexcited carriers in single-walled carbon nanotube *(Invited Paper)*,** S. Reich, Massachusetts Institute of Technology . . . . . [6328-14]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 5A . . . . . Mon. 8:10 to 10:15 am

Metamaterials

Keynote

8:10 am: **Modeling and theory involving metamaterial photonic structures,** A. D. Boardman, N. J. King, L. N. Velasco, Univ. of Salford (United Kingdom); Y. Rapoport, National Taras Shevchenko Univ. of Kyiv (Ukraine) . . . . . [6328-15]

8:55 am: **Enhanced or decreased group velocity in compositionally graded films *(Invited Paper)*,** L. Gao, Suzhou Univ. (China) . . . [6328-16]

9:25 am: **Enhancement of group velocity via homogenization,** T. G. Mackay, Univ. of Edinburgh (United Kingdom); A. Lakhtakia, The Pennsylvania State Univ. . . . . [6328-17]

9:45 am: **Optical hyperspace: negative refractive index and subwavelength imaging in anisotroptic dielectric (meta)materials *(Invited Paper)*,** E. E. Narimanov, L. V. Alekseyev, Princeton Univ.; V. A. Podolskiy, Oregon State Univ. . . . . [6328-18]

Coffee Break . . . . . 10:15 to 10:30 am

SESSION 6

Conv. Ctr. Room 5A . . . . . Mon. 10:30 am to 12:10 pm

Metal Nanostructures

Chair: **Tom G. Mackay**, Univ. of Edinburgh (United Kingdom)

10:30 am: **Theory and modeling of ultrafast processes and coherent control in metal plasmonic nanostructures *(Invited Paper)*,** M. I. Stockman, Georgia State Univ. . . . . [6328-19]

11:00 am: **Generation of femtosecond electromagnetic pulses at the nanoscale,** V. V. Kruglyak, Univ. of Exeter (United Kingdom); M. E. Portnoi, Univ. of Exeter (United Kingdom) and International Ctr. for Condensed Matter Physics (Brazil); R. J. Hicken, Univ. of Exeter (United Kingdom) . . . . . [6328-20]

11:20 am: **THz frequency studies of metallic structures *(Invited Paper)*,** S. Brand, M. Kaliteevski, R. A. Abram, Univ. of Durham (United Kingdom) . . . . . [6328-21]

11:50 am: **Optical whirlpools on resonant metal nanostructures,** M. Bashevoy, V. A. Fedotov, N. I. Zheludev, Southampton Univ. (United Kingdom) . . . . . [6328-22]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 7

Conv. Ctr. Room 5A . . . . . Mon. 1:30 to 3:00 pm

Nanoeducation I

Chair: **James S. Murday**, Naval Research Lab.

1:30 pm: **The impact of the nanoscale vision on the future of learning and teaching *(Invited Paper)*,** K. P. C. Madhavan, S. Goasguen, G. Klimeck, Purdue Univ. . . . . [6328-23]

2:00 pm: **Designing VR-enabled learning spaces for nano education *(Invited Paper)*,** S. K. Helsel, ExperiencePR, LLC . . . . . [6328-24]

2:30 pm: **Immersive virtual learning environment for nanoscience education: a paradigm shift *(Invited Paper)*,** J. A. LightFeather, The NanoTechnology Group Inc. . . . . [6328-25]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 8

Conv. Ctr. Room 5A . . . . . Mon. 3:30 to 4:45 pm

Nanoeducation II

Chair: **Judith A. LightFeather**, The NanoTechnology Group Inc.

Keynote

3:30 pm: **Education of small-minded people *(Presentation Only)*,** J. S. Murday, Naval Research Lab. . . . . [6328-26]

4:15 pm: **Pilot program to integrate nanotechnology at Utah's high schools *(Invited Paper)*,** T. Kar, Utah State Univ.; A. Kurtz, M. Anderson, West High School . . . . . [6328-27]

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Modeling of microscopic interaction force and interpretation for major well-known optical phenomenon and experiments,** R. Zhu, China Jiliang Univ. (China); L. Zhu, The Second Hospital of Zhejiang Univ. (China) . . . . . [6328-34]

✔ **Peculiar properties of electron transport in single-wall armchair carbon nanotubes,** D. V. Pozdnyakov, V. O. Galenchik, V. M. Borzdov, F. F. Komarov, Belarusian State Univ. (Belarus) . . . . . [6328-36]

✔ **Radiative instability of electron beam in carbon nanotubes,** S. A. Maksimenko, K. G. Batrakov, G. Y. Slepyan, P. P. Kuzhir, Belarusian State Univ. (Belarus) . . . . . [6328-37]

✔ **Nonlinear interaction of electromagnetic waves with chiral nanotubes: helical parametrization,** S. A. Maksimenko, A. Khrushchinsky, G. Y. Slepyan, Belarusian State Univ. (Belarus); O. V. Kibis, Novosibirsk State Technical Univ. (Russia) . . . . . [6328-38]

✔ **Durations and average speeds of ultrashort optical pulses shaped by chiral sculptured thin films,** J. B. Geddes III, A. Lakhtakia, The Pennsylvania State Univ. . . . . [6328-39]

✔ **Electromagnetic waves in fractal nanostructures,** S. V. Gaponenko, S. V. Zhukovsky, A. V. Lavrinenko, Institute of Molecular and Atomic Physics (Belarus) . . . . . [6328-41]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 9

Conv. Ctr. Room 5A . . . . . Tues. 1:30 to 3:20 pm

Quantum Optical Processes

Chair: **Ivanka Milosevic**, Univ. of Belgrade (Serbia and Montenegro)

Keynote

1:30 pm: **Single quantum dots in microcavities,** A. Kavokin, Univ. of Southampton (United Kingdom) . . . . . [6328-28]

2:15 pm: **Resonant polariton lifetime in quantum dots,** J. E. M. Haverkort, E. Bogaart, D. Sreenivasan, R. Nötzel, Technische Univ. Eindhoven (Netherlands); S. A. Maksimenko, G. Y. Slepyan, Belarusian State Univ. (Belarus) . . . . . [6328-29]

Keynote

2:35 pm: **Modeling quantum optical processes, interference, and correlations in novel nanostructures,** M. Babiker, S. C. Skipsey, The Univ. of York (United Kingdom); M. Al-Amri, King Khalid Univ. (Saudi Arabia); G. Juzeliunas, Vilnius Univ. (Lithuania) . . . . . [6328-30]

Coffee Break . . . . . 3:20 to 3:45 pm

SESSION 10

Conv. Ctr. Room 5A . . . . . Tues. 3:45 to 4:25 pm

Polymers and Biological Systems

Chair: **Stephanie Reich**, Massachusetts Institute of Technology

3:45 pm: **Adjacency matrix formulation of energy flow in dendrimeric polymers,** D. L. Andrews, S. Li, Univ. of East Anglia Norwich (United Kingdom) . . . . . [6328-32]

4:05 pm: **Optical properties of conjugated poly-phenylene-vinylene polymers,** V. I. Gavrilenko, C. E. Bonner, Jr., Norfolk State Univ. [6328-33]

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

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Optofluidics

Conference Chairs: **Demetri Psaltis**, California Institute of Technology; **Yeshaiahu Fainman**, Univ. of California/San Diego

Program Committee: **Stephen R. Quake**, Stanford Univ.; **George M. Whitesides**, Harvard Univ.

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 1

Conv. Ctr. Room 7A . . . . . Tues. 1:30 to 2:30 pm

Optofluidic Lasers

Chair: **Yeshaiahu Fainman,** Univ. of California/San Diego

1:30 pm: **Single-mode and tunable microfluidic dye lasers *(Invited Paper)*,** A. Kristensen, S. Balslev, M. Gersborg-Hansen, B. Bilenberg, T. Rasmussen, D. Nilsson, Danmarks Tekniske Univ. (Denmark) . . [6329-01]

1:50 pm: **Optofluidic quantum cascade laser platform: on-chip sensing and widely tunable lasers *(Invited Paper)*,** M. Loncar, L. Diehl, B. G. Lee, F. Capasso, Harvard Univ.; R. Perahia, O. J. Painter, California Institute of Technology; J. Faist, M. Giovannini, Univ. of Neuchatel (Switzerland) . . . . . [6329-02]

2:10 pm: **Tunable optofluidic dye lasers,** Z. Li, D. Psaltis, California Institute of Technology . . . . . [6329-03]

SESSION 2

Conv. Ctr. Room 7A . . . . . Tues. 2:30 to 4:10 pm

Optofluidics for Tuning and Adaptation

Chair: **Demetri Psaltis,** California Institute of Technology

2:30 pm: **Micron-scale tunability in photonic devices using optical fluidics *(Invited Paper)*,** B. J. Eggleton, P. Domachuk, The Univ. of Sydney (Australia); C. Monat, École Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [6329-04]

2:50 pm: **Configurable photonic crystal based devices and applications *(Invited Paper)*,** A. S. Sharkawy, J. P. Durbano, EM Photonics, Inc.; S. Shi, D. W. Prather, Univ. of Delaware; S. E. McBride, P. J. Zanzucchi, Sarnoff Corp. . . . . [6329-05]

Coffee Break . . . . . 3:10 to 3:30 pm

3:30 pm: **Microfluidic for adaptive optics applications *(Invited Paper)*,** U. Levy, Univ. of California/San Diego . . . . . [6329-06]

3:50 pm: **Miniature fluidic zoom lens *(Invited Paper)*,** Y. Lo, D. Zhang, Rhevision Technology, Inc. and Univ. of California/San Diego . . [6329-07]

SESSION 3

Conv. Ctr. Room 7A . . . . . Tues. 4:10 to 4:50 pm

Imaging and Detection with Optofluidics

Chair: **Demetri Psaltis,** California Institute of Technology

4:10 pm: **A compact optofluidic microscope *(Invited Paper)*,** C. Yang, X. Cui, X. Heng, D. Psaltis, California Institute of Technology . . . . [6329-08]

4:30 pm: **Real-time and background-free detection of nanoscale particles *(Invited Paper)*,** L. Novotny, F. V. Ignatovitch, Univ. of Rochester . . . . . [6329-09]

Nanotechnology Technical Group Meeting

Marriott Cardiff . . . . . 8:00 to 10:00 pm

Chair: **David Andrews,** Univ. of East Anglia Norwich (United Kingdom)

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

This meeting is open to all attendees.

See page 18 for additional information.

Wednesday 16 August

SESSION 4

Conv. Ctr. Room 7A . . . . . Wed. 8:30 to 9:10 am

Chair: **Yeshaiahu Fainman,** Univ. of California/San Diego

Keynote Presentation

Keynote

8:30 am: **Fluidic optics *(Invited Paper)*,** G. M. Whitesides, Harvard Univ. . . . . [6329-11]

SESSION 5

Conv. Ctr. Room 7A . . . . . Wed. 9:10 to 10:10 am

Optofluidic Tweezers

Chair: **Changhuei Yang,** California Institute of Technology

9:10 am: **Applications of optical tweezers to optofluidics *(Invited Paper)*,** M. Cronin-Golomb, Tufts Univ.; P. Domachuk, E. C. Mägi, B. J. Eggleton, The Univ. of Sydney (Australia) . . . . . [6329-12]

9:30 am: **Manipulation of microscopic objects using microbubble formed on the nanotube-functionalized conical fiber tip *(Invited Paper)*,** K. S. Mohanty, Maharaja Sayajirao Univ. of Baroda (India); S. K. Mohanty, K. D. Rao, P. K. Gupta, Ctr. for Advanced Technology (India) . . . . . [6329-13]

9:50 am: **Sorting of mammalian cells on a microfluidics flow cytometer *(Invited Paper)*,** P. J. Marchand, H. Zhang, W. Butler, P. McNeeley, J. Diver, Celula, Inc. . . . . [6329-14]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 6

Conv. Ctr. Room 7A . . . . . Wed. 10:30 to 11:30 am

Optofluidic Nanomaterials and Devices

Chair: **Demetri Psaltis,** California Institute of Technology

10:30 am: **Photofluidics *(Invited Paper)*,** D. Erickson, A. Yang, Cornell Univ. . . . . [6329-15]

10:50 am: **Optical characterization of suspensions of lithium niobate nanoparticles *(Invited Paper, Presentation Only)*,** J. Schwesyg, H. A. Eggert, Univ. Bonn (Germany); K. Meerholz, Univ. zu Köln (Germany); K. Buse, Univ. Bonn (Germany) . . . . . [6329-16]

11:10 am: **High-speed fabrication of patterned colloidal photonic structures in centrifugal microfluidic chips,** S. Lee, Korea Advanced Institute of Science and Technology (South Korea); G. Yi, LG Chem Research Park (South Korea); S. Yang, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6329-17]

SESSION 7

Conv. Ctr. Room 7A . . . . . Wed. 11:30 am to 12:30 pm

Bio-Optofluidics

Chair: **Uriel Levy,** Univ. of California/San Diego

11:30 am: **Determination of living cell characteristics and behavior using biophotonic methods *(Invited Paper)*,** D. G. Rabus, A. Welle, Forschungszentrum Karlsruhe (Germany); R. A. Seger, Univ. of California/Santa Cruz; Y. Ichihashi, M. Bruendel, Forschungszentrum Karlsruhe (Germany); J. Hieb, M. Isaacson, Univ. of California/Santa Cruz [6329-18]

11:50 am: **Rapid broad spectrum bacterial detection using electromagnetic cellular polarization and optical scattering *(Invited Paper)*,** A. Pu, D. Psaltis, California Institute of Technology; H. L. Kasdan, IRIS International, Inc. . . . . [6329-19]

12:10 pm: **All-optical microfluidic circuit for biochemical and cellular analysis powered by photoactive nanoparticles *(Invited Paper)*,** G. L. Liu, J. Kim, L. P. Lee, Univ. of California/Berkeley . . . . . [6329-20]

Lunch/Exhibition Break . . . . . 12:30 to 2:00 pm

SESSION 8

Conv. Ctr. Room 7A . . . . . Wed. 2:00 to 3:00 pm

Optofluidic Sensors

Chair: **Yeshaiahu Fainman,** Univ. of California/San Diego

2:00 pm: **Chemical and biological detectors using ultrahigh-Q microresonators *(Invited Paper)*,** K. J. Vahala, A. L. Martin, California Institute of Technology . . . . . [6329-21]

2:20 pm: **Optofluidic plasmonics,** K. A. Tetz, M. P. Nezhad, Y. Fainman, Univ. of California/San Diego . . . . . [6329-22]

2:40 pm: **Integration of optical and fluidic nanostructures for spectroscopy and tuning *(Invited Paper)*,** A. Scherer, G. Maltezos, California Institute of Technology; E. Kartalov, Univ. of Southern California and California Institute of Technology . . . . . [6329-23]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC496 **Fabrication and Processing of Nanostructures** (Cao) Mon. 14 Aug., 8:30 am to 5:30 pm

SC497 **Nanophotonics** (Prasad) Sun. 13 Aug., 1:30 to 5:30 pm

SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson) Tues. 15 Aug., 1:30 to 5:30 pm

SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding) Tues. 15 Aug., 6:00 to 10:00 pm

SC727 **Nanoplasmonics** (Stockman) Thurs. 17 Aug., 8:30 am to 5:30 pm

Organic Materials

Program on **Organic Photonics and Electronics**

Program Chair: **Zakya H. Kafafi,** Naval Research Lab.

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
	6330 **Nonlinear Optical Transmission and Multiphoton Processes in Organics IV** *(Yeates)*, p. 172			
		6331 **Linear and Nonlinear Optics of Organic Materials VI** *(Norwood)*, p. 174		
6332 **Liquid Crystals X** *(Khoo)*, p. 177				
6333 **Organic Light Emitting Materials and Devices X** *(Kafafi)*, p. 180				
		6334 **Organic Photovoltaics VII** *(Kafafi)*, p. 184		
	6335 **Organic Holographic Materials and Applications IV** *(Orlic)*, p. 187			
6336 **Organic Field-Effect Transistors V** *(Bao/Gundlach)*, p. 189				
Courses				
Register for Courses onsites at the SPIE Registration Desk!		SC797 **The Science and Technology of Organic Solar Cells** (McGehee), 1:30 to 5:30 pm	SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour), 8:30 am to 5:30 pm	
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	**SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18		
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

Monday-Tuesday 14-15 August 2006 • Proceedings of SPIE Vol. 6330

Nonlinear Optical Transmission and Multiphoton Processes in Organics IV

Conference Cosponsor: **Air Force Research Lab.**

Conference Chair: **A. Todd Yeates**, Air Force Research Lab.

Cochairs: **Kevin D. Belfield**, Univ. of Central Florida; **Francois Kajzar**, CEA Saclay (France)

Program Committee: **Chantal Andraud**, École Normale Supérieure de Lyon (France); **Rachel Jakubiak**, Air Force Research Lab.; **Satoshi Kawata**, Osaka Univ. (Japan); **Seth R. Marder**, Georgia Institute of Technology

Monday 14 August

SESSION 1

Conv. Ctr. Room 1A . . . . . Mon. 8:00 to 10:10 am

Two Photon Absorption I

Chair: **A. Todd Yeates**, Air Force Research Lab.

8:00 am: **Aggregation-enhanced two-photon absorption and up-converted fluorescence of quadrupolar 1,4-Bis(cyanostyryl)benzene derivatives showing solvatochromic fluorescence *(Invited Paper)*,** K. Lee, Hannam Univ. (South Korea) . . . . . [6330-01]

8:30 am: **Development of novel two-photon absorbing chromophores *(Invited Paper)*,** J. E. Rogers, J. E. Slagle, Air Force Research Lab.; D. G. McLean, R. L. Sutherland, Science Applications International Corp.; D. Krein, T. M. Cooper, L. Tan, A. M. Urbas, P. A. Fleitz, Air Force Research Lab. . . . . [6330-02]

9:00 am: **Monte Carlo simulation of two-photon induced molecular orientation in solid polymer films *(Invited Paper)*,** A. C. Mitus, G. Pawlik, Politechnika Wroclawska (Poland); F. Kajzar, CEA Saclay (France)[6330-03]

9:30 am: **Two-photon absorption spectroscopy of phthalocyanines and related compounds,** M. A. Drobizhev, N. S. Makarov, Montana State Univ.-Bozeman; Y. Stepanenko, Institute of Physical Chemistry (Poland); A. Rebane II, Montana State Univ.-Bozeman; E. A. Makarova, E. Lukyanets, Institute of Biochemistry and Physiology of Plants and Microorganisms (Russia); G. de la Torre, T. Torres, Univ. Autónoma de Madrid (Spain) . . . . . [6330-04]

9:50 am: **Solvent effects on the three-photon absorption cross-section of fluorene derivatives,** C. Torro, Univ. of Central Florida; I. Cohanoschi, K. D. Belfield, F. E. Hernández, Univ. of Central Florida and College of Optics and Photonics/Univ. of Central Florida . . . . . [6330-05]

Coffee Break . . . . . 10:10 to 10:30 am

SESSION 2

Conv. Ctr. Room 1A . . . . . Mon. 10:30 am to 12:00 pm

Two Photon Absorption II

Chair: **Kevin D. Belfield**, Univ. of Central Florida

10:30 am: **Combined nonlinear effects in two-photon absorption chromophores at high intensities *(Invited Paper)*,** R. L. Sutherland, D. G. McLean, M. C. Brant, Science Applications International Corp.; J. E. Rogers, P. A. Fleitz, A. M. Urbas, Air Force Research Lab. . . . . [6330-06]

11:00 am: **Novel two-photon absorbing stryrylpyridine-based multibranched dyes *(Invited Paper)*,** A. Attias, D. Kreher, F. Mathevet, Univ. Pierre et Marie Curie (France); P. L. Baldeck, Univ. Joseph Fourier (France) . . . . . [6330-07]

11:30 am: **Effect of excited state and population regeneration in the nonlinear transmission through a multiphoton absorbing organic liquid *(Invited Paper)*,** I. Khoo, The Pennsylvania State Univ. . . [6330-08]

Lunch Break . . . . . 12:00 to 1:00 pm

SESSION 3

Conv. Ctr. Room 1A . . . . . Mon. 1:00 to 1:40 pm

Two Photon Absorption III

Chair: **Kevin D. Belfield**, Univ. of Central Florida

1:00 pm: **Nonlinear optical diphenylaminofluorene chromophore adducts of [60]fullerene,** R. Jakubiak, Air Force Research Lab.; P. A. Padmawar, T. Canteenwala, S. Verma, Univ. of Massachusetts; L. Tan, Air Force Research Lab.; L. Y. Chiang, Univ. of Massachusetts . . . [6330-10]

1:20 pm: **Two-photon 3-D optical data storage: two-photon FRET in a photochromic system,** K. D. Belfield, Univ. of Central Florida; C. C. Corredor, Univ. of Central Florida and Bristol-Myers Squibb Pharmaceutical Research Institute; Z. Huang, Univ. of Central Florida and Huazhong Univ. of Science and Technology (China); M. V. Bondar, O. V. Przhonska, Univ. of Central Florida and Instytut Fizyki (Ukraine); I. Cohanoschi, F. E. Hernández, Univ. of Central Florida . . . . . [6330-09]

SESSION 4

Conv. Ctr. Room 1A . . . . . Mon. 1:40 to 3:10 pm

All Optical Switching

Chair: **Kwang Sup Lee**, SUNY/Univ. at Buffalo

1:40 pm: **Photonically engineered nanostructures for material characterization and all optical switching *(Invited Paper)*,** R. F. Mahrt, S. Jochim, IBM Zürich Research Lab. (Switzerland); N. Moll, IBM Zurich Research Lab. (Switzerland); S. Gulde, B. J. Offrein, IBM Zürich Research Lab. (Switzerland) . . . . . [6330-11]

2:10 pm: **Multiphoton spectroscopy of polymers for all-optical switching *(Invited Paper)*,** C. Bubeck, K. Koynov, Max-Planck-Institut für Polymerforschung (Germany); A. Bahtiar, Univ. Padjadjaran (Indonesia); T. Ahn, Samsung SDI Co., Ltd. (South Korea); A. Kibrom, Max-Planck-Institut für Polymerforschung (Germany) . . . . . [6330-12]

2:40 pm: **Second harmonic movie/imaging of live bacteria and cells *(Invited Paper)*,** Y. Okada-Shudo, The Institute of Physical and Chemical Research (RIKEN) (Japan) and The Univ. of Electro-Communications (Japan); S. Kawata, The Institute of Physical and Chemical Research (RIKEN) (Japan) and Osaka Univ. (Japan) . . . . . [6330-14]

Coffee Break . . . . . 3:10 to 3:40 pm

SESSION 5

Conv. Ctr. Room 1A . . . . . Mon. 3:40 to 5:20 pm

NLO Materials

Chair: **Antoni C. Mitus**, Politechnika Wroclawska (Poland)

3:40 pm: **Tunable broad-band DBR using photorefractive polymers *(Invited Paper)*,** T. Wada, T. Fujihara, T. Sassa, J. Mamiya, The Institute of Physical and Chemical Research (Japan); S. Umegaki, Keio Univ. (Japan) . . . . . [6330-15]

4:10 pm: **Third-order nonlinear optical properties of CuPc: influence of thickness and concentration *(Invited Paper)*,** B. Sahraoui, Z. Sofiani, Univ. d'Angers (France); B. J. Derkowska, M. Wojdyla, R. Czaplicki, P. Rytlewski, Univ. Mikolaja Kopernika (Poland); M. Addou, Univ. Ibn Tofail (Morocco); W. Bala, Univ. Mikolaja Kopernika (Poland) . . . . . [6330-16]

4:40 pm: **Quasi-phase-matched structures for frequency conversion in photopolymers doped with push-pull chromophores,** J. Bombenger, J. Vola, L. Mager, A. F. Fort, Institut de Physique et Chimie des Matériaux de Strasbourg (France); C. P. Carré, Univ. de Haute Alsace (France) [6330-17]

5:00 pm: **A solar concentrator basis,** M. Tecpoyotl-Torres, Univ. Autónoma del Estado de Morelos (Mexico); J. Campos, F. Tellez-Alanis, Univ. Nacional Autónoma de México (Mexico); J. J. Sánchez-Mondragón, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); J. J. Escobedo-Alatorre, Univ. Autónoma del Estado de Morelos (Mexico) . . . . . [6330-18]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote**, Air Force Research Lab.;*
***Zakya H. Kafafi**, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Third-order nonlinear optical properties of a new copolymer containing substituted thiophenes and 1,3,4-oxadiazole units,** C. Keloth, J. K. A. Anthony, H. D. Shashikala, A. V. Adhikari, U. K. Dalimba, G. Umesh, National Institute of Technology Karnataka (India) [6330-20]

✔ **Nonlinear transmission of erbium-doped single-mode fibers and impact of the gain saturation on steady states of bright optical pulses,** A. S. Shcherbakov, E. Tepichín-Rodriguez, M. Sanchez Sanchez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6330-22]

✔ **Experimental characterization of two-photon materials for fast rewritable optical data storage,** N. S. Makarov, A. Rebane II, M. A. Drobizhev, D. Peone, Montana State Univ.-Bozeman; H. Wolleb, H. Spahni, Ciba Specialty Chemicals (Switzerland) . . . . . [6330-23]

✔ **Optical switches based on nonlinear and dispersive media in one-dimensional photonic crystals,** X. Xu, Nanchang Univ. (China) . . . . . [6330-25]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Tuesday-Thursday 15-17 August 2006 • Proceedings of SPIE Vol. 6331

Linear and Nonlinear Optics of Organic Materials VI

Conference Chair: **Robert A. Norwood**, College of Optical Sciences/The Univ. of Arizona

Cochairs: **Manfred Eich**, Technische Univ. Hamburg-Harburg (Germany); **Jean-Michel Nunzi**, Univ. d'Angers (France)

Program Committee: **Koen J. Clays**, Katholieke Univ. Leuven (Belgium); **Alain F. Fort**, Institut de Physique et Chimie des Matériaux de Strasbourg (France); **Theodore G. Goodson III**, Univ. of Michigan; **James R. Heflin**, Virginia Polytechnic Institute and State Univ.; **Satoshi Kawata**, Osaka Univ. (Japan); **Tony C. Kowalczyk**, Lockheed Martin Space Systems Co.; **Mark G. Kuzyk**, Washington State Univ.; **Charles Y. C. Lee**, Air Force Office of Scientific Research; **Kwang-Sup Lee**, Hannam Univ. (South Korea); **Geoffrey A. Lindsay**, Naval Air Warfare Ctr.; **Aristides A. Marcano O.**, Instituto Venezolano de Investigaciones Científicas (Venezuela); **André P. Persoons**, Katholieke Univ. Leuven (Belgium); **Kenneth D. Singer**, Case Western Reserve Univ.; **Jayan Thomas**, College of Optical Sciences/The Univ. of Arizona; **Tatsuo Wada**, The Institute of Physical and Chemical Research (Japan)

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 1

Conv. Ctr. Room 1A . . . . . Tues. 1:30 to 3:30 pm

NLO Materials I

Chair: **Manfred Eich**, Technische Univ. Hamburg-Harburg (Germany)

1:30 pm: **Optimizing specific third-order polarizabilities and approaching the fundamental limit in donor substituted cyanoethynylethene (CEE) molecules *(Invited Paper)*,** I. Biaggio, Lehigh Univ. and ETH Zürich (Switzerland); J. C. May, B. Esembeson, Lehigh Univ.; T. Michinobu, ETH Zürich (Switzerland); F. Diederich, ETH Zurich (Switzerland) . . . . . [6331-01]

2:00 pm: **Observation of spatial phase shift in dark soliton crossing,** R. Fischer, D. N. Neshev, Y. S. Kivshar, The Australian National Univ. (Australia); D. Iturbe-Castillo, S. Chávez-Cerda, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); M. R. Meneghetti, D. P. Caetano, J. M. Hickmann, Univ. Federal de Estado de Alagoas (Brazil) . . [6331-02]

2:20 pm: **Quantum calculations of the dispersion of the fundamental limits of nonlinear susceptibilities,** M. G. Kuzyk, Washington State Univ.; J. Pérez-Moreno, Katholieke Univ. Leuven (Belgium) . . . . . [6331-03]

2:40 pm: **Control and switching of first hyperpolarizability by pH,** I. Asselberghs, Katholieke Univ. Leuven (Belgium); G. Hennrich, Univ. Autónomade Madrid (Spain); B. J. Coe, Univ. of Manchester (United Kingdom); C. Koen, Katholieke Univ. Leuven (Belgium) . . . . . [6331-04]

3:00 pm: **Linear and nonlinear optical properties of linear and hyperbranched conjugated polymers *(Invited Paper)*,** B. Z. Tang, The Hong Kong University of Science & Technology (Hong Kong China) . . . . . [6331-05]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 2

Conv. Ctr. Room 1A . . . . . Tues. 4:00 to 6:00 pm

Nanophotonics

Chair: **Andrew J. Guenthner**, Naval Air Warfare Ctr.

4:00 pm: **Design and fabrication of polymer-based photonic crystals,** E. J. Kelmelis, EM Photonics, Inc.; P. Yao, S. Shi, Univ. of Delaware; A. S. Sharkawy, EM Photonics, Inc.; D. W. Prather, Univ. of Delaware [6331-06]

4:20 pm: **Creating functional photonic crystals by multibeam interference lithography *(Invited Paper)*,** S. Yang, J. H. Moon, J. Ford, Y. Zhang, Univ. of Pennsylvania; V. Chen, J. W. Perry, Georgia Institute of Technology . . . . . [6331-07]

4:50 pm: **Photonic bandgap engineering for spectral narrowing of emission in self-assembled colloidal photonic crystals,** K. J. Clays, R. Vallée, K. Baert, Katholieke Univ. Leuven (Belgium) . . . . . [6331-08]

5:10 pm: **Modulation and dispersion control in photonic crystals *(Invited Paper)*,** M. Eich, J. Wülbern, M. Schmidt, A. Y. Petrov, Technische Univ. Hamburg-Harburg (Germany); U. Huebner, R. Boucher, Institut für Physikalische Hochtechnologie e.V. (Germany) . . . . . [6331-09]

5:40 pm: **New organic infiltrants for 2D and 3D photonic crystals,** R. A. Norwood, H. Sumimura, S. Tay, K. Yamnitsky, N. N. Peyghambarian, A. Kropachev, College of Optical Sciences/The Univ. of Arizona; T. Skotheim, Intex, Inc.; S. Yang, J. H. Moon, Univ. of Pennsylvania . . . . . [6331-10]

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Linear and nonlinear optical properties in new cyanine dye Langmuir-Blodgett multilayers,** C. Wang, S. Ma, F. Gao, H. Zeng, W. Liu, L. Liu, W. Wang, Fudan Univ. (China); H. Tian, East China Univ. of Science and Technology (China) . . . . . [6331-39]

✔ **Formation of the signal beam with inhomogeneous cross-section spatial distribution of the light polarization in nonlinear optical processes with elliptically polarized Gaussian beams in the isotropic chiral medium,** V. A. Makarov, I. A. Perezhogin, M.V. Lomonosov Moscow State Univ. (Russia) . . . . . [6331-43]

✔ **Optical absorption and second harmonic generation in SiO_2:DR1 sol-gel films as function of poling time,** A. Franco, Univ. Nacional Autonoma de Mexico (Mexico); J. A. Garcia-Macedo, G. Valverde-Aguilar, Univ. Nacional Autónoma de México (Mexico) . . . . . [6331-45]

✔ **Optical, thermal and microhardness studies on 1-(4-Bromophenyl)-3-(4-chlorophenyl)-2-propen-1-one: a nonlinear optical single crystal,** V. Ravindrachary, Mangalore Univ. (India); V. Crasta, St. Joseph's College of Engineering (India); B. F. Rajashekar, A. Harisha, Mangalore Univ. (India) . . . . . [6331-46]

✔ **Dielectric studies on swift heavy ion and electron irradiated organic single crystal,** V. Crasta, St. Joseph's College of Engineering (India); V. Ravindrachary, B. F. Rajashekar, A. Harisha, Mangalore Univ. (India); S. Shettigar, NMAM Institute of Technology (India) . . . . . [6331-47]

✔ **Integrated optical devices using bacteriorhodopsin as active nonlinear optical material,** A. Dér, L. Fábián, S. Valkai, Biological Research Ctr. (Hungary); E. K. Wolff, Univ. Witten/Herdecke (Germany); J. J. Ramsden, Cranfield Univ. (United Kingdom); P. Ormos, Biological Research Ctr. (Hungary) . . . . . [6331-49]

✔ **Synthesis and photochemical study of substituted heterohelicenes and related compounds,** Y. Hu, Bowling Green State Univ.; B. Wex, Arizona State Univ.; M. W. Perkovic, Western Michigan Univ.; D. C. Neckers, Bowling Green State Univ. . . . . [6331-51]

Wednesday 16 August

SESSION 3

Conv. Ctr. Room 1A . . . . . Wed. 8:00 to 10:00 am

Multiphoton and Holographic Materials

Chair: **Jayan Thomas**, College of Optical Sciences/The Univ. of Arizona

8:00 am: **Photorefractive polymer in reflection geometry with large efficiency,** M. Erlap, J. Thomas, S. Tay, G. Li, R. A. Norwood, N.N. Peyghamvarian, The Univ. of Arizona . . . . . [6331-52]

8:20 am: **Second-generation organometallic materials for nonlinear absorption *(Invited Paper)*,** K. S. Schanze, Univ. of Florida . . . [6331-12]

8:50 am: **High-performance 532-nm sensitive photorefractive polymeric composites,** P. Wang, M. Yamamoto, Nitto Denko Technical Corp.; J. Thomas, M. Eralp, S. Tay, G. Li, R. A. Norwood, N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona[6331-13]

9:10 am: **Studies of new nondestructive read-out media for two-photon 3D high-density storage *(Invited Paper)*,** P. M. Rentzepis, Univ. of California/Irvine . . . . . [6331-14]

9:40 am: **A novel class of highly sensitive material for two-photon 3D optical data storage,** M. Akiba, Univ. of California/Irvine . . . . . [6331-15]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 4

Conv. Ctr. Room 1A . . . . . Wed. 10:30 am to 12:00 pm

EO Materials I

Chair: **Koen J. Clays**, Katholieke Univ. Leuven (Belgium)

10:30 am: **Linear, octopolar, and dendritic phenylacetylene NLO-chromophores: symmetry implications on the molecular and supramolecular level *(Invited Paper)*,** G. Hennrich, R. H. Gonzalez-Jonte, Univ. Autónoma de Madrid (Spain); B. Gómez-Lor, Instituto de Ciencias de Materiales de Madrid (Spain); I. Asselberghs, K. J. Clays, V. Thierry, Katholieke Univ. Leuven (Belgium) . . . . . [6331-16]

11:00 am: **Pulse poling of high performance chromophores,** J. B. Westphal, A. Chen, N. Burt, Univ. of Washington . . . . . [6331-50]

11:20 am: **Studies of reorientational mobility of chromophores in poled nonlinear optical polymers by secondary poling,** K. Y. Wong, C. To, Chinese Univ. of Hong Kong (Hong Kong China) . . . . . [6331-18]

11:40 am: **Enhancement of the electro-optic coefficient in nonlinear polymers with sol-gel cladding,** C. T. DeRose, Y. Enami, C. L. Loychik, R. A. Norwood, D. L. Mathine, M. Fallahi, N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona; J. Luo, A. K. Y. Jen, Univ. of Washington; M. Yamamoto, M. Kathaperumal, Nitto Denko Technical Corp. . . . . [6331-19]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 5

Conv. Ctr. Room 1A . . . . . Wed. 1:30 to 3:00 pm

EO Materials II

Chair: **Mark G. Kuzyk**, Washington State Univ.

1:30 pm: **Single-molecule microscopy studies of electric-field poling in chromophore-polymer composite materials,** P. J. Reid, P. M. Wallace, D. R. B. Sluss, L. R. Dalton, B. H. Robinson, Univ. of Washington . [6331-20]

1:50 pm: **Supramolecular guest-host systems: combining high dye doping level with low aggregation tendency *(Invited Paper)*,** A. Priimagi, Helsinki Univ. of Technology (Finland); S. Cattaneo, Tampereen Teknillinen Yliopisto (Finland); R. H. A. Ras, S. Valkama, O. Ikkala, Helsinki Univ. of Technology (Finland); M. Kauranen, Tampereen Teknillinen Yliopisto (Finland) . . . . . [6331-21]

2:20 pm: **Polyimides with attached chromophores for improved performance in electro-optical devices,** A. J. Guenthner, M. E. Wright, S. Fallis, G. A. Lindsay, B. J. Petteys, G. R. Yandek, Naval Air Warfare Ctr.; D. Zang, IPITEK, Inc.; P. R. Ashley, U.S. Army Aviation and Missile Command . . . . . [6331-22]

2:40 pm: **Synthesis of well-defined NLO polymers by controlled radical polymerization (RAFT process),** A. Attias, D. Kreher, A. Roy, B. Charleux, Univ. Pierre et Marie Curie (France); F. Kajzar, I. Rău, CEA Saclay (France) . . . . . [6331-23]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 6

Conv. Ctr. Room 1A . . . . . Wed. 3:30 to 5:40 pm

Waveguides and Sensors

Chair: **Robert A. Norwood**, College of Optical Sciences/The Univ. of Arizona

3:30 pm: **Characterization of DNA-based material for optical devices,** D. E. Diggs, Air Force Research Lab. . . . . [6331-24]

3:50 pm: **Perfluoropolymer optical waveguides with low propagation loss and high reliability *(Invited Paper)*,** Y. Kuwana, S. Takenobu, K. Takayama, Y. Morizawa, Asahi Glass Co., Ltd. (Japan) . . . . . [6331-25]

4:20 pm: **Photopatternable fluorinated poly(arylene ether ketone) for optical waveguide devices,** J. Jiang, C. L. Callender, J. P. Noad, Communications Research Ctr. Canada (Canada); Y. Qi, J. Ding, M. Day, National Research Council Canada (Canada) . . . . . [6331-26]

4:40 pm: **Infrared ellipsometric measurement of biological films at Air/ZnS interfaces,** C. S. Yang, National Institute of Standards and Technology; A. C. Samuels, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6331-27]

5:00 pm: **Polymer waveguide biosensors with Bragg gratings,** J. Lee, K. Kim, M. Oh, Pusan National Univ. (South Korea) . . . . . [6331-28]

5:20 pm: **An all-optical polymer fiber cantilever,** M. G. Kuzyk, S. Bian, D. Robinson, Washington State Univ. . . . . [6331-29]

Thursday 17 August

SESSION 7

Conv. Ctr. Room 1A . . . . . Thurs. 8:00 to 10:00 am

EO Devices and Processes

Chair: **Jean-Michel Nunzi**, Univ. du Maine (France)

8:00 am: **Electro-optic polymers and their applications *(Invited Paper)*,** M. Kathaperumal, M. Yamamoto, Nitto Denko Technical Corp.; C. T. DeRose, R. A. Norwood, N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona . . . . . [6331-30]

8:30 am: **Packaged high-speed electro-optic polymer modulators *(Invited Paper)*,** R. Dinu, D. Jin, L. Zheng, M. K. Koenig, Y. Fang, Lumera Corp. . . . . [6331-31]

9:00 am: **Real-time monitoring of all-optical poling by two-beam second-harmonic generation,** A. Priimagi, Helsinki Univ. of Technology (Finland); S. Cattaneo, M. Kauranen, Tampereen Teknillinen Yliopisto (Finland) . . . . . [6331-32]

9:20 am: **Novel polymeric cores for electro-optic modulator,** L. Zheng, Lumera Corp. . . . . [6331-33]

9:40 am: **Electro-optical materials incorporating dendronized chromophores,** D. Huang, Lumera Corp. . . . . [6331-48]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 8

Conv. Ctr. Room 1A . . . . . Thurs. 10:30 am to 12:30 pm

NLO Materials II

Chair: **Theodore G. Goodson III**, Univ. of Michigan

10:30 am: **Efficient Faraday rotation in conjugated polymers *(Invited Paper)*,** T. Verbiest, S. Foerier, M. Vangheluwe, A. P. Persoons, G. Koeckelberghs, P. Gangopadhyay, Katholieke Univ. Leuven (Belgium) [6331-34]

11:00 am: **Retardation of the orientation relaxation of azo-dye-doped amorphous polymers upon photo-induced isomerization,** S. Chan, J. Nunzi, Univ. d'Angers (France); A. Quatela, M. Casalboni, Univ. degli Studi di Roma/Tor Vergata (Italy) . . . . . [6331-35]

11:20 am: **Ultrafast third-order nonlinear optical properties of 1D and 2D conjugated systems *(Invited Paper)*,** A. D. Slepkov, F. A. Hegmann, T. Luu, R. R. Tykwinski, Univ. of Alberta (Canada); K. Kamada, National Institute of Advanced Industrial Science and Technology (Japan); J. A. Marsden, J. J. Miller, E. L. Splitter, M. M. Haley, Univ. of Oregon [6331-36]

11:50 am: **Computer simulation of photoinduced helical structure formation on azobenzene-containing materials,** D. Barada, H. Sumimura, Univ. of Tsukuba (Japan); T. Fukuda, J. Y. Kim, National Institute of Advanced Industrial Science and Technology (Japan); M. Itoh, T. Yatagai, Univ. of Tsukuba (Japan) . . . . . [6331-37]

12:10 pm: **Using the relationship between geometry and hyperpolarizability as a tool for developing new paradigms for molecular engineering,** M. G. Kuzyk, J. Zhou, D. S. Watkins, Washington State Univ. . . . . [6331-38]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Sunday-Tuesday 13-15 August 2006 • Proceedings of SPIE Vol. 6332

Liquid Crystals X

Conference Chair: **Iam-Choon Khoo**, The Pennsylvania State Univ.

Program Committee: **Timothy J. Bunning**, Air Force Research Lab.; **Shaw H. Chen**, Univ. of Rochester; **Neil Collings**, Univ. of Cambridge (United Kingdom); **Jean-Pierre Huignard**, Thales Research & Technology (France); **Tomiki Ikeda**, Tokyo Institute of Technology (Japan); **Francesco F. Simoni**, Univ. Politecnica delle Marche (Italy); **David M. Walba**, Univ. of Colorado at Boulder

Sunday 13 August

SESSION 1

Conv. Ctr. Room 5B . . . . . Sun. 8:30 to 10:30 am

Photo-Alignment, Lasing Action, Polymer-LC Composite

Chair: **Iam-Choon Khoo**, The Pennsylvania State Univ.

8:30 am: **Experimental characterization and kinetic modeling of photoalignment of liquid crystals on coumarin-containing polymer films *(Invited Paper)*,** S. H. Chen, C. Kim, A. Trajkovska, J. U. Wallace, Univ. of Rochester . . . . . [6332-01]

9:00 am: **Random lasing and weak localization of light in nematic liquid crystals *(Invited Paper)*,** G. Strangi, Univ. della Calabria (Italy) . . . . . [6332-02]

9:30 am: **Viewing angle compensation of various LCD modes by using a liquid crystalline polymer film 'Nisseki LC film' *(Invited Paper)*,** S. Nishimura, H. Mazaki, Nippon Oil Corp. (Japan) . . . . . [6332-03]

10:00 am: **Photonic crystals based on holographic polymer-dispersed liquid crystal films and applications *(Invited Paper)*,** Y. Fuh, S. Wu, M. S. Lee, National Cheng Kung Univ. (Taiwan) . . . . . [6332-04]

Coffee Break . . . . . 10:30 to 10:50 am

SESSION 2

Conv. Ctr. Room 5B . . . . . Sun. 10:50 am to 12:40 pm

Optoelectronic Devices, Displays

Chair: **Neil Collings**, Univ. of Cambridge (United Kingdom)

10:50 am: **Single-layer liquid crystal optically addressed spatial light modulators *(Invited Paper)*,** N. Collings, O. Trushkevych, W. A. Crossland, T. D. Wilkinson, Univ. of Cambridge (United Kingdom) . . . . . [6332-05]

11:20 am: **Origin of fast response of vertically aligned nematic liquid crystal cells *(Invited Paper)*,** H. Naito, Y. Iwata, Y. Sasaki, Osaka Prefecture Univ. (Japan); M. Inoue, Toyo Corp. (Japan); H. Ichinose, Merck Ltd. (Japan); M. Klasen-Memmer, K. Tarumi, Merck KGaA (Germany) . . . . . [6332-06]

11:50 am: **Hybrid photonic crystal based on chiral liquid crystals *(Invited Paper)*,** M. Ozaki, Osaka Univ. (Japan) . . . . . [6332-07]

12:20 pm: **Nearly unpolarized and linearly polarized laser generation from dye-doped cholesteric liquid crystal laser using a mirror reflector,** Y. Zhou, Y. Huang, S. Wu, College of Optics and Photonics/Univ. of Central Florida . . . . . [6332-08]

Lunch Break . . . . . 12:40 to 1:40 pm

SESSION 3

Conv. Ctr. Room 5B . . . . . Sun. 1:40 to 3:10 pm

LC Modeling, Pattern Formation

Chair: **Shaw H. Chen**, Univ. of Rochester

1:40 pm: **Exploring motion reversal in polymer cholesteric liquid crystal devices,** T. Z. Kosc, C. J. Coon, K. L. Marshal, A. Trajkovska-Petkoska, S. D. Jacobs, Univ. of Rochester . . . . . [6332-09]

2:00 pm: **Feedback-free single-beam pattern formation by nanosecond,** N. N. Lepeshkin, San Francisco State Univ.; S. G. Lukishova, Institute of Radio-engineering and Electronics; R. W. Boyd, K. L. Marshal, Univ. of Rochester . . . . . [6332-10]

2:20 pm: **Monte Carlo modeling of optical properties of twisted NLC systems: role of anchoring forces *(Invited Paper)*,** A. C. Mitus, G. Pawlik, Politechnika Wroclawska (Poland); F. Kajzar, CEA Saclay (France) . . . . . [6332-11]

2:50 pm: **Computational chemistry methods for predicting the chiroptical and spectroscopic properties of liquid crystal systems II: application to chiral azoxybenzene mesogens,** K. L. Marshal, A. G. Noto, P. Chang, K. Lotito, A. Ovchinnikov, Univ. of Rochester; N. V. Tabirian, Beam Engineering for Advanced Measurements Co. . [6332-12]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 4

Conv. Ctr. Room 5B . . . . . Sun. 3:30 to 5:30 pm

Novel Switches, Tunable Eyewear, Novel LC

Chair: **Iam-Choon Khoo**, The Pennsylvania State Univ.

3:30 pm: **Improvements on the refresh rate and dynamical properties of an SLM by sequential readout using an acousto-optic modulator,** L. Pruvost, M. Mestre, B. Viaris de Lesegno, Univ. Paris-Sud II (France) . . . . . [6332-13]

3:50 pm: **Switchable electro-optics eyewear *(Invited Paper)*,** N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona[6332-14]

4:20 pm: **Tunable photonic devices based on the temperature-dependent photonic band gap in chiral nematic liquid crystals *(Invited Paper)*,** Y. Huang, Y. Zhou, S. Wu, College of Optics and Photonics/Univ. of Central Florida . . . . . [6332-15]

4:50 pm: **Novel ferroelectric liquid crystals consisting glassy liquid crystal as chiral dopants,** H. P. Chen, C. Lin, Y. Tsai, H. D. Shieh, National Chiao Tung Univ. (Taiwan) . . . . . [6332-16]

5:10 pm: **Topological alignment of NLCs using nanoelectrodes,** R. Ghannam, N. Collings, W. A. Crossland, Univ. of Cambridge (United Kingdom) . . . . . [6332-17]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 5B . . . . . Mon. 8:00 to 10:10 am

Chiral LC, Display, Spatial Light Modulator

Chair: **Shaw H. Chen**, Univ. of Rochester

8:00 am: **Optical properties of polymer-stabilized cholesteric liquid crystals *(Invited Paper)*,** E. R. Beckel, Air Force Research Lab.; S. A. Holmstrom, Univ. of Tulsa; L. V. Natarajan, V. P. Tondiglia, Science Applications International Corp.; T. J. Bunning, Air Force Research Lab. . . . . [6332-18]

8:30 am: **Structure and dynamics of isotropic liquid crystalline order with spherical symmetry *(Invited Paper)*,** J. Yamamoto, Kyoto Univ. (Japan); I. Nishiyama, Dainippon Ink and Chemicals, Inc. (Japan) [6332-19]

9:00 am: **Recent studies in LC devices and technology *(Invited Paper)*,** U. Efron, Ben-Gurion Univ. of the Negev (Israel) and Holon Institute of Technology (Israel); B. Apter, I. David, I. Zedaka, Holon Institute of Technology (Israel); R. Israeli, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6332-20]

9:30 am: **Control of the bistable molecular reorientation angle and storage of localized structures in nematic liquid crystals,** U. Bortolozzo, S. Residori, Institut Non Linéaire de Nice Sophia Antipolis (France) . . . . . [6332-21]

9:50 am: **A polarization-independent liquid crystal spatial light modulator,** M. J. Escuti, W. M. Jones, North Carolina State Univ. [6332-22]

Coffee Break . . . . . 10:10 to 10:40 am

SESSION 6

Conv. Ctr. Room 5B . . . . . Mon. 10:40 am to 12:30 pm

Lasing Action, Optofluidics, Organic Optical Materials

Chair: **Timothy J. Bunning**, Air Force Research Lab.

10:40 am: **Toward tuneable high-efficiency liquid crystal lasers with emission in 1 and 3-dimension *(Invited Paper)*,** H. J. Coles, Univ. of Cambridge (United Kingdom) . . . . . [6332-23]

11:10 am: **Organic photonic materials research at AFOSR *(Invited Paper)*,** C. Y. C. Lee, Air Force Office of Scientific Research . . . [6332-24]

11:40 am: **Optofluidics *(Invited Paper)*,** D. Psaltis, California Institute of Technology . . . . . [6332-25]

12:10 pm: **Visible laser light initiated thiol-ene based reflection H-PDLCs,** J. M. Wofford, Air Force Research Lab.; L. V. Natarajan, V. P. Tondiglia, R. L. Sutherland, Science Applications International Corp.; T. J. Bunning, Air Force Research Lab. . . . . [6332-26]

Lunch Break . . . . . 12:30 to 1:30 pm

SESSION 7

Conv. Ctr. Room 5B . . . . . Mon. 1:30 to 3:20 pm

Photonic Crystals, Bragg Grating, Nonlinear Optics

Chair: **Neil Collings**, Univ. of Cambridge (United Kingdom)

1:30 pm: **Tunable 3D photonic crystals by liquid crystal infiltration *(Invited Paper)*,** C. J. Summers, E. Graugnard, D. P. Gaillot, Georgia Institute of Technology; Y. Z. Williams, I. Khoo, The Pennsylvania State Univ. . . . . [6332-27]

2:00 pm: **A simple formulation for rewritable Bragg holograms with angle and polarization multiplicity *(Invited Paper)*,** T. Ikeda, Tokyo Institute of Technology (Japan) . . . . . [6332-28]

2:30 pm: **Pattern formation and optical structures in photorefractive liquid crystal light valves *(Invited Paper)*,** S. Residori, U. Bortolozzo, Institut Non Linéaire de Nice Sophia Antipolis (France); J. Huignard, Thales Research & Technology (France) . . . . . [6332-29]

3:00 pm: **Simultaneous exhibition of positive and negative nonlinear refractive index in dye-doped liquid crystal by the Z-scan technique,** M. D. Iturbe-Castillo, S. E. Balderas-Mata, R. Ramos-García II, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); A. A. Rodríguez-Rosales, Univ. Nacional Autónoma de México (Mexico) . . . . . [6332-30]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 8

Conv. Ctr. Room 5B . . . . . Mon. 3:50 to 5:40 pm

Nonlinear and Tunable Optics, Spectroscopy

Chair: **Iam-Choon Khoo**, The Pennsylvania State Univ.

3:50 pm: **Laser trapping of low refractive index colloids in a nematic liquid crystal *(Invited Paper)*,** I. Musevic, M. Skarabot, M. Ravnik, S. Zumer, Univ. v Ljubljani (Slovenia) . . . . . [6332-31]

4:20 pm: **Liquid crystal cladded metallo-dielectric and all-dielectric frequency selective surfaces for broadband tunable optical filters and planar negative index optics,** I. Khoo, A. Diaz, J. Bossard, D. Werner, The Pennsylvania State Univ. . . . . [6332-32]

4:40 pm: **Surface vibrational spectroscopic studies of rubbed and photo-irradiated polyvinyl cinnamate for liquid crystal alignment *(Invited Paper)*,** Y. Shen, C. Chen, Univ. of California/Berkeley; P. Pagliusi, Univ. della Calabria (Italy) . . . . . [6332-33]

5:10 pm: **Microwatt power optically controlled spatial solitons in azobenzene liquid crystals *(Invited Paper)*,** U. Hrozhyk, S. Serak, N. V. Tabirian, BEAM Engineering for Advanced Measurements Co. . [6332-34]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Liquid crystalline polyacetylenes carrying sterol pendants,** L. M. Lai, J. W. Y. Lam, The Hong Kong Univ. of Science and Technology (Hong Kong China); B. Z. Tang, The Hong Kong Univ. of Science and Technology (Hong Kong China) and Zhejiang Univ. (China) . . [6332-35]

✔ **Nonlinear phase contrast microscope,** L. I. Olivos-Pérez, M. D. Iturbe-Castillo, J. D. Sánchez-de-la-Llave, R. Ramos-García II, C. G. Treviño-Palacios, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6332-36]

✔ **Enhanced photorefractivity of CdSe nanorods doped nematic liquid crystals,** I. Khoo, J. D. Liou, K. X. Chen, The Pennsylvania State Univ. [6332-37]

✔ **The FDTD analysis of 100% efficient polarization-independent liquid crystal polarization grating,** C. Oh, M. J. Escuti, North Carolina State Univ. . . . . [6332-38]

✔ **Dislocation climb in cholesteric liquid crystal controlled by electric field,** B. I. Senyuk, I. I. Smalyukh, O. D. Lavrentovich, Kent State Univ. . . . . [6332-39]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Sunday-Wednesday 13-16 August 2006 • Proceedings of SPIE Vol. 6333

Organic Light Emitting Materials and Devices X

Conference Chair: **Zakya H. Kafafi**, Naval Research Lab.

Cochair: **Franky So**, Univ. of Florida

Program Committee: **Alasdair J. Campbell**, Imperial College London (United Kingdom); **Brian W. D'Andrade**, Universal Display Corp.; **Anil R. Duggal**, GE Global Research; **Tukaram K. Hatwar**, Eastman Kodak Co.; **Andrew B. Holmes**, The Univ. of Melbourne (Australia); **Ghassan E. Jabbour**, Arizona State Univ.; **Junji Kido**, Yamagata Univ. (Japan); **Ifor D. W. Samuel**, Univ. of St. Andrews (United Kingdom); **Joseph Shinar**, Iowa State Univ.; **Robert J. Visser**, Vitex Systems, Inc.

Sunday 13 August

SESSION 1

Conv. Ctr. Room 6C . . . . . Sun. 1:00 to 3:00 pm

New Materials and Structures for Enhanced OLEDs Lifetime

Chair: **Zakya H. Kafafi**, Naval Research Lab.

1:00 pm: **New materials and devices for enhanced PLED performance,** R. J. Wilson, M. Roberts, M. C. Dowling, I. Grizzi, Cambridge Display Technology (United Kingdom) . . . . . [6333-01]

1:25 pm: **A high work-function conducting polymer for improved performance of OLEDs,** I. Parker, DuPont Displays . . . . . [6333-02]

1:50 pm: **High-efficiency and long-lifetime fluorescent blue organic-emitting device,** Y. Ho, T. Lin, C. Wu, J. Lee, National Taiwan Univ. (Taiwan) . . . . . [6333-03]

2:10 pm: **Enhanced lifetime of polymer light-emitting diodes using poly(thieno[3,4-b]thiophene)-based conductive polymers,** X. Jiang, H. Yan, E. Klingenberg, D. Elder, Air Products and Chemicals, Inc. [6333-04]

2:35 pm: **Using a thin Mg anode buffer layer for increasing the stability of organic light-emitting devices,** H. M. Aziz, Xerox Research Ctr. of Canada (Canada); Y. Luo, G. Xu, McMaster Univ. (Canada); Z. D. Popovic, Xerox Research Ctr. of Canada (Canada) . . . . . [6333-05]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 2

Conv. Ctr. Room 6C . . . . . Sun. 3:30 to 5:30 pm

Science and Technology of OLED Displays

Chair: **Franky So**, Univ. of Florida

3:30 pm: **Polymer OLED microdisplays: technology and applications,** I. Underwood, MicroEmissive Displays Ltd. (United Kingdom) . . . [6333-06]

3:55 pm: **Systematic studies of polymer LEDs based on a combinatorial approach,** M. Kiy, T. A. Beierlein, R. Kern, C. Winnewisser, Ctr. Suisse d'Electronique et de Microtechnique SA (Switzerland); B. Ruhstaller, Zuercher Hochschule Winterthur (Switzerland); T. Schäfer, B. Schmidhalter, Ciba Specialty Chemicals Inc. (Switzerland) . . . . [6333-07]

4:15 pm: **A study on oligomeric fluorene derivatives,** A. B. Holmes, K. L. Chan, S. Y. Cho, S. E. Watkins, The Univ. of Melbourne (Australia)[6333-72]

4:40 pm: **Novel pixel circuit and driving method of AMOLED for mobile application,** T. Yamamoto, Sony Corp. (Japan) . . . . . [6333-08]

5:05 pm: **Combinatorial fabrication and screening of OLED arrays,** J. Shinar, Iowa State Univ. . . . . [6333-10]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 3

Conv. Ctr. Room 6C . . . . . Mon. 8:25 to 10:00 am

Organic Electrophosphorescence

Chair: **Alasdair J. Campbell**, Imperial College London (United Kingdom)

8:25 am: **Basic emission properties of triplet emitters applied in OLEDs,** H. Yersin, Univ. Regensburg (Germany) . . . . . [6333-11]

8:50 am: **Polymer-based phosphorescent light-emitting diodes: efficiency and lifetime issues,** J. Kim, W. Jeong, C. An, J. W. Kang, Seoul National Univ. (South Korea) . . . . . [6333-12]

9:05 am: **High triplet energy hosts and transport materials for OLEDs,** A. M. Hassan, M. E. Thompson, Univ. of Southern California . . [6333-13]

9:20 am: **Delayed luminescence in conjugated polymers,** D. Hertel, Univ. zu Köln (Germany) . . . . . [6333-14]

9:35 am: **Design strategies for achieving high triplet energy electron transporting host materials for blue electrophosphorescence,** L. S. Sapochak, P. E. Burrows, A. B. padmaperuma, P. Vecchi, H. Qiao, Pacific Northwest National Lab. . . . . [6333-15]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 4

Conv. Ctr. Room 6C . . . . . Mon. 10:30 am to 12:00 pm

New Materials for OLEDs

Chair: **Andrew B. Holmes**, The Univ. of Melbourne (Australia)

10:30 am: **Hole-transporting and emitting pendant polymers for organic electroluminescent devices,** Y. Shirota, Fukui Univ. of Technology (Japan); D. Mutaguchi, K. Hashimoto, D. Nagamatsu, K. Okumoto, Y. Ohsedo, H. Kageyama, Osaka Univ. (Japan) . . . . . [6333-16]

10:55 am: **Light-emitting dendrimers,** I. D. W. Samuel, Univ. of St. Andrews (United Kingdom); P. L. Burn, Univ. of Oxford (United Kingdom) [6333-17]

11:20 am: **Synthesis and electro-optical properties of copolymers derived from phenol functional telechelic oligofluorenes,** J. A. Cella, A. R. Duggal, C. M. Heller, J. Liu, J. Shiang, D. Simon, M. Sze, GE Global Research . . . . . [6333-18]

11:35 am: **Organic light-emitting diode with a DNA biopolymer electron-blocking layer,** J. G. Grote, Air Force Research Lab. . [6333-19]

Lunch Break . . . . . 12:00 to 1:00 pm

Solid State Lighting Plenary Session

Conv. Ctr. Room 6B . . . . . Mon. 1:00 to 1:50 pm

Chair: **Ian T. Ferguson**, Georgia Institute of Technology

1:00 pm: **More Light for a Brighter Future: GaN**, **Volker K. Härle**, OSRAM Opto Semiconductors GmbH (Germany)

See p. 8 for details.

SESSION 5

Conv. Ctr. Room 6B . . . . . Mon. 1:50 to 3:30 pm

LEDs/OLEDs for Solid State Lighting: Joint Session with Conference 6337

Chair: **Anil R. Duggal**, GE Global Research

1:50 pm: **Low-cost OLEDs for general illumination,** J. Liu, L. N. Lewis, A. R. Duggal, GE Global Research . . . . . [6333-20]

2:15 pm: **Highly efficient white color PLEDs for solid state lighting and displays,** Y. Yang, J. Huang, Univ. of California/Los Angeles . . [6333-21]

2:40 pm: **Organic light-emitting diode (OLED) and its application to lighting devices,** N. Ide, T. Komoda, Matsushita Electric Works, Ltd. (Japan); J. Kido, Yamagata Univ. (Japan) . . . . . [6333-22]

3:05 pm: **Phosphorescent organic light-emitting devices for white lighting applications,** B. W. D'Andrade, M. S. Weaver, J. J. Brown, Universal Display Corp. . . . . [6333-23]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 6

Conv. Ctr. Room 6B . . . . . Mon. 4:00 to 6:00 pm

White Electroluminescence: Joint Session with Conference 6337

Chair: **Linda S. Sapochak**, Pacific Northwest National Lab.

4:00 pm: **Molecular design strategies for white electroluminescence,** S. Y. Park, Seoul National Univ. (South Korea) . . . . . [6333-24]

4:25 pm: **White light and color tuning of OLED with phosphorous and fluorescent materials by solution process,** Y. Ohmori, Y. Hino, H. Kajii, Osaka Univ. (Japan) . . . . . [6333-25]

4:50 pm: **White organic light-emitting diodes with high efficiency,** K. Walzer, G. Schwartz, K. Fehse, K. Leo, Technische Univ. Dresden (Germany) . . . . . [6333-26]

5:15 pm: **Solution processed full-color polymer OLED displays and white solid state lighting devices fabricated by direct lithography,** M. Gather, A. Köhnen, K. Meerholz, Univ. zu Köln (Germany); A. Falcou, H. Becker, Merck OLED Materials GmbH (Germany) . . . . . [6333-27]

5:30 pm: **Accurate colorimetric feedback for RGB LED clusters,** K. Man, I. E. Ashdown, TIR Systems Ltd. (Canada) . . . . . [6337-01]

5:45 pm: **Electroluminescent devices from ionic transition metal complexes for lighting applications,** J. Slinker, J. Rivnay, J. A. DeFranco, D. A. Bernards, S. Flores-Torres, Cornell Univ.; M. Lowry, Princeton Univ.; L. Soltzberg, Simmons College; J. Kim, Univ. of Cambridge (United Kingdom); S. Bernhard, Princeton Univ.; R. H. Friend, Univ. of Cambridge (United Kingdom); H. D. Abruna, G. G. Malliaras, Cornell Univ. . [6333-28]

Illumination Technical Group

Marriott Solana . . . . . Mon. 8:00 to 10:00 pm

Chair: **R. John Koshel,** Lambda Research Corp.

Following the speakers and other agenda items the floor will be open for our traditional "Problems and Solutions Workshop" session so bring some challenges for the group.

The primary topic for this meeting is "Challenges and Examples of Fabricated Illumination Optics." Speakers from industry will talk about the issues associated with the design, optimization, and tolerancing of illumination systems and components that are ultimately manufactured. While the illumination industry is growing rapidly, especially with the incorporation of novel scientific techniques and new sources, the fabrication of the systems and components has to contend with demands of minimal cost, fabrication error (e.g., sinks or warping in injection-molded parts), and source variation. Some samples of manufactured illumination systems (production, prototype, or limited run) will be shown. For example,

Bill Cassarly (Optical Research Associates) will discuss and show "Rippled Mixers for Uniformity." Uniformity remains a central topic in illumination system design and mixing rods provide an effective means to providing uniformity. Typically, flux enters one end of a mixing rod and the flux exiting the other end provides improved spatial and/or angular uniformity. We investigate the use of mixing rods with rippled surface structures to provide enhanced uniformity.

The presenters will highlight the issues that they encountered during the design and fabrication processes. Bill and other speakers will show their optics in an informal environment that encourages questions. Systems range from lightpipes to luminaires to displays. If you would like to participate, please contact John Koshel via email (jkoshel@lambdares.com) or at the meeting. It is advised to contact him sooner rather than later due to the limited time slots available. At the end of the planned topic for the meeting, the floor will be opened to the audience to present other illumination results, trends, or questions. By attending this Illumination Technical Group meeting, you will hear and see state-of-the-art technology and concerns from the illumination community! Light refreshments will be served. We look forward to seeing you there.

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A ..... Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break ..... 12:00 to 1:30 pm

SESSION 7

Conv. Ctr. Room 6C ..... Tues. 1:30 to 3:00 pm

Light-Emitting OFETs: Joint Session with Conference 6336

Chair: **Yasuhiko Shirota**, Fukui Univ. of Technology (Japan)

1:30 pm: **Ambipolar organic light-emitting transistors with balanced charge and high carrier mobility,** M. Muccini, Istituto per lo Studio dei Materiali Nanostrutturati (Italy) ..... [6333-29]

1:55 pm: **Estimation of carrier recombination and electroluminescence emission regions in organic light-emitting field-effect transistors,** C. Adachi, T. Oyamada, H. Uchiuzo, Kyushu Univ. (Japan); S. Akiyama, Mitsubishi Chemical Corp. (Japan) ..... [6336-43]

2:15 pm: **Efficient ambipolar light-emitting polymer transistors in top and bottom gate geometry,** J. Zaumseil, C. L. Donley, J. Kim, R. H. Friend, H. Sirringhaus, Univ. of Cambridge (United Kingdom) ..... [6336-44]

2:40 pm: **A novel organic light-emitting device for use in electrically pumped lasers,** S. Schols, IMEC (Belgium) and Katholieke Univ. Leuven (Belgium); S. Verlaak, P. L. Heremans III, IMEC (Belgium) ..... [6333-30]

Coffee Break ..... 3:00 to 3:30 pm

SESSION 8

Conv. Ctr. Room 6C ..... Tues. 3:30 to 5:25 pm

Optical Excitations, Lasers, and Sensors

Chair: **Ifor D. W. Samuel**, Univ. of St. Andrews (United Kingdom)

3:30 pm: **Amplified spontaneous emission characteristics and low-threshold mechanism in organic solid state thin film based on styrylbenzene derivatives,** C. Adachi, H. Nakanotani, T. Matsushima, Kyushu Univ. (Japan) ..... [6333-31]

3:55 pm: **Influence of electronic properties on the threshold behavior of organic laser diode structures,** C. Pflumm, Imperial College London (United Kingdom); C. Karnutsch, Univ. Karlsruhe (Germany); J. C. deMello, D. D. C. Bradley, Imperial College London (United Kingdom) .. [6333-32]

4:15 pm: **Low-threshold blue vertically emitting polyfluorene DFB lasers employing first-order feedback,** C. Karnutsch, V. Haug, C. Gaertner, U. Lemmer, Univ. Karlsruhe (Germany); G. Heliotis, C. Pflumm, J. C. deMello, D. D. C. Bradley, Imperial College London (United Kingdom); J. Wang, T. Weimann, Physikalisch Technische Bundesanstalt (Germany) ..... [6333-33]

4:35 pm: **Optically excited chemosensitive organic thin film devices,** V. Bulovic, Massachusetts Institute of Technology ..... [6333-34]

5:00 pm: **Progress in nonvolatile memory effects and efficient infra-red emission in organic light-emitting devices,** G. E. Jabbour, Arizona State Univ. ..... [6333-35]

✔ Poster/Demo Session-Tuesday

Chair: **Franky So**, Univ. of Florida

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Self-assembly behavior and photophysical properties of polyfluorene-based rod-coil block copolymers,** G. Shan, S. Bao, Fudan Univ. (China) ..... [6333-42]

✔ **Degradation of small-molecule organic light-emitting devices,** J. Slinker, S. Flores-Torres, Cornell Univ.; L. Soltzberg, Simmons College; J. Kim, R. H. Friend, Univ. of Cambridge (United Kingdom); H. D. Abruna, G. G. Malliaras, Cornell Univ. ..... [6333-43]

✔ **A three-spectrum white OLED using green and new red phosphorescent sensitizers,** T. Shieh, Y. Huang, S. Yeh, M. Chu, M. Tseng, Industrial Technology Research Institute (Taiwan) ... [6333-44]

✔ **The emission phenomenon of organic light-emitting diodes with Rubrene-doped in carrier transport layer,** C. Tseng, U. Uerng-Yih, National Sun Yat-Sen Univ. (Taiwan) ..... [6333-45]

✔ **Aging-induced recombination zone shift in mixed-host organic light-emitting devices,** C. Hsiao, C. Tseng, J. Lee, National Taiwan Univ. (Taiwan) ..... [6333-46]

✔ **Enhancement of the OLED driving stability by introducing an LiF-mixed α-NPD hole-transport layer,** H. Baek, H. Lee, C. H. Lee, Seoul National Univ. (South Korea) ..... [6333-47]

✔ **RGB optimization in a top-emission organic light-emitting device,** Y. Chang, H. Chen, J. Lee, Y. Kiang, C. Yang, National Taiwan Univ. (Taiwan) ..... [6333-48]

✔ **Aggregation-induced emission,** H. Tong, Y. Dong, M. Häußler, Z. Li, B. Mi, J. W. Y. Lam, H. S. Kwok, The Hong Kong Univ. of Science and Technology (Hong Kong China); B. Z. Tang, The Hong Kong Univ. of Science and Technology (Hong Kong China) and Zhejiang Univ. (China) ..... [6333-49]

✔ **Characterization of materials and multilayer structures of OLED by spectroscopic ellipsometry,** C. Defranoux, P. Heinrich, L. Kitzinger, SOPRA SA (France) ..... [6333-50]

✔ **Organic semiconductor lasers by soft nanopatterning and deposition,** L. Persano, E. Mele, A. Camposeo, P. Del Carro, R. Stabile, R. Cingolani, D. Pisignano, Univ. degli Studi di Lecce (Italy) . [6333-51]

✔ **Optically pumped organic semiconductor laser with low-temperature cleaved mirrors,** M. Shibamoto, K. Matsumoto, H. Takasugi, M. Katou, S. N. Takahashi, Keio Univ. (Japan) .... [6333-52]

✔ **Blue emitting OLED with star-shaped multifunctional oligomer,** M. L. Gong, Sun Yat-Sen Univ. (China); N. J. Xiang, Sun Yat-sen Univ. (China); K. L. Tong, T. H. Lee, S. K. So, L. M. L. Leung, Hong Kong Baptist Univ. (Hong Kong China) ..... [6333-53]

✔ **Top-emitting polymer light-emitting diodes using aluminum doped zinc oxide as a transparent electrode,** K. Lee, S. H. Park, S. H. Kim, J. M. Shin, S. Jeong, Pusan National Univ. (South Korea) ..... [6333-55]

✔ **Numerical study of annihilation processes in electrically pumped organic semiconductor laser diodes,** C. Gaertner, Univ. Karlsruhe (Germany); C. Pflumm, Imperial College London (United Kingdom); C. Karnutsch, V. Haug, U. Lemmer, Univ. Karlsruhe (Germany) . [6333-56]

✔ **Amplified spontaneous emission of cross-linkable conjugated polymers in multilayer devices,** B. Wallikewitz, M. de la Rosa, Univ. zu Köln (Germany); A. Falcou, H. Becker, Merck OLED Materials GmbH (Germany); D. Hertel, K. Meeholz, Univ. zu Köln (Germany) . . [6333-57]

✔ **Full-color RGB OLEDs on CMOS substrates for active-matrix OLED microdisplays,** D. Kreye, M. Toerker, U. Vogel, J. Amelung, Fraunhofer-Institut für Photonische Mikrosysteme (Germany) . . . . . [6333-58]

✔ **Altering the interfacial morphology of polymer light-emitting diodes using polymer interlayers: effect on hole injection and device performance,** M. J. Harding, Imperial College London (United Kingdom) and OSRAM Opto Semiconductors Inc.; D. Poplavskyy, OSRAM Opto Semiconductors Inc.; A. J. Campbell, Imperial College London (United Kingdom); V. Choong, F. So, OSRAM Opto Semiconductors Inc. . . . . [6333-59]

✔ **Solution-processed titanium oxide electron injection/transport functional layer in polymer light-emitting diodes,** S. H. Kim, J. Y. Kim, S. H. Park, K. Lee, Pusan National Univ. (South Korea) . . . . . [6333-60]

✔ **Injection of current density over MA/cm² in organic thin film and investigation of carrier transport processes from nA/cm² to MA/cm²,** T. Matsushima, C. Adachi, Kyushu Univ. (Japan) . . . . . [6333-62]

✔ **Nearly ohmic injection contacts from PEDOT:PSS to phenylamine compounds with high ionization potentials,** S. C. Tse, S. W. Tsang, S. K. So, Hong Kong Baptist Univ. (Hong Kong China) . . . . . [6333-63]

✔ **Using N-type organic material with photoconductivity for low-reflectance OLEDs,** K. Chuang, Y. Ho, J. Lee, C. Chao, M. Leung, C. Li, H. Chen, National Taiwan Univ. (Taiwan) . . . . . [6333-64]

✔ **Charge mobility of mixed organic semiconductors: a NPB-AlQ_3 study,** S. Liu, Academia Sinica (Taiwan) and National Taiwan Univ. (Taiwan); J. Wang, National Taiwan Univ. (Taiwan) and Academia Sinica (Taiwan) . . . . . [6333-65]

✔ **Organic-fullerene composite anode structures for organic light-emitting diodes,** Y. Yuan, S. Han, Z. Lu, Univ. of Toronto (Canada) . . . . . [6333-66]

✔ **Enhanced OLED efficiency by increasing the light outcoupling,** A. Köhnen, M. de la Rosa, N. Rehmann, P. Zacharias, K. Meerholz, Univ. zu Köln (Germany) . . . . . [6333-67]

✔ **Enhancement of electron injection in flexible organic light emitting diodes using Al-Mg alloy cathode,** J. Lee, K. Hong, Pohang Univ. of Science and Technology (South Korea) . . . . . [6333-68]

✔ **Electric field-induced dissociation of excited states in fluorescent dye-doped tris(8-hydroxyquinoline) aluminum layers,** Y. Luo, McMaster Univ. (Canada); H. M. Aziz, Xerox Research Ctr. of Canada (Canada); G. Xu, McMaster Univ. (Canada); Z. D. Popovic, Xerox Research Ctr. of Canada (Canada) . . . . . [6333-69]

✔ **Structurally integrated organic light emitting device-based chemical and biological sensors,** Z. Zhou, R. Shinar, C. Qian, Y. Cai, Iowa State Univ.; B. J. Choudhury, Intel Corp.; J. Shinar, Iowa State Univ. . . . . [6333-70]

Wednesday 16 August

SESSION 9

Conv. Ctr. Room 6C . . . . . Wed. 10:30 am to 12:00 pm

Interfaces in OLEDs and OPVs: Joint Session with Conference 6334

Chair: **Christoph J. Brabec**, Konarka Technologies GmbH (Germany)

10:30 am: **Interface energetics of derivatives of polyflourene,** A. L. Kahn, J. Hwang, Princeton Univ.; E. Kim, J. Bredas, Georgia Institute of Technology . . . . . [6333-36]

10:55 am: **The importance of the interface in organic-inorganic solar cells,** M. D. McGehee, Stanford Univ. . . . . [6334-05]

11:20 am: **Electrical doping in OLEDs applying molecular dopants: high-power efficiency and long lifetimes for display applications,** T. W. Canzler, P. Wellmann, M. Hofmann, A. G. Werner, J. Birnstock, A. Lux, J. Blochwitz-Nimoth, NOVALED GmbH (Germany) . . . . . [6333-37]

11:45 am: **Multilayer polymer light-emitting diodes: white light emission with high efficiency,** X. Gong, S. Wang, D. A. Moses, G. C. Bazan, A. J. Heeger, Univ. of California/Santa Barbara . . . . . [6333-71]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 10

Conv. Ctr. Room 6C . . . . . Wed. 1:30 to 3:00 pm

Carrier Transport in OLEDs and OPVs: Joint Session with Conference 6334

Chair: **Antoine L. Kahn**, Princeton Univ.

1:30 pm: **Direct determination of carrier mobilities of OLED materials by admittance spectroscopy,** S. K. So, S. W. Tsang, S. C. Tse, K. L. Tong, Hong Kong Baptist Univ. (Hong Kong China) . . . . . [6333-39]

1:55 pm: **Tuning hole transport in highly dispersed blends of chemically similar polyfluorene copolymers: design rules for single-component systems for polymer light-emitting diodes,** A. J. Campbell, J. Harding, R. C. Maher, L. F. Cohen, Imperial College London (United Kingdom) . . . . . [6333-40]

2:15 pm: **Role of carrier mobility, exciton diffusion, and their interplay for charge balance and improved properties of organic electrophosphorescent device,** B. D. Chin, S. Lee, J. K. Kim, Korea Institute of Science and Technology (South Korea); C. H. Lee, Seoul National Univ. (South Korea) . . . . . [6333-41]

2:35 pm: **Comparison of the field and Fermi level dependence of transport and recombination in polymer/C60 cells and solid state dye-sensitized cells,** B. C. O'Regan, C. Shuttle, S. Koops, S. Handa, J. R. Durrant, Imperial College London (United Kingdom) . . . . . [6334-06]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Tuesday-Thursday 15-17 August 2006 • Proceedings of SPIE Vol. 6334

Organic Photovoltaics VII

Conference Chair: **Zakya H. Kafafi**, Naval Research Lab.

Cochair: **Christoph J. Brabec**, Konarka Technologies GmbH (Germany)

Program Committee: **Homer Antoniadis**, InnovaLight, Inc.; **Rene A. J. Janssen**, Technische Univ. Eindhoven (Netherlands); **Paul A. Lane**, Naval Research Lab.; **Niyazi S. Sariciftci**, Johannes Kepler Univ. Linz (Austria); **Yasuhiko Shirota**, Fukui Univ. of Technology (Japan); **Tetsuo Tsutsui**, Kyushu Univ. (Japan)

Monday 14 August

Plenary Session on Solar Energy

Conv. Ctr. Room 6A . . . . . Mon. 1:30 to 5:30 pm

Chair: **Ravi Durvasula**, GE Global Research

1:30 pm: **Nanotechnology for Photovoltaics**, Loucas Tsakalakos, GE Global Research . . . . . [6339-101]

2:00 pm: **The Promise of Concentrator Photovoltaics Using High-Efficiency Multijunction Solar Cells**, Raed A. Sherif, Spectrolab, Inc. . . . . [6339-102]

2:30 pm: **High and Medium Concentration Photovoltaics Using III-V Multi-Junctions**, Daniel Aiken, EMCORE Corp. . . . . [6339-103]

3:00 pm: **The Path from Niche to Mainstream Supplier of Clean Energy**, Richard Swanson, Sunpower Corp. . . . . [6339-104]

Coffee Break . . . . . 3:30 to 4:00 pm

4:00 pm: **The Sustainable Hydrogen Economy**, John A. Turner, National Renewable Energy Lab. . . . . [6340-105]

4:45 pm: **Chemical Conversion of Solar Energy and Photocatalysis**, Akira Fujishima, Kanagawa Academy of Science and Technology (Japan) . . . . . [6340-106]

See p. 8 for details.

Illumination Technical Group

Marriott Solana . . . . . Mon. 8:00 to 10:00 pm

Chair: **R. John Koshel,** Lambda Research Corp.

Following the speakers and other agenda items the floor will be open for our traditional "Problems and Solutions Workshop" session so bring some challenges for the group.

The primary topic for this meeting is "Challenges and Examples of Fabricated Illumination Optics." Speakers from industry will talk about the issues associated with the design, optimization, and tolerancing of illumination systems and components that are ultimately manufactured. While the illumination industry is growing rapidly, especially with the incorporation of novel scientific techniques and new sources, the fabrication of the systems and components has to contend with demands of minimal cost, fabrication error (e.g., sinks or warping in injection-molded parts), and source variation. Some samples of manufactured illumination systems (production, prototype, or limited run) will be shown. For example,

Bill Cassarly (Optical Research Associates) will discuss and show "Rippled Mixers for Uniformity." Uniformity remains a central topic in illumination system design and mixing rods provide an effective means to providing uniformity. Typically, flux enters one end of a mixing rod and the flux exiting the other end provides improved spatial and/or angular uniformity. We investigate the use of mixing rods with rippled surface structures to provide enhanced uniformity.

The presenters will highlight the issues that they encountered during the design and fabrication processes. Bill and other speakers will show their optics in an informal environment that encourages questions. Systems range from lightpipes to luminaires to displays. If you would like to participate, please contact John Koshel via email (jkoshel@lambdares.com) or at the meeting. It is advised to contact him sooner rather than later due to the limited time slots available. At the end of the planned topic for the meeting, the floor will be opened to the audience to present other illumination results, trends, or questions. By attending this Illumination Technical Group meeting, you will hear and see state-of-the-art technology and concerns from the illumination community! Light refreshments will be served. We look forward to seeing you there.

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

✔ Poster/Demo Session-Tuesday

Chair: **Christoph J. Brabec**, Konarka Technologies GmbH (Germany)

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Exciton dissociation and migration in enhanced-order conjugated polymer/nanoparticle hybrid materials,** Y. Y. Lin, I. S. Liu, C. Chen, W. Su, National Taiwan Univ. (Taiwan) . . . . . [6334-26]

✔ **Charge separation and transport properties of organic solar cells based on MEHPPV/TiO_2 nanorods hybrid materials,** Y. T. Lin, T. W. Tzeng, C. Chen, W. Su, National Taiwan Univ. (Taiwan) . . . . . [6334-27]

✔ **Correlation between the temperature dependences of short-circuit current and carrier mobility in P3HT:PCBM blend solar cells,** S. Noh, J. Kim, C. H. Lee, Seoul National Univ. (South Korea); M. Lee, B. Jung, Samsung SDI Co., Ltd. (South Korea); S. Lee, D. Hwang, Korea Institute of Science and Technology (South Korea); H. Kim, Sogang Univ. (South Korea) . . . . . [6334-28]

✔ **Low band gap polymers for organic solar cells,** E. Bundgaard, F. C. Krebs, Risø National Lab. (Denmark) . . . . . [6334-29]

✔ **Metal dopant enhanced electric and photovoltaic properties,** M. Wu, C. Lin, National Taiwan Univ. (Taiwan); K. Chen, Academia Sinica (Taiwan); L. Chen, National Taiwan Univ. (Taiwan) . . . . . [6334-30]

✔ **Characterization of cubic mesoporous TiO_2 thin films by spectroscopic ellipsometric porosimetry technique,** P. Heinrich, J. P. Piel, C. Defranoux, A. Darragon, Y. Turcant, L. Kitzinger, SOPRA SA (France); D. Grosso, Brunel Univ. (France); C. Boissière, Univ. Pierre et Marie Curie (France) . . . . . [6334-31]

✔ **Cryscade™ solar cell: material and device,** P. I. Lazarev, Kontrakt Technology Ltd. (Russia); A. Kozhanov, M.V. Lomonosov Moscow State Univ. (Russia); A. Solodov, Kontrakt Technology Ltd. (Russia) [6334-32]

✔ **Three-dimensional chemical and physical analysis of the degradation mechanisms in organic photovoltaics,** K. Norrman, J. Alstrup, M. Jørgensen, Risø National Lab. (Denmark); M. Lira-Cantu, Institut de Ciència de Materials de Barcelona (Spain); N. B. Larsen, F. C. Krebs, Risø National Lab. (Denmark) . . . . . [6334-34]

✔ **Nanocomposites for organic and hybrid organic-inorganic solar cells,** A. Reale, A. Di Carlo, F. Brunetti, M. Lucci, M. L. Terranova, S. Orlanducci, E. Tamburri, F. Toschi, V. Sessa, Univ. degli Studi di Roma/ Tor Vergata (Italy) . . . . . [6334-35]

✔ **Improved photovoltaic properties and morphological studies of a donor-bridge-acceptor block copolymer system,** S. Sun, C. Zhang, S. Choi, K. I. Seo, A. J. Ledbetter, C. E. Bonner, Jr., Norfolk State Univ. . . . . [6334-36]

✔ **Higher fullerenes and endohedral metallofullerenes for photovoltaic applications,** M. Drees, D. MacFarland, Z. Zhou, S. Wilson, Luna Innovations, Inc. . . . . [6334-37]

✔ **Characterization of the charge generation and transport properties of bulk heterojunction structure by non-steady-state photo-EMF technique,** S. S. Mansurova, M. Espinoza Tlaxcaltecatl, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); M. Gather, K. Meerholz, Univ. zu Köln (Germany) . . . . . [6334-38]

✔ **Oxygen doping of iron phthalocyanine films,** T. G. Abdel-Malik, Minia Univ. (Egypt); H. A. Motaway, Alexandria Univ. (Egypt) . . . . . [6334-39]

✔ **Highly efficient polymer solar cells using solution-based titanium oxide as an optical spacer,** J. Y. Kim, S. H. Kim, H. Lee, K. Lee, Pusan National Univ. (South Korea); A. J. Heeger, Univ. of California/Santa Barbara . . . . . [6334-40]

✔ **Phenomenological modeling of the external quantum efficiency of conjugated polymer/fullerene bulk heterojunction,** D. B. Romero, W. N. Herman, Univ. of Maryland/College Park . . . . . [6334-42]

✔ **Low-bandgap regioregular fluorene copolymer/C70 derivative bulk heteojunction solar cells,** Y. Yao, C. Shi, G. Li, V. Shrotriya, Q. Pei, Y. Yang, Univ. of California/Los Angeles . . . . . [6334-43]

✔ **Tandem stacking structure for polymer solar cells by using transparent electrodes,** V. Shrotriya, Univ. of California/Los Angeles; G. Li, Univ. of California/ Los Angeles; Y. Yao, Y. Yang, Univ. of California/ Los Angeles . . . . . [6334-44]

Wednesday 16 August

SESSION 1

Conv. Ctr. Room 6C . . . . . Wed. 8:30 to 10:00 am

Novel Concepts, Structures, and Materials for OPVs

Chair: **Zakya H. Kafafi**, Naval Research Lab.

8:30 am: **Organic and hybrid photovoltaic fibers,** C. J. Brabec, Konarka Technologies GmbH (Germany); R. Gaudiana, Konarka Technologies, Inc. [6334-01]

8:55 am: **Pi-conjugated dendrimers for organic and hybrid photovoltaics,** S. E. Shaheen, National Renewable Energy Lab. [6334-02]

9:20 am: **Light energy conversion in photosynthetic reaction centers at bio-inorganic interfaces,** N. Lebedev, S. Trammell, S. Tsoi, M. Moore, Naval Research Lab.; A. Spano, Univ. of Virginia; I. Griva, George Mason Univ. . . . . [6334-03]

9:35 am: **Solar cells based on stable organic pigments: device architectures and processing,** P. Peumans, Stanford Univ. . . [6334-04]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 6C . . . . . Wed. 10:30 am to 12:00 pm

Interfaces in OLEDs and OPVs: Joint Session with Conference 6333

Chair: **Christoph J. Brabec**, Konarka Technologies GmbH (Germany)

10:30 am: **Interface energetics of derivatives of polyflourene,** A. L. Kahn, J. Hwang, Princeton Univ.; E. Kim, J. Bredas, Georgia Institute of Technology . . . . . [6333-36]

10:55 am: **The importance of the interface in organic-inorganic solar cells,** M. D. McGehee, Stanford Univ. . . . . [6334-05]

11:20 am: **Electrical doping in OLEDs applying molecular dopants: high-power efficiency and long lifetimes for display applications,** T. W. Canzler, P. Wellmann, M. Hofmann, A. G. Werner, J. Birnstock, A. Lux, J. Blochwitz-Nimoth, NOVALED GmbH (Germany) . . . . . [6333-37]

11:45 am: **Multilayer polymer light-emitting diodes: white light emission with high efficiency,** X. Gong, S. Wang, D. A. Moses, G. C. Bazan, A. J. Heeger, Univ. of California/Santa Barbara . . . . . [6333-71]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 3

Conv. Ctr. Room 6C . . . . . Wed. 1:30 to 3:00 pm

Carrier Transport in OLEDs and OPVs: Joint Session with Conference 6333

Chair: **Antoine L. Kahn**, Princeton Univ.

1:30 pm: **Direct determination of carrier mobilities of OLED materials by admittance spectroscopy,** S. K. So, S. W. Tsang, S. C. Tse, K. L. Tong, Hong Kong Baptist Univ. (Hong Kong China) . . . . . [6333-39]

1:55 pm: **Tuning hole transport in highly dispersed blends of chemically similar polyfluorene copolymers: design rules for single-component systems for polymer light-emitting diodes,** A. J. Campbell, J. Harding, R. C. Maher, L. F. Cohen, Imperial College London (United Kingdom) . . . . . [6333-40]

2:15 pm: **Role of carrier mobility, exciton diffusion, and their interplay for charge balance and improved properties of organic electrophosphorescent device,** B. D. Chin, S. Lee, J. K. Kim, Korea Institute of Science and Technology (South Korea); C. H. Lee, Seoul National Univ. (South Korea) . . . . . [6333-41]

2:35 pm: **Comparison of the field and Fermi level dependence of transport and recombination in polymer/C60 cells and solid state dye-sensitized cells,** B. C. O'Regan, C. Shuttle, S. Koops, S. Handa, J. R. Durrant, Imperial College London (United Kingdom) . . . . . [6334-06]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 4

Conv. Ctr. Room 6C . . . . . Wed. 3:30 to 5:30 pm

Bulk Heterojunction Solar Cells

Chair: **Alasdair J. Campbell**, Imperial College London (United Kingdom)

3:30 pm: **Charge carrier transport and lifetime investigations on bulk-heterojunction solar cells,** G. Dennler, C. Lungenschmied, Johannes Kepler Univ. Linz (Austria); A. J. Mozer, Osaka Univ. (Japan); A. Pivrikas, R. Österbacka, Åbo Akademi Univ. (Finland); G. Juska, Vilnius Univ. (Lithuania); H. Neugebauer, N. S. Sariciftci, Johannes Kepler Univ. Linz (Austria) . . . . . [6334-07]

4:00 pm: **The influence of poly(3-hexylthiophene) molecular weight on polymer and polymer/PCBM blend film characteristics and photovoltaic device performance,** A. M. Ballantyne, J. Dane, J. Wilson, D. D. C. Bradley, J. Nelson, Y. Astuti, J. R. Durrant, Imperial College London (United Kingdom); W. Duffy, I. A. McCulloch, Merck Chemicals Ltd. (United Kingdom) . . . . . [6334-08]

4:20 pm: **Performance enhancement of polymer-fullerene bulk heterojunction solar cells,** L. J. A. Koster, V. D. Mihailetchi, J. C. Hummelen, P. W. M. Blom, Rijksuniv. Groningen (Netherlands) . [6334-09]

4:50 pm: **Alternative device concepts for future requirements of organic solar cells,** K. M. Coakley, Konarka Technologies, Inc.; C. Waldauf, P. Denk, M. Morana, D. Muehlbacher, M. Koppe, M. C. Scharber, Konarka Austria (Austria); P. I. Schilinsky, Siemens AG (Germany); S. Choulis, J. A. Hauch, C. J. Brabec, Konarka Technologies GmbH (Germany) . . . . . [6334-10]

5:10 pm: **Inverted bulk heterojunction organic photovoltaic devices using a solution-berived ZnO underlayer,** M. S. White, National Renewable Energy Lab.; D. C. Olson, Colorado School of Mines; S. E. Shaheen, D. S. Ginley, National Renewable Energy Lab. . . . . [6334-11]

Thursday 17 August

SESSION 5

Conv. Ctr. Room 6C . . . . . Thurs. 8:30 to 10:00 am

Low-Band Gap Polymer OPVs

Chair: **Michael D. McGehee**, Stanford Univ.

8:30 am: **Low-bandgap polymer solar cells,** R. A. J. Janssen, M. M. Wienk, M. G. R. Turbiez, Y. A. G. Nicolas, A. P. Zoombelt, M. Fonrodona, Technische Univ. Eindhoven (Netherlands) . . . . . [6334-12]

9:00 am: **Charge carrier photogeneration and transport properties of a novel low-bandgap conjugated polymer for organic photovoltaics,** C. Soci, I. Hwang, C. Yang, D. A. Moses, Univ. of California/Santa Barbara; Z. Zhu, D. J. Waller, R. Gaudiana, Konarka Technologies, Inc.; C. J. Brabec, Konarka Technologies GmbH (Austria); A. J. Heeger, Univ. of California/Santa Barbara . . . . . [6334-13]

9:20 am: **Photovoltaics from soluble acene derivatives,** M. T. Lloyd, A. C. Mayer, Cornell Univ.; J. E. Anthony, Univ. of Kentucky; G. G. Malliaras, Cornell Univ. . . . . [6334-14]

9:35 am: **Light absorbing P-type semiconducting thiophene polymers for organic photovoltaic devices,** I. A. McCulloch, C. Bailey, W. Duffy, M. J. Heeney, M. N. Shkunov, D. Sparrowe, S. Tierney, W. Zhang, Merck Chemicals Ltd. (United Kingdom); J. R. Durrant, J. Nelson, Imperial College London (United Kingdom) . . . . . [6334-15]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 6C . . . . . Thurs. 10:30 am to 12:00 pm

Exciton Diffusion

Chair: **Rene A. J. Janssen**, Technische Univ. Eindhoven (Netherlands)

10:30 am: **Exciton diffusion measurements in organic semiconductors,** I. D. W. Samuel, A. J. Lewis, A. Ruseckas, Univ. of St. Andrews (United Kingdom) . . . . . [6334-16]

11:00 am: **Exciton diffusion and energy transfer in organic photovoltaics: measurements and novel device architectures,** S. R. Scully, M. D. McGehee, Stanford Univ. . . . . [6334-17]

11:20 am: **Modeling the photocurrent of thin-film multilayer organic solar cells,** S. Yoo, W. Potscavage, Jr., B. Domercq, B. Kippelen, Georgia Institute of Technology . . . . . [6334-18]

11:40 am: **Characterization of materials and multilayer structures of organic solar cells by spectroscopic ellipsometry,** C. Defranoux, P. Heinrich, A. Darragon, L. Kitzinger, SOPRA SA (France); F. Monestier, J. Simon, P. Torchio, L. Escoubas, Institut Fresnel (France); J. Nunzi, Univ. d'Angers (France) . . . . . [6334-19]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 7

Conv. Ctr. Room 6C . . . . . Thurs. 1:30 to 3:40 pm

Science and Technology of OPVs

Chair: **Peter Peumans**, Stanford Univ.

1:30 pm: **Origin of the open-circuit voltage in organic solar cells,** J. Xue, Univ. of Florida . . . . . [6334-20]

1:55 pm: **Investigation of ambipolar transport properties of polymer-fullerene blends for organic solar cell applications,** M. Morana, C. Waldauf, M. Koppe, D. Muehlbacher, P. Denk, M. C. Scharber, Konarka Austria (Austria); C. J. Brabec, Konarka Technologies GmbH (Germany) . . . . . [6334-21]

2:15 pm: **Barix multilayer barrier technology for organic solar cells,** L. L. Moro, T. Ramos, N. M. Rutherford, R. J. Visser, Vitex Systems, Inc. [6334-22]

2:40 pm: **Two-fold efficiency increase in nanocrystalline-TiO_2/polymer photovoltaic devices by interfacial modification with a lithium salt,** D. A. R. Barkhouse, M. J. Carey, H. E. Assender, Z. Xie, K. R. Kirov, B. M. Henry, B. Lochab, P. L. Burn, Univ. of Oxford (United Kingdom) . . . . . [6334-23]

3:00 pm: **Three-dimensional chemical and physical analysis of the degradation mechanisms in organic photovoltaics,** K. Norrman, M. Jørgensen, J. Alstrup, N. B. Larsen, F. C. Krebs, Risø National Lab. (Denmark); M. Lira-Cantu, Institut de Ciència de Materials de Barcelona (Spain) . . . . . [6334-33]

3:20 pm: **Organic bulk heterojunction solar cells: product requirements, market aspects, and technological challenges,** C. J. Brabec, Konarka Technologies GmbH (Germany) . . . . . [6334-24]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Monday-Tuesday 14-15 August 2006 • Proceedings of SPIE Vol. 6335

Organic Holographic Materials and Applications IV

Conference Chair: **Susanna Orlic**, Technische Univ. Berlin (Germany)

Cochair: **Klaus Meerholz**, Univ. zu Köln (Germany)

Program Committee: **Eunkyoung Kim**, Yonsei Univ. (South Korea); **Robert R. McLeod**, Univ. of Colorado at Boulder; **David A. Waldman**, Aprilis, Inc.

Monday 14 August

SESSION 1

Conv. Ctr. Room 1B . . . . . Mon. 8:15 to 10:05 am

Materials I

Chair: **Susanna Orlic**, Technische Univ. Berlin (Germany)

8:15 am: **Holographic phase gratings in back and frontlights for liquid crystal displays *(Invited Paper)*,** C. M. Van Heesch, C. A. Guerrero Sanchez, Technische Univ. Eindhoven (Netherlands); M. J. Escuti, North Carolina State Univ.; D. J. Broer, C. W. M. Bastiaansen, Technische Univ. Eindhoven (Netherlands) . . . . . [6335-01]

8:45 am: **Phase and absorption metrology for thick photopolymer devices,** A. C. Sullivan, Univ. of Colorado/ Boulder; M. R. Ayers, InPhase Technologies; R. R. McLeod, Univ. of Colorado/ Boulder . . . . . [6335-02]

9:05 am: **Photorefractive polymers with sub-millisecond response time,** J. Thomas, M. Eralp, S. Tay, G. Li, College of Optical Sciences/The Univ. of Arizona; P. Wang, M. Yamamoto, Nitto Denko Technical Corp.; A. Schülzgen, R. A. Norwood, N. N. Peyghambarian, College of Optical Sciences/The Univ. of Arizona . . . . . [6335-03]

9:25 am: **Optical gain in azo-dye-containing materials: a novel recording mechanism,** F. Gallego-Gomez, Univ. zu Köln (Germany); F. del Monte, Consejo Superior de Investigaciones Científicas (Spain); K. Meerholz, Univ. zu Köln (Germany) . . . . . [6335-04]

9:45 am: **Temperature dependence and characterization of gratings in PQ/PMMA holographic materials,** J. M. Russo, C. Chen, R. K. Kostuk, The Univ. of Arizona . . . . . [6335-05]

Coffee Break . . . . . 10:05 to 10:30 am

SESSION 2

Conv. Ctr. Room 1B . . . . . Mon. 10:30 am to 12:20 pm

Applications I

Chair: **Susanna Orlic**, Technische Univ. Berlin (Germany)

10:30 am: **Advances in Aprilis CROP holographic storage materials for optical storage at 407-nm with density greater than 200 bits/sq μm *(Invited Paper)*,** D. A. Waldman, C. Wang, E. S. Kolb, Aprilis, Inc.[6335-06]

11:00 am: **Progress in microholographic data storage,** S. Orlic, E. Dietz, T. Feid, S. Frohmann, J. Gortner, B. Heimke, R. Henze, Technische Univ. Berlin (Germany); P. Koppa, Budapest Univ. of Technology and Economics (Hungary); C. Müller, Technische Univ. Berlin (Germany); Z. Nagy, F. Ujhelyi, Budapest Univ. of Technology and Economics (Hungary) . . . . . [6335-07]

11:20 am: **Media tilt tolerance of bit-based and page-based holographic storage systems,** Y. Takashima, L. Hesselink, Stanford Univ. . . . . [6335-08]

11:40 am: **Development of a holographic data storage material based on photochromic dye doped thermoplastics,** E. P. Boden, GE Global Research; M. Dubois, Lockheed Martin Aeronautics Co.; X. Shi, B. L. Lawrence, M. C. Nielsen, C. Erben, K. L. Longley, M. McLaughlin, P. Wu, GE Global Research . . . . . [6335-09]

12:00 pm: **A 130-channel demultiplexer using cascaded volume holographic gratings recorded in photopolymer films,** D. D. Do, N. Kim, Chungbuk National Univ. (South Korea); J. W. An, LGS Corp. (South Korea); K. Y. Lee, Sunchon National Univ. (South Korea) . . . . . [6335-10]

Lunch Break . . . . . 12:20 to 1:30 pm

SESSION 3

Conv. Ctr. Room 1B . . . . . Mon. 1:30 to 3:20 pm

Materials II

Chair: **Susanna Orlic**, Technische Univ. Berlin (Germany)

1:30 pm: **Coherence imaging of bone and tissue using photorefractive polymers *(Invited Paper)*,** M. F. Salvador, S. Köber, Univ. zu Köln (Germany); F. Koistra, J. C. Hummelen, Rijksuniv. Groningen (Netherlands); K. Meerholz, Univ. zu Köln (Germany) . . . . . [6335-11]

2:00 pm: **Detection of vibrations in the audio range using photorefractive polymers,** S. S. Mansurova, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); M. Gather, Univ. zu Köln (Germany); M. Espinoza Tlaxcaltecatl, P. Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); K. Meerholz, Univ. zu Köln (Germany) . . . . . [6335-12]

2:20 pm: **Photochemical effects during holographic grating formation in photopolymer using the nonlocal polymerization driven diffusion model,** M. R. Gleeson, J. T. Sheridan, C. E. Close, J. V. Kelly, F. T. O'Neill, National Univ. of Ireland/Dublin (Ireland) . . . . . [6335-13]

2:40 pm: **Local longitudinal sensitivity of photo-induced molecular migration in azobenzene-containing polymers,** R. J. B. Bachelot, Univ. de Technologie de Troyes (France); A. Bouhelier, Argonne National Lab.; Y. Gilbert, P. Royer, Univ. de Technologie de Troyes (France); G. P. Wiederrecht, Argonne National Lab.; L. Novotny, Univ. of Rochester . . . . . [6335-14]

3:00 pm: **Impact of initiation species on index distribution in diffusion photopolymers,** A. C. Sullivan, M. W. Grabowski, Univ. of Colorado; R. R. McLeod, Univ. of Colorado/ Boulder . . . . . [6335-15]

Coffee Break . . . . . 3:20 to 3:45 pm

SESSION 4

Conv. Ctr. Room 1B . . . . . Mon. 3:45 to 5:35 pm

Applications II

Chair: **Susanna Orlic**, Technische Univ. Berlin (Germany)

3:45 pm: **Commercial realization of high-performance holographic data storage *(Invited Paper)*,** W. L. Wilson, K. R. Curtis, K. E. Anderson, S. P. Weaver, A. J. Hill, B. Ihas, L. Dhar, InPhase Technologies . [6335-16]

4:15 pm: **Novel features of HVD™ system,** H. Horimai, OPTWARE Corp. (Japan) and Japan Science and Technology Agency-CREST (Japan); X. Tan, N. Kitazaki, T. Sasada, Y. Kaneko, M. Kinoshita, H. Matsuda, K. Mizunoe, M. Igarashi, OPTWARE Corp. (Japan); J. Li, OPTWARE Corp (Japan); H. Narumi, M. Matsumoto, S. Yoshino, M. Kakinuma, Y. Sakai, K. Suzuki, Y. Tsurukawa, A. Kawamura, OPTWARE Corp. (Japan) . [6335-17]

4:35 pm: **Performance of photopolymer materials for microlocalized volume storage,** C. Müller, E. Dietz, T. Feid, S. Frohmann, J. Gortner, B. Heimke, R. Henze, S. Orlic, Technische Univ. Berlin (Germany) . [6335-18]

4:55 pm: **Optimized scheduling technique for holographic data storage,** J. V. Kelly, M. R. Gleeson, C. E. Close, J. T. Sheridan, F. T. O'Neill, National Univ. of Ireland/Dublin (Ireland) . . . . . [6335-19]

5:15 pm: **Current status of holography applications for 3D/2D convertible display, optical data storage, and lithography,** B. Lee, H. Kim, S. Han, J. Hahn, Y. Lim, H. Choi, Seoul National Univ. (South Korea) . . . . . [6335-20]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Electrooptics properties of PVA doped with different metallic salts as conductors polymers and its use in holographic replication,** M. d. l. P. Hernández Garay, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); A. Olivares Perez, Instituto Nacional de Astrofisica, Optica y Electronica (Mexico); D. López-Velásquez, Benemérita Univ. Autónoma de Puebla (Mexico); I. Fuentes Tapia, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6335-21]

✔ **Diffusion model of monomers in a photopolymer film for holographic recording,** E. Kim, H. Lee, Yonsei Univ. (South Korea); N. Kim, Chungbuk National Univ. (South Korea) . . . . . [6335-22]

✔ **SeO_2 addition on PVA-based photopolymer for improving photostorage stabilities and diffraction efficiencies,** D. Kim, S. Nam, S. Yeo, J. Lim, A. Lee, H. Choi, D. Lee, Kwangwoon Univ. (South Korea) . . . . . [6335-23]

✔ **Polymer modified sol-gel materials for photochromic applications,** R. Janik, S. H. Kucharski, Politechnika Wroclawska (Poland) [6335-24]

✔ **Photochromism and diffraction grating in cyanoazobenzene copolymer films,** M. Serwadczak, Politechnika Wroclawska (Poland); M. Wubbenhorst, Katholieke Univ. Leuven (Belgium); S. H. Kucharski, Politechnika Wroclawska (Poland) . . . . . [6335-25]

✔ **Shrinkage and temporal effects on grating formation during short exposures in photopolymer,** J. V. Kelly, M. R. Gleeson, C. E. Close, F. T. O'Neill, J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland); S. Gallego, C. Neipp, Univ. of Alicante (Spain) . . . . . [6335-26]

✔ **Photopolymers containing triazine monomers for holographic recording,** E. Kim, H. Lee, Yonsei Univ. (South Korea); S. Lee, iBule Photonics (South Korea) . . . . . [6335-27]

✔ **Photochemical kinetics and polymer chain control in acrylamide-based photopolymer,** C. E. Close, M. R. Gleeson, J. V. Kelly, F. T. O'Neill, D. Mooney, J. T. Sheridan, National Univ. of Ireland/Dublin (Ireland) . . . . . [6335-28]

✔ **Fabrication of surface plasmon based diffractive optical elements using dye: PMMA,** Y. Lim, K. Choi, S. Kim, Seoul National Univ. (South Korea); H. Lee, E. Kim, Yonsei Univ. (South Korea); B. Lee, Seoul National Univ. (South Korea) . . . . . [6335-29]

✔ **Optical characteristics of novel Bisazo polymers for rewritable holographic data storage,** J. Y. Kim, T. Fukuda, D. Barada, H. Ushijima, K. Yase, National Institute of Advanced Industrial Science and Technology (Japan) . . . . . [6335-31]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Sunday-Tuesday 13-15 August 2006 • Proceedings of SPIE Vol. 6336

Organic Field-Effect Transistors V

Conference Chairs: **Zhenan Bao**, Stanford Univ.; **David J. Gundlach**, National Institute of Standards and Technology

Program Committee: **Michael L. Chabinyc**, Palo Alto Research Ctr. Inc.; **Ananth Dodabalapur**, The Univ. of Texas at Austin; **Marcus Halik**, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); **Martin J. Heeney**, Merck Chemicals Ltd. (United Kingdom); **Eric K. Lin**, National Institute of Standards and Technology; **George G. Malliaras**, Cornell Univ.; **Tobin J. Marks**, Northwestern Univ.; **Takao Someya**, The Univ. of Tokyo (Japan)

Sunday 13 August

SESSION 1

Conv. Ctr. Room 2 . . . . . Sun. 8:30 to 10:15 am

Semiconductors Materials and Transport

Chair: **Iain A. McCulloch**, Merck Chemicals Ltd. (United Kingdom)

8:30 am: **Materials design for printed transistors *(Invited Paper)*,** B. S. Ong, Xerox Research Ctr. of Canada (Canada) . . . . . [6336-01]

8:55 am: **High-performance (>1.3 cm2/Vs) stable thin film field effect transistors (TFTs) from novel organic semiconductors *(Invited Paper)*,** H. Meng, EI duPont de Nemours & Company, Inc. . . . . [6336-02]

9:20 am: **Recent progress in electron-transport organic semiconductors and n-channel field-effect transistors *(Invited Paper)*,** B. Kippelen, Georgia Institute of Technology . . . . . [6336-03]

9:45 am: **Organic field-effect transistors based on pentacene derivatives,** M. Ling, A. B. Mallik, M. Senatore, M. Tang, T. Okamoto, Z. Bao, Stanford Univ. . . . . [6336-04]

10:00 am: **n-type organic semiconductors for thin-film transistors based on fluorinated bisbenzimidazole perylene,** H. Chen, Zhejiang Univ. (China); M. Ling, Stanford Univ.; X. Mo, M. Shi, M. Wang, Zhejiang Univ. (China); Z. Bao, Stanford Univ. . . . . [6336-05]

Coffee Break . . . . . 10:15 to 10:45 am

SESSION 2

Conv. Ctr. Room 2 . . . . . Sun. 10:45 am to 12:05 pm

Organic Single Crystals

Chair: **C. Daniel Frisbie**, Univ. of Minnesota

10:45 am: **Single-crystal growth of organic semiconductors for field-effect applications *(Invited Paper)*,** C. Kloc, Lucent Technologies/Bell Labs. . . . . [6336-06]

11:10 am: **Self-assembled single-crystal organic semiconductors via solution process for high-performance organic field-effect transistors *(Invited Paper)*,** K. Cho, D. H. Kim, Pohang Univ. of Science and Technology (South Korea) . . . . . [6336-07]

11:35 am: **In situ growing single-crystal nanoribbons of copper phthalocyanine along SiO_2 surface for high-quality nanometer transistors,** W. Hu, Institute of Chemistry (China) . . . . . [6336-08]

11:50 am: **Bulk and interface trap states in organic single crystals for field-effect devices,** A. F. Stassen, Swiss Federal Institutes of Technology (Switzerland); C. Goldmann, ETH Zürich (Switzerland); C. Krellner, Swiss Federal Institutes of Technology (Switzerland); S. Haas, K. P. Pernstich, ETH Zürich (Switzerland); D. J. Gundlach, Swiss Federal Institutes of Technology (Switzerland); B. Batlogg, ETH Zürich (Switzerland) [6336-09]

Lunch Break . . . . . 12:05 to 1:30 pm

SESSION 3

Conv. Ctr. Room 2 . . . . . Sun. 1:30 to 3:25 pm

Structure and Scanning Probe Characterization

Chair: **Michael L. Chabinyc**, Palo Alto Research Ctr. Inc.

1:30 pm: **Using high-sensitivity electric force microscopy to probe charge injection and charge trapping in organic electronic materials *(Invited Paper)*,** J. A. Marohn, M. J. Jaquith, S. M. Yazdanian, T. N. Ng, Cornell Univ. . . . . [6336-10]

1:55 pm: **Crystalline structures in organic semiconductors for high-performance OTFT applications *(Invited Paper)*,** H. Yang, Rensselaer Polytechnic Institute; T. J. Shin, Pohang Univ. of Science and Technology (South Korea); M. Ling, Stanford Univ.; C. Y. Ryu, Rensselaer Polytechnic Institute; Z. Bao, Stanford Univ. . . . . [6336-11]

2:20 pm: **Microstructural effects on the performance of poly(thiophene) field-effect transistors *(Invited Paper)*,** A. Salleo, M. L. Chabinyc, Palo Alto Research Ctr. Inc.; M. F. Toney, IBM Almaden Research Ctr. . . . . [6336-12]

2:45 pm: **Semiconductor/insulator interfaces in organic thin-film transistors *(Invited Paper)*,** C. D. Frisbie, Univ. of Minnesota . [6336-13]

3:10 pm: **Raman investigation of electric-field-induced molecular modifications in organic field-effect transistors,** B. A. Paez Sierra, NANOIDENT Technologies AG (Austria); D. R. T. Zahn, Technische Univ. Chemnitz (Germany); F. Padinger, K. Schröter, NANOIDENT Technologies AG (Austria) . . . . . [6336-14]

Coffee Break . . . . . 3:25 to 3:55 pm

SESSION 4

Conv. Ctr. Room 2 . . . . . Sun. 3:55 to 5:55 pm

Trapping and Gate Insulator Effects

Chair: **Thokchom B. Singh**, Johannes Kepler Univ. Linz (Austria)

3:55 pm: **On the crucial role of the insulator-semiconductor interface in organic thin-film transistors *(Invited Paper)*,** G. Horowitz, M. Mottaghi, P. Lang, F. Rodriguez, A. Yassar, Univ. Paris 7-Denis Diderot (France); S. Lenfant, Univ. of Lille (France); D. Dominique, Ctr. National de la Recherche Scientifique (France) . . . . . [6336-15]

4:20 pm: **Hysteresis in pentacene-based organic thin-film transistors *(Invited Paper)*,** G. Gu, M. G. Kane, Sarnoff Corp. . . . . [6336-16]

4:45 pm: **Tuning organic semiconductor growth with aromatic,** M. E. Roberts, M. Ling, Z. Bao, Stanford Univ. . . . . [6336-17]

5:00 pm: **Low-voltage pentacene FETs with novel high-k polymeric dielectric and its hyteresis behavior,** C. E. Park, S. Kim, Pohang Univ. of Science and Technology (South Korea) . . . . . [6336-18]

5:15 pm: **High-performance organic field-effect transistors,** W. Y. Chou, C. W. Kuo, H. L. Cheng, Y. S. Mai, National Cheng Kung Univ. (Taiwan) . . . . . [6336-19]

5:30 pm: **Solution processed high-performance organic thin film transistors *(Invited Paper)*,** T. Lee, J. H. Shin, J. Y. Kim, Y. Byun, S. Y. Lee, SAMSUNG (South Korea) . . . . . [6336-20]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 2 . . . . . Mon. 8:15 to 10:00 am

Device Physics

Chair: **David J. Gundlach**, National Institute of Standards and Technology

8:15 am: **Contact effects in polymer field-effect transistors *(Invited Paper)*,** D. Natelson, Rice Univ. . . . . [6336-21]

8:40 am: **Field-effect diagnostic of organic PV cell materials and devices *(Invited Paper)*,** A. K. Pandey, K. N. N. Unni, Univ. d'Angers (France); K. Y. Man, The Univ. of Hong Kong (Hong Kong China); M. Girtan, J. Nunzi, Univ. d'Angers (France) . . . . . [6336-22]

9:05 am: **Varying charge injection into polymer field effect transistors using self-assembled monolayers,** R. Rawcliffe, S. Khodabakhsh, T. Jones, A. J. Campbell, Imperial College London (United Kingdom); M. N. Shkunov, M. J. Heeney, S. Tierney, I. A. McCulloch, Merck Chemicals Ltd. (United Kingdom) . . . . . [6336-24]

9:20 am: **Environmental stability of polymeric thin-film transistors,** M. L. Chabinyc, F. Endicott, Palo Alto Research Ctr. Inc.; B. D. Vogt, D. M. DeLongchamp, E. K. Lin, National Institute of Standards and Technology; Y. Wu, P. Liu, B. S. Ong, Xerox Research Ctr. of Canada (Canada)[6336-25]

9:35 am: **High intra-chain hole mobility on molecular wires of ladder type *(Invited Paper)*,** L. D. A. Siebbeles, Technische Univ. Delft (Netherlands) . . . . . [6336-26]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 6

Conv. Ctr. Room 2 . . . . . Mon. 10:30 am to 12:10 pm

Novel OFET Designs and Circuits

Chair: **Alberto Salleo**, Palo Alto Research Ctr. Inc.

10:30 am: **Organic transistor logic for wireless applications *(Invited Paper)*,** P. L. Heremans III, IMEC (Belgium) . . . . . [6336-27]

10:55 am: **Organic CMOS technology by interface treatment *(Invited Paper)*,** N. Benson, M. Ahles, C. Melzer, R. Schmechel, H. von Seggern, Technische Univ. Darmstadt (Germany) . . . . . [6336-28]

11:20 am: **Interfacial effects in organic field-effect transistors studied in MemOFETs, PhotOFETs, and BiOFETs *(Invited Paper)*,** T. B. Singh, P. Stadler, N. Marjanovic, H. Neugebauer, N. S. Sariciftci, G. Hernandezsosa, A. M. Ramil, H. Sitter, R. Schwoediauer, S. Bauer, Johannes Kepler Univ. Linz (Austria); A. Andreev, Montan Univ. Leoben (Austria); J. G. Grote, Air Force Research Lab. . . . . [6336-29]

11:45 am: **Low-voltage organic transistors and low-power organic circuits *(Invited Paper)*,** H. Klauk, Max Planck Institut for Solid State Research (Germany) . . . . . [6336-30]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 7

Conv. Ctr. Room 2 . . . . . Mon. 1:30 to 3:05 pm

Advances in Solution Processed OFETs

Chair: **Kilwon Cho**, Pohang Univ. of Science and Technology (South Korea)

1:30 pm: **Vapor and solution deposited organic thin-film semiconductor transistors *(Invited Paper)*,** T. N. Jackson, The Pennsylvania State Univ. . . . . [6336-31]

1:55 pm: **Organic thin-film electronics from vitreous solution-processed rubrene hypereutectics *(Invited Paper)*,** N. Stingelin-Stutzmann, Queen Mary Univ. of London (United Kingdom) . . . [6336-32]

2:20 pm: **Thermal annealing induced enhancement in the performance of polymer field-effect transistor using poly(3-hexylthiophene) and [6,6]-phenyl C61-butyric acid methyl ester,** S. Cho, Univ. of California/Santa Barbara and Pusan National Univ. (South Korea); J. Yeun, J. Y. Kim, Univ. of California/Santa Barbara; K. Lee, Pusan National Univ. (South Korea) and Univ. of California/Santa Barbara; A. J. Heeger, Univ. of California/Santa Barbara . . . . . [6336-33]

2:35 pm: **Field-effect transistors of polymer semiconducting/insulating blends and block copolymers,** C. Muller, P. Smith, ETH Zürich (Switzerland); N. Stingelin-Stutzmann, Queen Mary Univ. of London (United Kingdom); S. Goffri, Univ. of Cambridge (United Kingdom); H. Sirringhaus, Univ of Cambridge (United Kingdom); R. H. Friend, Univ. of Cambridge (United Kingdom); D. W. Breiby, M. M. Nielsen, Risø National Lab. (Denmark); C. P. Radano, Technische Univ Eindhoven (Netherlands); R. A. J. Janssen, Technische Univ. Eindhoven (Netherlands); E. W. Meijer, Katholieke Univ. Leuven (Netherlands); O. A. Sherman, Technische Univ. Eindhoven (Netherlands); H. Chanzy, Ctr. National de la Recherche Scientifique (France) . . . . . [6336-34]

2:50 pm: **Organic-inorganic hybrid nanocomposites and bio-organic materials for OFETs,** A. L. R. Vellaisamy, Z. Xu, L. M. Wong, H. Xiang, B. Yan, C. Che, The Univ. of Hong Kong (Hong Kong China) . . . . . [6336-35]

Coffee Break . . . . . 3:05 to 3:35 pm

SESSION 8

Conv. Ctr. Room 2 . . . . . Mon. 3:35 to 5:40 pm

Processing and Materials for OFETs

Chair: **Hong Meng**, El duPont de Nemours & Company, Inc.

3:35 pm: **Challenges and perspectives of printed electronics *(Invited Paper)*,** H. Kempa, U. Fügmann, N. Brandt, F. Thomas, M. Bartzsch, G. Schmidt, K. Preissler, U. Hahn, A. C. Huebler, Technische Univ. Chemnitz (Germany) . . . . . [6336-36]

4:00 pm: **High-performing polymer semiconductors for OFET devices *(Invited Paper)*,** I. A. McCulloch, M. J. Heeney, C. Bailey, W. Duffy, M. N. Shkunov, D. Sparrowe, S. Tierney, W. Zhang, Merck Chemicals Ltd. (United Kingdom); M. L. Chabinyc, Palo Alto Research Ctr. Inc.; R. J. Kline, National Institute of Standards and Technology . . . . . [6336-37]

4:25 pm: **Solution processing, micropatterning, and transistor performance of organic semiconductors with bulky substitutents,** J. Locklin, Y. Ito, A. Sung, Z. Bao, Stanford Univ. . . . . [6336-38]

4:40 pm: **Complementary organic circuits,** J. A. DeFranco, G. G. Malliaras, Cornell Univ. . . . . [6336-39]

4:55 pm: **Synthesis, mobility, and conductivity of well-defined regioregular poly(3-hexylthiophene) and diblock copolymers of regioregular poly(3-hexylthiophene),** G. Sauve, R. Zhang, B. Li, M. C. Iovu, C. Craley, Carnegie Mellon Univ.; M. Jeffries-EL, Iowa State Univ.; J. Cooper, Carnegie Mellon Univ.; S. Jia, Plextronics, Inc.; S. Tristram-Nagle, Carnegie Mellon Univ.; D. M. Smilgies, Cornell Univ.; D. N. Lambeth, T. A. Kowalewski, R. D. McCullough, Carnegie Mellon Univ. . . . . [6336-40]

5:10 pm: **Functionalized acenes for organic electronics,** J. E. Anthony, Univ. of Kentucky . . . . . [6336-41]

5:25 pm: **Field-effect transistors made of alumina-coated carbon nanotubes,** Y. Liu, Institute of Chemistry (China) . . . . . [6336-42]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Conv. Ctr. Room 6A . . . . . Tues. 8:30 am to 12:00 pm

Chairs: ***James G. Grote****, Air Force Research Lab.;*
Zakya H. Kafafi*, Naval Research Lab.*

8:30 am: **Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures**, Sailing He, Kungliga Tekniska Högskolan (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

9:00 am: **Plasmonic Nanostructures: Artificial Molecules** , Naomi J. Halas, Rice Univ.

9:30 am: **Organic Thin Film Electronics**, Zhenan Bao, Stanford Univ.

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **A Review on Nanophotonics Research at NRL**, Richard J. Colton, Naval Research Lab.

11:00 am: **Organic Light Emitting Devices for Flat Panel Display and Solid State Lighting Applications**, Franky So, Univ. of Florida

11:30 am: **Organic Solar Cells**, Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. 11 for details.

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

SESSION 9

Conv. Ctr. Room 6C . . . . . Tues. 1:30 to 3:00 pm

Light-Emitting OFETs: Joint Session with Conference 6333

Chair: **Yasuhiko Shirota,** Fukui Univ. of Technology (Japan)

1:30 pm: **Ambipolar organic light-emitting transistors with balanced charge and high carrier mobility *(Invited Paper)*,** M. Muccini, Istituto per lo Studio dei Materiali Nanostrutturati (Italy) . . . . . [6333-29]

1:55 pm: **Estimation of carrier recombination and electroluminescence emission regions in organic light-emitting field-effect transistors,** C. Adachi, T. Oyamada, H. Uchiuzo, Kyushu Univ. (Japan); S. Akiyama, Mitsubishi Chemical Corp. (Japan) . . . . . [6336-43]

2:15 pm: **Efficient ambipolar light-emitting polymer transistors in top and bottom gate geometry *(Invited Paper)*,** J. Zaumseil, C. L. Donley, J. Kim, R. H. Friend, H. Sirringhaus, Univ. of Cambridge (United Kingdom) . . . . . [6336-44]

2:40 pm: **A novel organic light-emitting device for use in electrically pumped lasers,** S. Schols, IMEC (Belgium) and Katholieke Univ. Leuven (Belgium); S. Verlaak, P. L. Heremans III, IMEC (Belgium) . . . . . [6333-30]

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Kinetics of trap release in organic semiconductors,** T. N. Ng, J. A. Marohn, Cornell Univ.; M. L. Chabinyc, Palo Alto Research Ctr. Inc. . . . . [6336-46]

✔ **Effects of substrate temperature on properties of Alq_3 and NPB amorphous layers prepared by vacuum deposition,** K. Chiu, Chung Yuan Christian Univ. (Taiwan) . . . . . [6336-47]

✔ **Studies of polycrystalline pentacene thin-film transistors at the microscopic level,** H. Cheng, W. Chou, C. Kuo, F. Tang, S. Lai, National Cheng Kung Univ. (Taiwan) . . . . . [6336-48]

✔ **Ambipolar pentacene field-effect transistor with double-layer organic insulator,** J. Kwak, H. Baek, C. H. Lee, Seoul National Univ. (South Korea) . . . . . [6336-49]

✔ **Interfacial control for developing organic rewritable optical memory using organic photo-FET having photosensitive gate dielectric,** M. Yoshida, National Institute of Advanced Industrial Science and Technology (Japan); H. Kawai, T. Kawai, Tokyo Univ. of Science (Japan); S. Uemura, S. Hoshino, T. Kodzasa, H. Kamata, National Institute of Advanced Industrial Science and Technology (Japan) . . . . . [6336-50]

✔ **Improving photo-switching property of organic photo-FET having photosensitive gate dielectric,** H. Kawai, T. Kawai, Tokyo Univ. of Science (Japan); M. Yoshida, S. Uemura, S. Hoshino, T. Kodzasa, T. Kamata, National Institute of Advanced Industrial Science and Technology (Japan) . . . . . [6336-51]

✔ **Performance of organic field effect transistor constructed with polycarbonate gate dielectric layer,** S. Ochiai, S. Mototani, Y. Uchida, A. Ohashi, K. Kojima, T. Mizutani, Aichi Institute of Technology (Japan) . . . . . [6336-52]

✔ **Bias-dependent charge accumulation in pentacene-based thin-film transistors,** C. Lin, K. Chuang, Y. Chen, J. Lee, J. Huang, National Taiwan Univ. (Taiwan); Y. Wang, Industrial Technology Research Institute (Taiwan) . . . . . [6336-53]

✔ **Charge carrier transport studies of organic single-crystal field-effect transistors,** M. Ling, Z. Bao, Stanford Univ. . . . . [6336-54]

✔ **Analytical and T-CAD modeling of pentacene thin-film transistors,** Y. Chen, Y. Chen, J. Lee, J. Huang, National Taiwan Univ. (Taiwan); Y. Wang, Y. Wang, Industrial Technology Research Institute (Taiwan) . . . . . [6336-55]

✔ **All-organic heterojunction bipolar transistor,** B. Yan, A. L. R. Vellaisamy, C. Che, The Univ. of Hong Kong (Hong Kong China) . . . . . [6336-56]

✔ **Patterning of organic semiconductors,** Z. Bao, Stanford Univ. . . . . [6336-58]

✔ **Micropatterning of organic semiconductor crystals by solution deposition,** Y. Ito, J. Locklin, Z. Bao, Stanford Univ. . . . . [6336-59]

✔ **Gated space-charge-limited current in organic thin-film transistors for trap energy determination and device optimization,** R. D. Yang, A. C. Kummel, Univ. of California/San Diego . . . . . [6336-60]

✔ **Modification of transport and structural properties by magnetic fields of vanadyl phthalocyanine field-effect transistors,** B. A. Paez Sierra, NANOIDENT Technologies AG (Austria); V. Kolotovska, D. R. T. Zahn, Technische Univ. Chemnitz (Germany); F. Padinger, K. Schröter, NANOIDENT Technologies AG (Austria) . . . . . [6336-61]

✔ **Electric characteristics of organic thin-film transistors and logic circuits with a ferroelectric gate insulator,** Y. S. Yang, Electronics and Telecommunications Research Institute (South Korea) . . . . . [6336-62]

✔ **Photo-response of OTFT,** S. H. Kim, S. C. Lim, J. H. Lee, J. B. Koo, C. H. Koo, Y. S. Yang, K. H. Kim, T. Zyung, Electronics and Telecommunications Research Institute (South Korea) . . . . . [6336-63]

✔ **Instability of OTFT with organic gate dielectrics,** S. C. Lim, S. H. Kim, K. H. Kim, J. B. Koo, J. H. Lee, Electronics and Telecommunications Research Institute (South Korea); C. H. Ku, Kyunghee Univ. (South Korea); Y. S. Yang, Electronics and Telecommunications Research Institute (South Korea); D. Kim, Chungnam National Univ. (South Korea); T. Zyung, Electronics and Telecommunications Research Institute (South Korea) . . . . . [6336-64]

✔ **New solution processes to improve crystallinity of P3HT films and their OTFT properties,** S. Nomura, G. G. Malliaras, Cornell Univ. . . . . [6336-65]

✔ **Surface-induced alignment of liquid crystalline semiconductors by command surface for organic thin-film transistors,** T. Fujiwara, J. Locklin, Z. Bao, Stanford Univ. . . . . [6336-66]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC571 **Organic Photonics and Electronics: New Technologies for Emerging Applications** (Jabbour) Weds. 16 Aug., 8:30 am to 5:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

Illumination Engineering

Program on **Illumination Engineering**

Program Chair: **Ian T. Ferguson,** Georgia Institute of Technology

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
	6337 **Sixth International Conference on Solid State Lighting** *(Ferguson/Narendran/Taguchi/Ashdown)*, p. 193			
6338 **Nonimaging Optics and Efficient Illumination Systems III** *(Winston/Benítez)*, p. 197				
	Conference of Related Interest: 6339 **High and Low Concentration for Solar Electric Applications** *(Symko-Davies)*, p. 200			
Courses				
	SC798 **Practical Radiometry** (Strojnik), 8:30 am to 5:30 pm	SC011 **Design of Efficient Illumination Systems** (Cassarly), 8:30 am to 12:30 pm	SC657 **Accurate Measurement of LED Optical Properties** (Tirpak), 1:30 to 5:30 pm	
	SC770 **Solid State Lighting II** (Ferguson), 8:30 am to 12:30 pm	SC388 **Non-Imaging Optics** (Winston), 1:30 to 5:30 pm	Register for Courses onsites at the SPIE Registration Desk!	
	SC799 **Solid State Lighting Phosphors** (Summers), 1:30 to 5:30 pm			
Special Events				
Symposium-Wide Plenary Presentations: 5:40 to 7:00 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty,** presented by Kristen M. Kulinowski, 5:40 to 6:20 pm; **Digital Cinem a: Past, Present, and Future,** presented by Bill Werner, Texas Instruments, 6:20 to 7:00 pm, p. 7	*Special Program:* **A Tribute to Holography Pioneers Emmett Leith and Yuri Denisyuk** *(Caulfield)* 8:30 am to 6:30 pm, p. 41	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	**EXHIBITION,** p. 24 10:00 am to 5:00 pm	10:00 am to 2:00 pm
	X-Ray and Algorithms Plenary, 8:30 to 9:50 am, p. 8	**Organic and Nanophotonics Plenary,** 8:30 am to 12:00 pm, p. 11	**Book Publishing for Engineers and Scientists,** 8:30 to 11:00 am, p. 21	**How to Start a Small High Tech Business Almost Anywhere,** 8:30 am to 12:30 pm, p. 22
	Lunch with the Experts - A Special Student Event, 12:30 to 1:30 pm, p. 20	*Industry Perspectives:* **Solar Energy: Roadblocks and Possibilities for the Future,** 9:00 to 10:00 am, p. 14	**The Craft of Scientific Presentations: a Workshop on Technical Presentations,** 8:30 am to 12:30 pm, p.22	*Special Panel/Workshop:* **Atmospheric and Environmental Remote Sensing Data Processing and Utilization: Perspective on Calibration/Validation Initiatives and Strategies,** in conjunction with Conf. 6301, 3:50 to 4:50 pm, p. 19
	Solid State Lighting Plenary, 1:00 to 1:50 pm, p. 8	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	**Essential Interpersonal Skills for Technical Professionals,** 8:30 am to 5:30 pm, p. 21	
	Solar Energy Plenary, 1:30 to 5:30 pm, p. 9	**Fellows Luncheon,** 12:00 to 2:00 pm, p. 5	*Industry Perspectives:* **Nanotechnology Marketplace,** 9:00 to 9:30 am, p. 16	**SPIE Women in Optics Presentation and Reception,** 4:00 to 5:30 pm, p.6
	Poster Session, 6:00 to 7:30 pm, p. 6	*Industry Perspectives:* **Solid State Lighting,** 12:30 to 1:15 pm, p. 15	*Industry Perspectives:* **Engineering Public/Private Partnerships,** 9:00 to 10:00 am, p. 16	
	All-Symposium Welcome Reception, 7:00 to 8:30 pm, p. 6	**Future of Imaging Plenary Session,** 1:00 to 2:20 pm, p. 13	*Industry Perspectives:* **High-Brightness LEDs,** 12:30 to 1:15 pm, p. 15	
	Panel: **Life in the Cosmos,** 8:00 to 9:30 pm, p.17	**Annual General Meeting of the SPIE Corporation,** 6:00 to 7:00 pm, p. 4	**SPIEWorks Career Fair,** 10:00 am to 5:00 pm, p. 20	
	Illumination Technical Group, 8:00 to 10:00 pm, p. 17	**SPIE Members Reception,** 7:00 to 8:30 pm, p.5	*Special Program:* Conf. 6285 **The Nature of Light: Light in Nature** *(Creath)* 1:30 to 5:10 pm, p. 42	
	Adaptive Optics Technical Group, 8:00 to 10:00 pm, p. 18	*Workshop:* **X-Ray Mirror Optics,** 8:00 to 9:00 pm, p. 17	**The Craft of Scientific Writing: A Workshop On Technical Writing,** 1:30 to 5:30 pm, p. 23	
		Poster/Demo Session, 8:00 to 10:00 pm, p. 6	**Poster Session,** 5:30 to 7:00 pm, p. 6	
		Lens Design Technical Group, 8:00 to 10:00 pm, p. 18	**SPIE's 2006 Annual Awards Banquet,** Banquet and Awards presentations, 7:30 pm, p. 5	
		Nanotechnology Technical Group, 8:00 to 10:00 pm, p. 18		
		Optical Materials and Optics Fabrication Technical Group, 8:00 to 10:00 pm, p. 19		
		Optics in Information Systems Technical Group, 8:00 to 10:00 pm, p. 19		
		Optomechanical/Instrument Technical Group, 8:00 to 10:00 pm, p. 19		
		Penetrating Radiation Technical Group, 8:00 to 10:00 pm, p. 19		

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Sixth International Conference on Solid State Lighting

Conference Chairs: **Ian T. Ferguson**, Georgia Institute of Technology; **Nadarajah Narendran**, Rensselaer Polytechnic Institute; **Tsunemasa Taguchi**, Yamaguchi Univ. (Japan); **Ian E. Ashdown**, TIR Systems Ltd. (Canada)

Program Committee: **Srinath K. Aanegola**, GELcore LLC; **Andrew A. Allerman**, Sandia National Labs.; **William J. Cassarly**, Optical Research Associates; **Lianghui Chen**, Institute of Semiconductors (China); **Makarand H. Chipalkatti**, OSRAM Opto Semiconductors Inc.; **Steven P. DenBaars**, Univ. of California/Santa Barbara; **Kevin J. Dowling**, Color Kinetics Inc.; **Ivan Eliashevich**, EMCORE Corp.; **Volker K. Härle**, OSRAM Opto Semiconductors GmbH (Germany); **Stephen G. Johnson**, Lawrence Berkeley National Lab.; **Bernd Keller**, CREE Lighting; **Asif M. Khan**, Univ. of South Carolina; **Michael R. Krames**, Lumileds Lighting, LLC; **Yung-Sheng Liu**, Industrial Technology Research Institute (Taiwan); **Shuji Nakamura**, Univ. of California/Santa Barbara; **Seong-Ju Park**, Gwangju Institute of Science and Technology (South Korea); **Yongjo Park**, SAMSUNG Advanced Institute of Technology (South Korea); **Yoon-Soo Park**, Seoul National Univ. (South Korea); **Robert V. Steele**, Strategies Unlimited; **Brent K. Wagner**, Georgia Institute of Technology

Monday 14 August

SESSION 1

Solid State Lighting Plenary Session

Conv. Ctr. Room 6B . . . . . Mon. 1:00 to 1:50 pm

Chair: **Ian T. Ferguson**, Georgia Institute of Technology

1:00 pm: **More Light for a Brighter Future: GaN *(Invited Paper, Presentation Only)*,** Volker K. Härle, OSRAM Opto Semiconductors GmbH (Germany) . . . . . [6337-101]

SESSION 2

Conv. Ctr. Room 6B . . . . . Mon. 1:50 to 3:30 pm

LEDs/OLEDs for Solid State Lighting: Joint Session with Conference 6333

Chair: **Anil R. Duggal**, GE Global Research

1:50 pm: **Low-cost OLEDs for general illumination,** J. Liu, L. N. Lewis, A. R. Duggal, GE Global Research . . . . . [6333-20]

2:15 pm: **Highly efficient white color PLEDs for solid state lighting and displays,** Y. Yang, J. Huang, Univ. of California/Los Angeles . . [6333-21]

2:40 pm: **Organic light-emitting diode (OLED) and its application to lighting devices,** N. Ide, T. Komoda, Matsushita Electric Works, Ltd. (Japan); J. Kido, Yamagata Univ. (Japan) . . . . . [6333-22]

3:05 pm: **Phosphorescent organic light-emitting devices for white lighting applications,** B. W. D'Andrade, M. S. Weaver, J. J. Brown, Universal Display Corp. . . . . [6333-23]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 3

Conv. Ctr. Room 6B . . . . . Mon. 4:00 to 6:00 pm

White Electroluminescence: Joint Session with Conference 6333

Chair: **Linda S. Sapochak**, Pacific Northwest National Lab.

4:00 pm: **Molecular design strategies for white electroluminescence,** S. Y. Park, Seoul National Univ. (South Korea) . . . . . [6333-24]

4:25 pm: **White light and color tuning of OLED with phosphorous and fluorescent materials by solution process,** Y. Ohmori, Y. Hino, H. Kajii, Osaka Univ. (Japan) . . . . . [6333-25]

4:50 pm: **White organic light-emitting diodes with high efficiency,** K. Walzer, G. Schwartz, K. Fehse, K. Leo, Technische Univ. Dresden (Germany) . . . . . [6333-26]

5:15 pm: **Solution processed full-color polymer OLED displays and white solid state lighting devices fabricated by direct lithography,** M. Gather, A. Köhnen, K. Meerholz, Univ. zu Köln (Germany); A. Falcou, H. Becker, Merck OLED Materials GmbH (Germany) . . . . . [6333-27]

5:30 pm: **Accurate colorimetric feedback for RGB LED clusters,** K. Man, I. E. Ashdown, TIR Systems Ltd. (Canada) . . . . . [6337-01]

5:45 pm: **Electroluminescent devices from ionic transition metal complexes for lighting applications,** J. Slinker, J. Rivnay, J. A. DeFranco, D. A. Bernards, S. Flores-Torres, Cornell Univ.; M. Lowry, Princeton Univ.; L. Soltzberg, Simmons College; J. Kim, Univ. of Cambridge (United Kingdom); S. Bernhard, Princeton Univ.; R. H. Friend, Univ. of Cambridge (United Kingdom); H. D. Abruna, G. G. Malliaras, Cornell Univ. . [6333-28]

Illumination Technical Group

Marriott Solana . . . . . Mon. 8:00 to 10:00 pm

Chair: **R. John Koshel,** Lambda Research Corp.

Following the speakers and other agenda items the floor will be open for our traditional "Problems and Solutions Workshop" session so bring some challenges for the group.

The primary topic for this meeting is "Challenges and Examples of Fabricated Illumination Optics." Speakers from industry will talk about the issues associated with the design, optimization, and tolerancing of illumination systems and components that are ultimately manufactured. While the illumination industry is growing rapidly, especially with the incorporation of novel scientific techniques and new sources, the fabrication of the systems and components has to contend with demands of minimal cost, fabrication error (e.g., sinks or warping in injection-molded parts), and source variation. Some samples of manufactured illumination systems (production, prototype, or limited run) will be shown. For example,

Bill Cassarly (Optical Research Associates) will discuss and show "Rippled Mixers for Uniformity." Uniformity remains a central topic in illumination system design and mixing rods provide an effective means to providing uniformity. Typically, flux enters one end of a mixing rod and the flux exiting the other end provides improved spatial and/or angular uniformity. We investigate the use of mixing rods with rippled surface structures to provide enhanced uniformity.

The presenters will highlight the issues that they encountered during the design and fabrication processes. Bill and other speakers will show their optics in an informal environment that encourages questions. Systems range from lightpipes to luminaires to displays. If you would like to participate, please contact John Koshel via email (jkoshel@lambdares.com) or at the meeting. It is advised to contact him sooner rather than later due to the limited time slots available. At the end of the planned topic for the meeting, the floor will be opened to the audience to present other illumination results, trends, or questions. By attending this Illumination Technical Group meeting, you will hear and see state-of-the-art technology and concerns from the illumination community! Light refreshments will be served. We look forward to seeing you there.

Tuesday 15 August

Opening Remarks

Conv. Ctr. Room 6B . . . . . Tues. 8:25 to 8:30 am

Ian T. Ferguson, Georgia Institute of Technology

SESSION 4

Conv. Ctr. Room 6B . . . . . Tues. 8:30 to 10:20 am

Nitride Materials

Chair: **Tsunemasa Taguchi**, Yamaguchi Univ. (Japan)

8:30 am: **Highly efficient InGaN vertical LED on metal alloy substrate from near UV to green color for solid state lighting application *(Invited Paper)*,** C. A. Tran, C. F. Chu, C. C. Chen, W. H. Liu, H. C. Chen, C. I. Chu, F. H. Fan, J. K. Yen, T. T. Doan, SemiLEDs Corp. . . . . [6337-02]

9:00 am: **Efficient orange light-emitting diodes based on InGaN/GaN quantum-well structures,** C. Huang, T. Tang, J. Huang, W. Shiao, C. Yang, National Taiwan Univ. (Taiwan) . . . . . [6337-03]

9:20 am: **AlInGaN-based vertical light-emitting diodes on metal alloy substrate,** C. Cheng, C. Chu, W. Liu, J. Chu, H. Cheng, F. Fan, J. Yen, Semi-Photonics Co., Ltd. (Taiwan); C. A. Tran, T. Doan, SemiLEDs Corp. . . . . [6337-04]

9:40 am: **Developing a chronobiological understanding of solid state lighting,** C. Liu, N. M. Bullock, G. Tosini, Morehouse School of Medicine; L. H. Howe, D. B. Nicol, N. Li, I. T. Ferguson, Georgia Institute of Technology . . . . . [6337-64]

10:00 am: **A thermally stable and highly reflective AgAl alloy for GaN flip-chip light-emitting diodes,** J. Kim, Gwangju Institute of Science and Technology (South Korea) and SAMSUNG Electro-Mechanics Co., Ltd. (South Korea); G. Ha, M. Kwon, S. Park, Gwangju Institute of Science and Technology (South Korea); J. Yang, K. Min, G. Park, SAMSUNG Electro-Mechanics Co., Ltd. (South Korea) . . . . . [6337-06]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 5

Conv. Ctr. Room 6B . . . . . Tues. 10:50 am to 12:20 pm

Generation of White Light

Chair: **Volker K. Härle**, OSRAM Opto Semiconductors GmbH (Germany)

10:50 am: **P-type doping and electroluminescence for ZnO *(Invited Paper)*,** D. P. Norton, Y. Li, J. M. Erie, H. Kim, S. J. Pearton, F. Ren, H. Wang, J. Chen, Univ. of Florida . . . . . [6337-56]

11:20 am: **White-light generation based on an InGaN/GaN quantum-well blue/green light-emitting diode and absorption/reemission of CdSe/ZnS nanocrystals,** H. Chen, D. Yeh, C. Lu, C. Huang, W. Shiao, J. Huang, C. Yang, National Taiwan Univ. (Taiwan) . . . . . [6337-07]

11:40 am: **Cadmium selenide nanocrystals as white-light phosphors,** J. D. Gosnell, M. A. Schreuder, S. J. Rosenthal, S. M. Weiss, Vanderbilt Univ. . . . . [6337-08]

12:00 pm: **Structured nanocrystals and nanocomposites for white-light emission,** J. R. DiMaio, B. Kokuoz, J. M. Ballato, Clemson Univ. [6337-09]

Lunch/Exhibition Break . . . . . 12:20 to 1:30 pm

SESSION 6

Conv. Ctr. Room 6B . . . . . Tues. 1:30 to 3:00 pm

Performance Optimization of LEDs

Chair: **Ian E. Ashdown**, byHeart Consultants Ltd. (Canada)

1:30 pm: **Light-emitting diode structures for high extraction efficiency *(Invited Paper)*,** H. Jeon, Seoul National Univ. (South Korea) . . [6337-60]

2:00 pm: **Optical and structural investigation on InGaN/GaN multiple quantum well light-emitting diodes grown by metalorganic chemical vapor deposition,** Z. C. Feng, H. Tsai, J. Chen, J. C. Wang, J. Yang, National Taiwan Univ. (Taiwan); P. Li, C. Wetzel, T. Detchprohm, J. S. Nelson, Uniroyal Optoelectronics . . . . . [6337-10]

2:20 pm: **Light extraction enhancement of InGaN MQW by reducing total internal reflection through surface plasmon effect,** C. Lee, D. L. Wang, C. Chen, J. Y. Chang, National Central Univ. (Taiwan); L. Wu, Formosa Epitaxy Inc. (Taiwan) . . . . . [6337-11]

2:40 pm: **Silicone materials for LED packaging,** M. Bahadur, A. W. Norris, Dow Corning Corp.; M. Yoshitake, Dow Corning Toray Co., Ltd. . . . . [6337-13]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 7

Conv. Ctr. Room 6B . . . . . Tues. 3:30 to 5:20 pm

White Light Generation

Chair: **Seong-Ju Park**, Gwangju Institute of Science and Technology (South Korea)

3:30 pm: **Recent progress of UV-pumped white LED *(Invited Paper)*,** C. Sone, J. Cho, J. S. Im, S. Yoon, J. W. Lee, H. Kim, J. Kim, K. Baik, H. K. Kim, Y. Kim, K. Kim, J. Jeong, B. Min, Y. Park, SAMSUNG Advanced Institute of Technology (South Korea) . . . . . [6337-14]

4:00 pm: **Design optimization and experimental verification of white-light-emitting diodes using multiple phosphor films,** D. Kan, National Taiwan Univ. (Taiwan); E. Wu, Hong Kong Applied Science and Technology Research Institute Co. Ltd. (Hong Kong China); D. Wang, National Taiwan Univ. (Taiwan) . . . . . [6337-15]

4:20 pm: **White LEDs and modules in chip-on-board technology for general lighting,** P. Hartmann, Tridonic Optoelectronics GmbH (Austria) . . . . . [6337-16]

4:40 pm: **Performance of white LED systems due to different dimming methods,** Y. Gu, N. Narendran, T. Dong, H. Wu, Rensselaer Polytechnic Institute . . . . . [6337-17]

5:00 pm: **Performance of white PC LEDs based on near-UV chips,** E. Radkov, GELcore LLC . . . . . [6337-18]

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Coherent lamp,** A. Rahmani Nejad, Civil Aviation Organization (Iran) . . . . . [6337-44]

✔ **The effect of packaging process on thermal behavior of light-emitting devices,** H. K. Kim, Y. Kim, SAMSUNG Advanced Institute of Technology (South Korea) . . . . . [6337-46]

✔ **The analysis of light extraction efficiency of GaN-based LEDs with a novel microcavity,** J. Chang, National Ctr. for High Performance Computing (Taiwan); L. Liao, C. Hwang, National Cheng Kung Univ. (Taiwan) . . . . . [6337-47]

✔ **Thermal modeling and performance of LED packaging for illuminating device,** G. Sheu, F. Hwu, C. Cheng, J. Chen, National Central Univ. (Taiwan) . . . . . [6337-48]

✔ **Evaluation of inorganic and organic light-emitting diode displays for signage application,** P. Sharma, H. L. Kwok, Univ. of Victoria (Canada) . . . . . [6337-50]

✔ **Reducing lighting energy use in retail windows,** J. P. Freyssinier, D. Frering, J. Taylor, N. Narendran, P. Rizzo, Rensselaer Polytechnic Institute . . . . . [6337-51]

✔ **Luminance recommendations for lighted signage,** J. P. Freyssinier, N. Narendran, J. D. Bullough, Rensselaer Polytechnic Institute . [6337-52]

✔ **Light extraction simulation with ray tracing and vector analysis,** T. Lee, C. Sun, National Central Univ. (Taiwan) . . . . . [6337-54]

Wednesday 16 August

SESSION 8

Conv. Ctr. Room 6B . . . . . Wed. 8:30 to 10:20 am

Fabrication Improvements for LEDs

Chair: **Andrew A. Allerman**, Sandia National Labs.

8:30 am: **Measuring color quality of light sources *(Invited Paper)*,** W. Davis, National Institute of Standards and Technology . . . . . [6337-19]

9:00 am: **2D photonic crystal patterning for high-volume LED manufacturing,** R. R. Hershey, D. L. LaBrake, M. Miller, C. Jones, Molecular Imprints, Inc. . . . . [6337-20]

9:20 am: **Use of the Crawford transformation in evaluation of spectral background efficiency of LED light sources,** H. Zwick, U.S. Army Medical Research Detachment; P. E. Edsall, Northrop Grumman Corp.; L. Hare, J. W. Ness, U.S. Military Academy . . . . . [6337-21]

9:40 am: **Improved reliability of GaN-based light-emitting diodes by selective wet etching of p-GaN,** G. Ha, T. Park, J. Kim, M. Kwon, S. Na, S. Park, Gwangju Institute of Science and Technology (South Korea); S. Myoung, K. Min, G. Park, SAMSUNG Electro-Mechanics Co., Ltd. (South Korea) . . . . . [6337-22]

10:00 am: **Demonstration of dual-wavelength GaN LEDs using a TRMAR structure,** X. Guo, Q. Lin, X. L. Gu, L. M. Dong, G. Shen, Beijing Univ. of Technology (China); K. L. Wang, Univ. of California/Los Angeles . . . . . [6337-23]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 9

Conv. Ctr. Room 6B . . . . . Wed. 10:50 am to 12:20 pm

Performance Optimization of LEDs

Chair: **Edward D. Petrow**, Lincoln Technical Services, Inc.

10:50 am: **Color tunable LED spot lighting *(Invited Paper)*,** C. G. A. Hoelen, J. Ansems, P. Deurenberg, W. van Duijneveldt, Philips Lighting B.V. (Netherlands); K. van Os, Philips Applied Technologies (Netherlands); M. Peters, Philips Lighting B.V. (Netherlands); P. J. Schmidt, Philips Research Labs. (Germany); G. Steenbruggen, T. Treurniet, A. Valster, J. ter Weeme, Philips Lighting B.V. (Netherlands) . . . . . [6337-57]

11:20 am: **Stability and performance evaluation of high-brightness light-emitting diodes under DC and pulsed bias conditions,** M. Meneghini, S. Buso, G. Spiazzi, L. R. Trevisanello, G. Meneghesso, E. Zanoni, Univ. degli Studi di Padova (Italy) . . . . . [6337-24]

11:40 am: **Investigation of the optical properties of YAG:Ce phosphor at different wavelengths,** Y. Zhu, N. Narendran, Y. Gu, Rensselaer Polytechnic Institute . . . . . [6337-25]

12:00 pm: **Frequency mixing processes in FA center systems,** M. H. Majles Ara, Teacher Training Univ. (Iran) . . . . . [6337-26]

Lunch/Exhibition Break . . . . . 12:20 to 1:30 pm

SESSION 10

Conv. Ctr. Room 6B . . . . . Wed. 1:30 to 3:00 pm

Characterization of LEDs

Chair: **Nadarajah Narendran**, Rensselaer Polytechnic Institute

1:30 pm: **Thermal analysis and design of high power LED packages and systems *(Invited Paper)*,** M. Shin, Myongji Univ. (South Korea) . . . . . [6337-27]

2:00 pm: **Characterizing thermal resistance coefficient of high-power LED devices,** L. Jayasinghe, Y. Gu, N. Narendran, Rensselaer Polytechnic Institute . . . . . [6337-28]

2:20 pm: **Extended parallel pulse code modulation of LEDs,** I. E. Ashdown, TIR Systems Ltd. (Canada) . . . . . [6337-29]

2:40 pm: **Lighting simulations using smoothed LED profiles compared with measured profiles,** C. A. Deller, J. B. Franklin, G. B. Smith, Univ. of Technology/Sydney (Australia) . . . . . [6337-30]

Coffee Break . . . . . 3:00 to 3:30 pm

SESSION 11

Conv. Ctr. Room 6B . . . . . Wed. 3:30 to 5:00 pm

Growth Structures for LEDs

Chair: **Ivan Eliashevich**, EMCORE Corp.

3:30 pm: **Efficiency enhancement of 400-nm violet LEDs utilizing island-like GaN thick film by HVPE technology *(Invited Paper)*,** J. Tsay, Industrial Technology Research Institute (Taiwan) . . . . . [6337-05]

4:00 pm: **MOCVD growth of GaN on ZnO,** N. Li, E. Park, Y. Huang, Georgia Institute of Technology; J. Nause, CERMET, Inc.; I. T. Ferguson, Georgia Institute of Technology and CERMET, Inc. . . . . [6337-63]

4:20 pm: **White photoluminescence from SiN_x films prepared by plasma enhanced chemical vapor deposition,** Z. Kang, B. K. Wagner, J. Parrish, C. J. Summers, Georgia Institute of Technology . . . . . [6337-31]

4:40 pm: **High thermal stable Ni/Ag(Al) alloy contact to p-GaN,** C. L. Lin, C. H. Chou, C. Liu, National Central Univ. (Taiwan) . . . . . [6337-32]

Thursday 17 August

SESSION 12

Conv. Ctr. Room 6B . . . . . Thurs. 8:30 to 10:20 am

Lighting Applications

Chair: **Robert V. Steele**, Strategies Unlimited

8:30 am: **Lighting trends and challenges for the aviation market *(Invited Paper)*,** J. M. Singer, S. R. Mangum, J. L. Lundberg, Honeywell Lighting and Electronics . . . . . [6337-58]

9:00 am: **Geometrical lighting system using Hex-gamut soft program based on RGBCYV multiphosphor emissions under the near-UV LED excitation,** Y. Uchida, T. Taguchi, Yamaguchi Univ. (Japan) . . . [6337-34]

9:20 am: **Polychromatic optical feedback: control, stability, and dimming,** S. Robinson, I. E. Ashdown, TIR Systems Ltd. (Canada) . . . . . [6337-35]

9:40 am: **Driving platform for OLED lighting investigations,** U. Vogel, A. Elgner, D. Kreye, J. Amelung, M. Scholles, Fraunhofer-Institut für Photonische Mikrosysteme (Germany) . . . . . [6337-36]

10:00 am: **Lightguide with controlled numerical aperture for general illumination,** T. R. M. Sales, S. Chakmakjian, D. J. Schertler, G. M. Morris, RPC Photonics, Inc. . . . . [6337-37]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 13

Conv. Ctr. Room 6B . . . . . Thurs. 10:50 am to 12:20 pm

Optimization of LEDs

Chair: **Yoon-Soo Park**, Seoul National Univ. (South Korea)

10:50 am: **Photonic crystals for enhanced efficiency of blue and green InGaN LEDs *(Invited Paper)*,** A. J. Fischer, D. D. Koleske, G. R. Hadley, J. R. Wendt, R. J. Shul, Sandia National Labs.; J. J. Wierer, M. R. Krames, Lumileds Lighting, LLC . . . . . [6337-61]

11:20 am: **A novel solid state general illumination source,** D. B. Nicol, M. Wang, S. Gupta, N. Li, C. Summers, I. T. Ferguson, Georgia Institute of Technology . . . . . [6337-62]

11:40 am: **Bridge light replacement study using high-flux LEDs,** J. W. Curran, S. P. Keeney, Dialight Corp. . . . . [6337-39]

12:00 pm: **Binning and filtering: the six-color solution,** I. E. Ashdown, TIR Systems Ltd. (Canada) . . . . . [6337-40]

Lunch/Exhibition Break . . . . . 12:20 to 1:50 pm

SESSION 14

Conv. Ctr. Room 6B . . . . . Thurs. 1:50 to 3:40 pm

Application of LEDs

Chair: **Ian T. Ferguson**, Georgia Institute of Technology

1:50 pm: **Recent progress of near-UV based high-Ra warm-white and greenish-white LEDs, and its medical applications *(Invited Paper)*,** T. Taguchi, Yamaguchi Univ. (Japan) . . . . . [6337-59]

2:20 pm: **Life testing of high-brightness LEDs relative to application environment,** J. L. Lundberg, S. R. Mangum, J. M. Singer, Honeywell Lighting and Electronics . . . . . [6337-38]

2:40 pm: **LED light fixture for parking garages,** J. P. Peck, Dialight Corp. . . . . [6337-41]

3:00 pm: **LED luminaire with controlled light distribution,** T. R. M. Sales, S. Chakmakjian, D. J. Schertler, G. M. Morris, RPC Photonics, Inc. . . . . [6337-42]

3:20 pm: **Color temperature tunable white-light LED system,** I. Speier, M. Salsbury, TIR Systems Ltd. (Canada) . . . . . [6337-43]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC011 **Design of Efficient Illumination Systems** (Cassarly) Tues. 15 Aug., 8:30 am to 12:30 pm

SC388 **Non-Imaging Optics** (Winston) Tues. 15 Aug., 1:30 to 5:30 pm

SC657 **Accurate Measurement of LED Optical Properties** (Tirpak) Weds. 16 Aug., 1:30 to 5:30 pm

SC770 **Solid State Lighting II** (Ferguson) Mon. 14 Aug., 8:30 am to 12:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

SC799 **Solid State Lighting Phosphors** (Summers) Mon. 14 Aug., 1:30 to 5:30 pm

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Nonimaging Optics and Efficient Illumination Systems III

Conference Chairs: **Roland Winston**, Univ. of California/Merced; **Pablo Benítez**, Univ. of California/Merced and Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC

Program Committee: **William J. Cassarly**, Optical Research Associates; **Philip L. Gleckman**, Idealab Capital Partners; **Jeffrey M. Gordon**, Ben-Gurion Univ. of the Negev (Israel); **Anurag Gupta**, Optical Research Associates; **Douglas A. Kirkpatrick**, Defense Advanced Research Projects Agency; **R. John Koshel**, Lambda Research Corp.; **Kenneth K. Li**, Wavien, Inc.; **Juan C. Miñano**, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC; **Holger Moench**, Philips Research Labs. (Germany); **Narkis E. Shatz**, Science Applications International Corp.; **John F. Van Derlofske**, Rensselaer Polytechnic Institute

Sunday 13 August

SESSION 1

Conv. Ctr. Room 6B . . . . . Sun. 8:30 to 10:05 am

Fundamentals

Chair: **Roland Winston**, Univ. of California/Merced

8:30 am: **Etendue and optical system design *(Invited Paper)*,** S. A. Lerner, B. Dahlgren, Hewlett-Packard Co. . . . . [6338-01]

9:05 am: **Physical modeling of tungsten filament lamps,** L. Fu, R. Leutz, H. Ries, Philipps-Univ. Marburg (Germany) . . . . . [6338-02]

9:25 am: **To split or not to split: case studies on Monte Carlo analysis of illumination ray tracing concerning the usefulness of ray splitting,** P. LeHouillier, Lambda Research Corp. . . . . [6338-03]

9:45 am: **String paradigm in nonimaging optics,** R. Winston, P. Benítez, Univ. of California/Merced . . . . . [6338-04]

Coffee Break . . . . . 10:05 to 10:35 am

SESSION 2

Conv. Ctr. Room 6B . . . . . Sun. 10:35 am to 12:30 pm

Design I

Chair: **Narkis E. Shatz**, Science Applications International Corp.

10:35 am: **Generalized functional method of nonimaging optical design,** J. C. Bortz, N. E. Shatz, Science Applications International Corp. . . . . [6338-05]

10:55 am: **High-order aspherics: application of the SMS nonimaging design method in imaging optics,** F. Muñoz, Light Prescriptions Innovators-Europe (Spain); P. Benítez, J. C. Miñano, Univ. Politécnica de Madrid (Spain) . . . . . [6338-06]

11:15 am: **Geodesic lenses applied to nonimaging optics *(Invited Paper)*,** J. C. Miñano, P. Benítez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators; F. García, D. Grabovickic, A. Santamaría, D. Pérez, Univ. Politécnica de Madrid (Spain) . . . . . [6338-07]

11:50 am: **Free-form illumination lenses designed by a pseudo-rectangular lawnmower algorithm,** W. A. Parkyn, D. G. Pelka, Tailored Optics, Inc. . . . . [6338-08]

12:10 pm: **Near-field dielectric optics near the thermodynamic limit,** J. M. Gordon, D. Feuermann, Ben-Gurion Univ. of the Negev (Israel); T. W. Ng, National Univ. of Singapore (Singapore) . . . . . [6338-23]

Lunch Break . . . . . 12:30 to 1:50 pm

SESSION 3

Conv. Ctr. Room 6B . . . . . Sun. 1:50 to 3:30 pm

Design II

Chair: **Pablo Benítez**, Univ. of California/Merced

1:50 pm: **Beam-shaping lenses in illumination optics,** T. W. Tukker, Philips Lighting B.V. (Netherlands) . . . . . [6338-09]

2:10 pm: **On the design of reflectors that produce a cut-off line with a given anisotropic source of light,** G. Kloos, Hella KGaA Hueck & Co. (Germany) . . . . . [6338-10]

2:30 pm: **Designing and calculating asymmetric reflectors for illumination tasks,** F. Zhao, Zumtobel Staff Lighting, Inc. . . . . [6338-11]

2:50 pm: **Multiple light recycling with the Carambola,** L. Fu, R. Leutz, H. Ries, Philipps-Univ. Marburg (Germany) . . . . . [6338-12]

3:10 pm: **Asymmetric dual paraboloid reflectors: improving system throughput by narrowing cone angles,** G. X. Ouyang, K. K. Li, Wavien, Inc. . . . . [6338-26]

Coffee Break . . . . . 3:30 to 4:00 pm

SESSION 4

Conv. Ctr. Room 6B . . . . . Sun. 4:00 to 5:20 pm

LED and Displays I

Chair: **William J. Cassarly**, Optical Research Associates

4:00 pm: **Color reproduction for LED-based general lighting,** B. A. Salters, M. C. P. M. Krijn, Philips Research Labs. (Netherlands) [6338-13]

4:20 pm: **No air gap high-efficiency LED collimators,** O. Dross, Light Prescriptions Innovators Europe (Spain); J. C. Miñano, P. Benítez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators Europe (Spain); J. C. Chaves, Light Prescriptions Innovators, LLC . . . . [6338-14]

4:40 pm: **Design considerations for a backlight with switchable viewing angles,** I. Fujieda, Y. Takagi, F. Rahadian, Ritsumeikan Univ. (Japan) . . . . . [6338-15]

5:00 pm: **A novel display metrology method for LED backlight system,** J. Chang, National Ctr. for High-Performance Computing (Taiwan); L. Liao, C. Hwang, National Cheng Kung Univ. (Taiwan) . . . . . [6338-16]

Symposium-Wide Plenary Presentation

Conv. Ctr. Room 6A . . . . . Sun. 5:40 to 7:00 pm

5:40 pm: **Nanotechnology: Managing Potential Risks in a Climate of Uncertainty**

Kristen M. Kulinowski, Executive Director for Public Policy of the Center for Biological and Environmental Nanotechnology (CBEN) and Faculty at Rice Univ.

6:20 pm: **Digital Cinema: Past, Present, and Future**

Bill Werner, Systems Engineering and Electronics Design Team Leader for DLP Cinema Development at Texas Instruments

See p. 7 for presentation overviews.

Monday 14 August

SESSION 5

Conv. Ctr. Room 6B . . . . . Mon. 8:30 to 10:05 am

LED and Displays II

Chair: **John F. Van Derlofske**, Rensselaer Polytechnic Institute

8:30 am: **LED illumination in etendue critical applications *(Invited Paper)*,** P. Duine, Philips Lighting B.V. (Netherlands) . . . . . [6338-17]

9:05 am: **Narrowing spectral width of green LED by GMR structure to expand the color mixing field,** S. Tu, Y. Lee, National Central Univ. (Taiwan); J. Sheu, National Cheng Kung Univ. (Taiwan); J. Chang, National Central Univ. (Taiwan) . . . . . [6338-18]

9:25 am: **Luminance enhancement of LED light sources for etendue-limited applications,** W. Falicoff, Light Prescriptions Innovators, LLC; P. Benítez, Light Prescriptions Innovators Europe (Spain); J. C. Chaves, Light Prescriptions Innovators, LLC; J. C. Miñano, Light Prescriptions Innovators Europe (Spain); W. A. Parkyn, Light Prescriptions Innovators, LLC; O. Dross, Light Prescriptions Innovators Europe (Spain) . . . . . [6338-19]

9:45 am: **Combination of light sources and light distribution using manifold optics,** J. C. Chaves, W. Falicoff, Light Prescriptions Innovators, LLC; O. Dross, J. C. Miñano, P. Benítez, Light Prescriptions Innovators Europe (Spain); W. A. Parkyn, Light Prescriptions Innovators, LLC[6338-20]

Coffee Break . . . . . 10:05 to 10:35 am

SESSION 6

Conv. Ctr. Room 6B . . . . . Mon. 10:35 to 11:50 am

Concentrators and Couplers

Chair: **R. John Koshel**, Lambda Research Corp.

10:35 am: **Very high-efficiency solar cells *(Invited Paper)*,** A. M. Barnett, Univ. of Delaware; D. A. Kirkpatrick, Defense Advanced Research Projects Agency; C. Honsberg, Univ. of Delaware . . . . . [6338-21]

11:10 am: **Solar internal lighting using optical collectors and fibers,** F. Francini, D. Fontani, D. Jafrancesco, L. Mercatelli, P. Sansoni, Istituto Nazionale di Ottica Applicata (Italy) . . . . . [6338-22]

11:30 am: **Feasibility of nonimaging optical concentrators for optical interconnect,** R. P. Dahlgren, J. A. Wysocki, K. D. Pedrotti, Univ. of California/Santa Cruz . . . . . [6338-24]

Lunch Break . . . . . 11:50 am to 1:00 pm

Solid State Lighting Plenary Session

Conv. Ctr. Room 6B . . . . . Mon. 1:00 to 1:50 pm

Chair: **Ian T. Ferguson**, Georgia Institute of Technology

1:00 pm: **More Light for a Brighter Future: GaN**, **Volker K. Härle**, OSRAM Opto Semiconductors GmbH (Germany)

See p. 8 for details.

Illumination Technical Group

Marriott Solana . . . . . Mon. 8:00 to 10:00 pm

Chair: **R. John Koshel,** Lambda Research Corp.

Following the speakers and other agenda items the floor will be open for our traditional "Problems and Solutions Workshop" session so bring some challenges for the group.

The primary topic for this meeting is "Challenges and Examples of Fabricated Illumination Optics." Speakers from industry will talk about the issues associated with the design, optimization, and tolerancing of illumination systems and components that are ultimately manufactured. While the illumination industry is growing rapidly, especially with the incorporation of novel scientific techniques and new sources, the fabrication of the systems and components has to contend with demands of minimal cost, fabrication error (e.g., sinks or warping in injection-molded parts), and source variation. Some samples of manufactured illumination systems (production, prototype, or limited run) will be shown. For example,

Bill Cassarly (Optical Research Associates) will discuss and show "Rippled Mixers for Uniformity." Uniformity remains a central topic in illumination system design and mixing rods provide an effective means to providing uniformity. Typically, flux enters one end of a mixing rod and the flux exiting the other end provides improved spatial and/or angular uniformity. We investigate the use of mixing rods with rippled surface structures to provide enhanced uniformity.

The presenters will highlight the issues that they encountered during the design and fabrication processes. Bill and other speakers will show their optics in an informal environment that encourages questions. Systems range from lightpipes to luminaires to displays. If you would like to participate, please contact John Koshel via email (jkoshel@lambdares.com) or at the meeting. It is advised to contact him sooner rather than later due to the limited time slots available. At the end of the planned topic for the meeting, the floor will be opened to the audience to present other illumination results, trends, or questions. By attending this Illumination Technical Group meeting, you will hear and see state-of-the-art technology and concerns from the illumination community! Light refreshments will be served. We look forward to seeing you there.

Tuesday 15 August

✔ Poster/Demo Session-Tuesday

Poster authors will begin displaying posters after 10:00 am Tuesday morning. A poster session and demo session, with authors present at their posters, will be held Tuesday evening from 8:00 to 10:00 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **The new design with mixing RGB LED (red, green, blue light-emitting diode) for modern LCD (liquid crystal displays) backlight system,** Y. Fang, C. Chang, C. Lee, National Kaohsiung First Univ. of Science and Technology (Taiwan) . . . . . [6338-25]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC011 **Design of Efficient Illumination Systems** (Cassarly) Tues. 15 Aug., 8:30 am to 12:30 pm
SC388 **Non-Imaging Optics** (Winston) Tues. 15 Aug., 1:30 to 5:30 pm
SC657 **Accurate Measurement of LED Optical Properties** (Tirpak) Weds. 16 Aug., 1:30 to 5:30 pm
SC770 **Solid State Lighting II** (Ferguson) Mon. 14 Aug., 8:30 am to 12:30 pm
SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm
SC799 **Solid State Lighting Phosphors** (Summers) Mon. 14 Aug., 1:30 to 5:30 pm

Solar Energy

Program on **Solar Energy**

Program Chair: **Ravi Durvasula,** GE Global Research

Sunday	Monday	Tuesday	Wednesday	Thursday
Conferences				
	6339 **High and Low Concentration for Solar Electric Applications** *(Symko-Davies)*, p. 200			
	6340 **Solar Hydrogen and Nanotechnology** *(Vayssieres)*, p.201			
Conferences of Related Interest:				
6286 **Advances in Thin-Film Coatings for Optical Applications III** *(Ellison)*, p. 44		6334 **Organic Photovoltaics VII** *(Kafafi)*, p. 151		
6321 **Nanophotonic Materials III** *(Gaburro/Cabrini)*, p. 142				
	6337 **Sixth International Conference on Solid State Lighting** *(Ferguson/Narendran/Taguchi/Ashdown)*, p. 193			
6338 **Nonimaging Optics and Efficient Illumination Systems III** *(Winston/Benítez)*, p. 197				
Courses				
SC497 **Nanophotonics** (Prasad), 1:30 to 5:30 pm	SC321 **Thin Film Optical Coatings** (Macleod), 8:30 am to 5:30 pm	SC014 **Introduction to Optomechanical Design** (Vukobratovich), 8:30 am to 5:30 pm		SC727 **Nanoplasmonics** (Stockman), 8:30 am to 5:30 pm
SC798 **Practical Radiometry** (Strojnik), 8:30 am to 5:30 pm	SC496 **Fabrication and Processing of Nanostructures** (Cao) , 8:30 am to 5:30 pm	SC011 **Design of Efficient Illumination Systems** (Cassarly), 8:30 am to 12:30 pm	SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi), 8:30 am to 12:30 pm	
		SC388 **Non-Imaging Optics** (Winston), 1:30 to 5:30 pm		
		SC608 **Photonic Crystals: A Crash Course in Designer Electromagnetism** (Johnson), 1:30 to 5:30 pm		
		SC655 **Introduction to Optical Tweezers and Optical Micromanipulation** (Dholakia, Spalding), 6:00 to 10:00 pm		
		SC781 **Optomechanical Analysis** (Hatheway), 8:30 am to 5:30 pm		
		SC797 **The Science and Technology of Organic Solar Cells** (McGehee), 1:30 to 5:30 pm		

Register for Courses onsites at the SPIE Registration Desk!

See full Special Events Daily Schedule on page 4.

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High and Low Concentration for Solar Electric Applications

Conference Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

Program Committee: **Andreas Bett**, Fraunhofer-Institut für Solare Energiesysteme (Germany); **Timothy J. Coutts**, National Renewable Energy Lab.; **Daniel J. Friedman**, National Renewable Energy Lab.; **Raed A. Sherif**, Spectrolab; **Richard Swanson**, Sunpower Corp.; **Roland Winston**, Univ. of California/Merced

Monday 14 August

Introduction

Conv. Ctr. Room 9 . . . . . Mon. 8:20 to 8:30 am

Martha Symko-Davies, National Renewable Energy Lab.

SESSION 1

Conv. Ctr. Room 9 . . . . . Mon. 8:30 to 10:00 am

CPV Systems

Chair: **Sarah R. Kurtz**, National Renewable Energy Lab.

8:30 am: **Optical design considerations for high-concentration photovoltaics *(Invited Paper)*,** V. Garboushian, Amonix Inc. . . [6339-01]

9:00 am: **Progress in the development of modular reflective concentrators for large-scale deployment,** S. Horne, G. Conley, SolFocus, Inc.; D. K. Fork, Palo Alto Research Ctr. . . . . [6339-02]

9:20 am: **Performance and reliability of a 30-kW triple-junction photovoltaic receiver for 500X concentrator dish or central receiver applications,** P. J. Verlinden, J. B. Lasich, Solar Systems Pty Ltd. (Australia) . . . . . [6339-03]

9:40 am: **Start-up of first 100 kW 3-sun PV system,** L. M. Fraas, JX Crystals, Inc. . . . . [6339-04]

Coffee Break . . . . . 10:00 to 10:30 am

SESSION 2

Conv. Ctr. Room 9 . . . . . Mon. 10:30 am to 12:10 pm

CPV Performance

Chair: **Raed A. Sherif**, SpectroLab, Inc.

10:30 am: **PV concentration system performance: impact of manufacturing errors of the optical system,** J. L. Alvarez Rico, J. Cabrera, V. Diaz, Isofoton (Spain) . . . . . [6339-06]

10:50 am: **Probing concentrator solar cell performance at high flux with localized irradiation,** E. A. Katz, W. Tassew, D. Feuermann, J. M. Gordon, Ben-Gurion Univ. of the Negev (Israel) . . . . . [6339-07]

11:10 am: **Second-generation PVCC design with a dielectric light injector and polyhedron interior cavity,** U. Ortabasi, United Innovations, Inc.; R. Winston, Univ. of California/Merced; S. Ellis, Photon Engineering, LLC . . . . . [6339-09]

11:30 am: **p-n Junction heterostructure device physics modeling of four junction solar cell under concentration,** M. J. Griggs, B. M. Kayes, H. A. Atwater, California Institute of Technology . . . . . [6339-10]

11:50 am: **Optical control of sunlight concentrators,** F. Francini, D. Fontani, D. Jafrancesco, L. Mercatelli, P. Sansoni, Istituto Nazionale di Ottica Applicata (Italy) . . . . . [6339-08]

Lunch Break . . . . . 12:10 to 1:30 pm

SESSION 3

Plenary Session on Solar Energy

Conv. Ctr. Room 6A . . . . . Mon. 1:30 to 5:30 pm

Chair: **Ravi Durvasula**, GE Global Research

1:30 pm: **Nanotechnology for Photovoltaics**, Loucas Tsakalakos, GE Global Research . . . . . [6339-101]

2:00 pm: **The Promise of Concentrator Photovoltaics Using High-Efficiency Multijunction Solar Cells**, Raed A. Sherif, Spectrolab, Inc. . . . . [6339-102]

2:30 pm: **High and Medium Concentration Photovoltaics Using III-V Multi-Junctions**, Daniel Aiken, EMCORE Corp. . . . . [6339-103]

3:00 pm: **The Path from Niche to Mainstream Supplier of Clean Energy**, Richard Swanson, Sunpower Corp. . . . . [6339-104]

Coffee Break . . . . . 3:30 to 4:00 pm

4:00 pm: **The Sustainable Hydrogen Economy**, John A. Turner, National Renewable Energy Lab. . . . . [6340-105]

4:45 pm: **Chemical Conversion of Solar Energy and Photocatalysis**, Akira Fujishima, Kanagawa Academy of Science and Technology (Japan) . . . . . [6340-106]

See p. 9 for details.

Coffee Break . . . . . 3:30 to 4:00 pm

✔ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm in Exhibit Hall B2. Light refreshments will be served. Poster authors, see page 241 for setup instructions.

✔ **Cylindrical linear focus optics for concentrator photovoltaics (CPV),** J. Avaliani, OPTICA (Georgia) . . . . . [6339-11]

✔ **Cooling and solar energy concentration effects on Ga-As PV cells temperature,** J. Avaliani, I. Kordzakhia, OPTICA (Georgia) . . [6339-12]

✔ **Design and modeling of a measuring device for the HAMLET concentrator,** D. Pérez, J. C. Miñano, P. Benítez, Univ. Politécnica de Madrid (Spain); M. Hernandez, Light Prescriptions Innovators, LLC (Spain); A. Cvetkovic, Univ. Politécnica de Madrid (Spain) . . [6339-14]

✔ **Modeling of multijunction solar cells by crosslight APSYS,** Z. Li, Y. Xiao, Z. Li, Crosslight Software Inc. (Canada) . . . . . [6339-15]

Monday-Thursday 14-17 August 2006 • Proceedings of SPIE Vol. 6340

Solar Hydrogen and Nanotechnology

Conference Chair: **Lionel Vayssieres**, National Institute for Materials Science (Japan)

Program Committee: **Hironori Arakawa**, Tokyo Univ. of Science (Japan); **Jan Augustynski**, Univ. de Genève (Switzerland); **Joe da Costa**, The Univ. of Queensland (Australia); **Maria L. Ghirardi**, National Renewable Energy Lab.; **Michael Graetzel**, École Polytechnique Fédérale de Lausanne (Switzerland); **Claude Levy-Clement**, Ctr. National de la Recherche Scientifique (France); **Yoshihiro Nakato**, Osaka Univ. (Japan); **Janusz Nowotny**, Univ. of New South Wales (Australia); **Ian C. Plumb**, Commonwealth Scientific & Industrial Research Organisation (Australia); **Pathiyamattom J. Sebastian**, Univ. Nacional Autónoma de México (Mexico); **Paulo S. Soares Guimarães**, Univ. Federal de Minas Gerais (Brazil); **John A. Turner**, National Renewable Energy Lab.; **T. Nejat Veziroglu**, The International Ctr. for Hydrogen Energy Technologies; **Gunnar Westin**, Uppsala Univ. (Sweden); **K. G. Upul Wijayantha**, Hydrogen Solar Ltd. (United Kingdom); **Jin Z. Zhang**, Univ. of California/Santa Cruz

Monday 14 August

SESSION 1

Conv. Ctr. Room 6E . . . . . Mon. 9:00 to 10:00 am

Modeling and Electronic Structure of Photocatalysts and Photocatalytic Reactions I

Chair: **Lionel Vayssieres**, National Institute for Materials Science (Japan)

9:00 am: **Electronic structure and surface characteristics of photocatalytic reactions on TiO_2 and doped TiO_2 nanoparticles *(Invited Paper)*,** L. Österlund, Swedish Defence Research Agency (Sweden) [6340-01]

9:40 am: **The surface stress and excited states of the water-adsorbed TiO_2 surface,** K. Yamashita, H. Kamisaka, The Univ. of Tokyo (Japan) [6340-02]

Coffee Break . . . . . 10:00 to 10:40 am

SESSION 2

Conv. Ctr. Room 6E . . . . . Mon. 10:40 am to 12:20 pm

Modeling and Electronic Structure of Photocatalysts and Photocatalytic Reactions II

Chair: **Lars Österlund**, Swedish Defence Research Agency (Sweden)

10:40 am: **Modeling of TiO_2 and doped-TiO_2 surfaces in contact with water for hydrogen generation *(Invited Paper)*,** K. M. E. Larsson, Uppsala Univ. (Sweden) . . . . . [6340-03]

11:20 am: **Understanding the electronic properties of hydrogen generation and storage materials with photon-in/photon-out soft-x-ray spectroscopy *(Invited Paper)*,** J. Guo, Lawrence Berkeley National Lab. . . . . [6340-04]

12:00 pm: **Water molecule adsorption properties on $BiVO_4$ surface,** M. Oshikiri, National Institute for Materials Science (Japan) . . . . . [6340-05]

Lunch Break . . . . . 12:20 to 1:30 pm

SESSION 3

Plenary Session on Solar Energy

Conv. Ctr. Room 6A . . . . . Mon. 1:30 to 5:30 pm

Chair: **Ravi Durvasula**, GE Global Research

1:30 pm: **Nanotechnology for Photovoltaics**, Loucas Tsakalakos, GE Global Research . . . . . [6339-101]

2:00 pm: **The Promise of Concentrator Photovoltaics Using High-Efficiency Multijunction Solar Cells**, Raed A. Sherif, Spectrolab, Inc. . . . . [6339-102]

2:30 pm: **High and Medium Concentration Photovoltaics Using III-V Multi-Junctions**, Daniel Aiken, EMCORE Corp. . . . . [6339-103]

3:00 pm: **The Path from Niche to Mainstream Supplier of Clean Energy**, Richard Swanson, Sunpower Corp. . . . . [6339-104]

Coffee Break . . . . . 3:30 to 4:00 pm

4:00 pm: **The Sustainable Hydrogen Economy**, John A. Turner, National Renewable Energy Lab. . . . . [6340-105]

4:45 pm: **Chemical Conversion of Solar Energy and Photocatalysis**, Akira Fujishima, Kanagawa Academy of Science and Technology (Japan) . . . . . [6340-106]

See p. 9 for details.

✔ Posters-Monday

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✔ **Effect of niobium segregation on surface properties of titanium dioxide,** L. Sheppard, J. Nowotny, T. Bak, M. Nowotny, C. C. Sorrell, Univ. of New South Wales (Australia) . . . . . [6340-39]

✔ **Defect disorder and semiconducting properties of titanium dioxide,** M. Nowotny, J. Nowotny, T. Bak, L. Sheppard, C. C. Sorrell, Univ. of New South Wales (Australia) . . . . . [6340-40]

✔ **Analytical methods development for supramolecular design in solar hydrogen production,** K. J. Brewer, J. R. Brown, M. Elvington, M. T. Mongelli, D. F. Zigler, Virginia Polytechnic Institute and State Univ. . . . . [6340-43]

Tuesday 15 August

SESSION 4

Conv. Ctr. Room 6E . . . . . Tues. 8:30 to 10:10 am

Synthesis of Advanced Nanostructures and Semiconductors I

Chair: **Lionel Vayssieres**, National Institute for Materials Science (Japan)

8:30 am: **One-dimensional oxide nanostructures: growth, applications, and devices *(Invited Paper)*,** S. Mathur, S. Barth, T. Ruegamer, J. Altmayer, Institut für Neue Materialien GmbH (Germany) . . . . . [6340-06]

9:10 am: **Template-based synthesis of Fe_2O_3 nanotubes and multilayered Fe_2O_3/TiO_2 nanotubes using atomic layer deposition,** M. Rooth, A. Johansson, M. Boman, A. Hårsta, Uppsala Univ. (Sweden)[6340-07]

9:30 am: **Synthesis and characterization of the optical and electric transport properties of metal oxide nanowires *(Invited Paper)*,** B. Chen, NASA Ames Research Ctr. . . . . [6340-08]

Coffee Break . . . . . 10:10 to 10:50 am

SESSION 5

Conv. Ctr. Room 6E . . . . . Tues. 10:50 to 11:50 am

Synthesis of Advanced Nanostructures and Semiconductors II

Chair: **Sanjay Mathur**, Institut für Neue Materialien GmbH (Germany)

10:50 am: **Solution processing of complex nanomaterials for photocatalysis *(Invited Paper)*,** G. Westin, Uppsala Univ. (Sweden) . . . . . [6340-09]

11:30 am: **Photothermal generation of inorganic nanotubes and fullerenes with concentrated sunlight,** A. Albu-Yaron, Weizmann Institute of Science (Israel); D. Feuermann, J. M. Gordon, E. A. Katz, Ben-Gurion Univ. of the Negev (Israel); M. Levy, R. Popovitz-Biro, R. Tenne, Weizmann Institute of Science (Israel) . . . . . [6340-10]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 6

Conv. Ctr. Room 6E . . . . . Tues. 1:30 to 3:10 pm

Solar Hydrogen at Titanium Dioxide Surfaces I

Chair: **Yasuhiro Tachibana**, Osaka Univ. (Japan)

1:30 pm: **Application of defect chemistry for engineering of photosensitive oxide semiconductors: example of titanium dioxide *(Invited Paper)*,** J. Nowotny, T. Bak, M. Nowotny, L. Sheppard, C. C. Sorrell, Univ. of New South Wales (Australia) . . . . . [6340-11]

2:10 pm: **Nanostructured thin films produced in flame aerosol reactors for photosplitting of water,** P. Biswas, E. Thimsen, Washington Univ. in St. Louis . . . . . [6340-12]

2:30 pm: **Solar hydrogen production by water splitting using TiO_2-based photoelectrodes *(Invited Paper)*,** H. Arakawa, C. Shiraishi, A. Takeuchi, T. Yamaguchi, Tokyo Univ. of Science (Japan) . . . . . [6340-13]

Coffee Break . . . . . 3:10 to 3:50 pm

SESSION 7

Conv. Ctr. Room 6E . . . . . Tues. 3:50 to 5:10 pm

Solar Hydrogen at Titanium Dioxide Surfaces II

Chair: **Hironori Arakawa**, Tokyo Univ. of Science (Japan)

3:50 pm: **Quantum dot sensitized semiconductors for solar energy conversion *(Invited Paper)*,** Y. Tachibana, H. Y. Akiyama, Osaka Univ. (Japan); T. Torimoto, Nagoya Univ. (Japan); S. Kuwabata, Osaka Univ. (Japan) . . . . . [6340-14]

4:30 pm: **Photo-electrochemical generation of hydrogen using hybrid titanium dioxide nanotube arrays *(Invited Paper)*,** M. Misra, V. Mahajan, K. S. Raja, S. Mahapatra, Univ. of Nevada/Reno . . . . . [6340-15]

Wednesday 16 August

SESSION 8

Conv. Ctr. Room 6E . . . . . Wed. 9:00 to 10:00 am

Solar Hydrogen at Tungsten Trioxide Surfaces

Chair: **Lionel Vayssieres**, National Institute for Materials Science (Japan)

9:00 am: **Nanostructured thin-film WO_3 photoanodes for solar water and sea-water splitting *(Invited Paper)*,** J. Augustynski, Univ. de Genève (Switzerland) . . . . . [6340-17]

9:40 am: **Use of amorphous silicon tandem junction solar cells for hydrogen production in a photoelectrochemical cell,** A. P. Stavrides II, A. Kunrath, J. Hu, R. Treglio, A. Feldman, MVSystems, Inc.; B. Marsen, B. Cole, E. Miller, Univ. of Hawai'i at Manoa; A. Madan, Colorado School of Mines . . . . . [6340-18]

Coffee Break . . . . . 10:00 to 10:40 am

SESSION 9

Conv. Ctr. Room 6E . . . . . Wed. 10:40 am to 12:20 pm

Solar Hydrogen at Iron Oxide Surfaces I

Chair: **Jan Augustynski**, Univ. de Genève (Switzerland)

10:40 am: **Modifications to tungsten trioxide sol processing for improved solar energy conversion efficiency,** A. P. Finlayson, B. A. Glowacki, Univ. of Cambridge (United Kingdom) . . . . . [6340-19]

11:00 am: **Semiconductor photoanodes in the system Fe_2O_3-Nb_2O_5 for photoelectrochemical water splitting *(Invited Paper)*,** V. M. Aroutiounian, V. M. Arakelyan, G. E. Shahnazaryan, G. M. Stepanyan, Yerevan State Univ. (Armenia); J. A. Turner, H. Wang, National Renewable Energy Lab.[6340-20]

11:40 am: **Photoelectrochemical hydrogen production using nanostructured Fe_2O_3 electrodes *(Invited Paper)*,** J. A. Glasscock, P. R. F. Barnes, I. C. Plumb, Commonwealth Scientific and Industrial Research Organisation (Australia) . . . . . [6340-21]

Lunch/Exhibition Break . . . . . 12:20 to 2:00 pm

SESSION 10

Conv. Ctr. Room 6E . . . . . Wed. 2:00 to 3:00 pm

Solar Hydrogen at Iron Oxide Surfaces II

Chair: **Ian C. Plumb**, Commonwealth Scientific and Industrial Research Organisation (Australia)

2:00 pm: **1D confinement effect in hematite quantum rod arrays *(Invited Paper)*,** L. Vayssieres, National Institute for Materials Science (Japan) . . . . . [6340-22]

2:40 pm: **Optimizing charge transport in Fe_2O_3 films deposited on nanowire arrays,** P. R. F. Barnes, J. A. Glasscock, S. Wicks, P. N. Bonato, A. Bendavid, P. J. Martin, I. C. Plumb, Commonwealth Scientific and Industrial Research Organisation (Australia) . . . . . [6340-23]

Coffee Break . . . . . 3:00 to 3:20 pm

SESSION 11

Conv. Ctr. Room 6E . . . . . Wed. 3:20 to 5:40 pm

Solar Hydrogen at Advanced Nanocomposite Semiconductors

Chair: **Yoshihiro Nakato**, Osaka Univ. (Japan)

3:20 pm: **Hydrogen production from water on oxynitride photocatalysts *(Invited Paper)*,** K. Domen, K. Maeda, The Univ. of Tokyo (Japan) . . . . . [6340-24]

4:00 pm: **Electrodeposition of arrays of ZnO nanostructures and application to photoelectrochemical devices *(Invited Paper)*,** C. Levy-Clement, R. Tena-Zaera, J. Elias, A. Katty, Ctr. National de la Recherche Scientifique (France) . . . . . [6340-25]

4:40 pm: **Hydrogen generation from water using photoelectrochemical cells based on nanomaterials *(Invited Paper)*,** J. Z. Zhang, A. Wolcott, Univ. of California/Santa Cruz; Y. Zhao, The Univ. of Georgia . . [6340-26]

5:20 pm: **Core-shell nanorods for efficient photoelectrochemical hydrogen production,** Z. G. Yu, SRI International; C. E. Pryor, The Univ. of Iowa; W. H. Lau, Univ. of California/Santa Barbara; M. A. Berding, D. B. MacQueen, SRI International . . . . . [6340-27]

Thursday 17 August

SESSION 12

Conv. Ctr. Room 6E . . . . . Thurs. 8:00 to 10:00 am

Advanced Materials for Solar Hydrogen Generation

Chair: **Lionel Vayssieres**, National Institute for Materials Science (Japan)

8:00 am: **Solar water splitting with a composite silicon/metal oxide semiconductor electrode *(Invited Paper)*,** Y. Nakato, Osaka Univ. (Japan) . . . . . [6340-28]

8:40 am: **Solar hydrogen accumulation in a GaAs-metal hydrid photoelectrochemical cell *(Invited Paper)*,** Y. M. Solonin, D. B. Dan'ko, L. Shcherbakova, Institute for Problems in Materials Science (Ukraine) . . . . . [6340-29]

9:20 am: **Supramolecular complexes as photoinitiated electron collectors: applications in solar hydrogen production *(Invited Paper)*,** K. J. Brewer, M. Elvington, J. R. Brown, D. F. Zigler, Virginia Polytechnic Institute and State Univ. . . . . [6340-30]

Coffee Break . . . . . 10:00 to 10:40 am

SESSION 13

Conv. Ctr. Room 6E . . . . . Thurs. 10:40 to 11:40 am

Photobiological Generation of Hydrogen

Chair: **Karen J. Brewer**, Virginia Polytechnic Institute and State Univ.

10:40 am: **[FeFe]-hydrogenases and photobiological hydrogen production *(Invited Paper)*,** M. L. Ghirardi, P. King, K. Kim, National Renewable Energy Lab.; J. Cohen, K. Schulten, Univ. of Illinois at Urbana-Champaign; M. Seibert, National Renewable Energy Lab. . . . . [6340-31]

11:20 am: **Structural and functional investigations of biological catalysts for development of bio-hybrid H_2 production systems,** P. W. King, D. Svedruzic, M. L. Ghirardi, National Renewable Energy Lab.; K. Schulten, Univ. of Illinois at Urbana-Champaign; M. Seibert, National Renewable Energy Lab. . . . . [6340-44]

Lunch/Exhibition Break . . . . . 11:40 am to 1:00 pm

SESSION 14

Conv. Ctr. Room 6E . . . . . Thurs. 1:00 to 2:00 pm

Advanced Patterning Techniques and Nanodevices

Chair: **Gunnar Westin**, Uppsala Univ. (Sweden)

1:00 pm: **Dynamic shadow mask technique for device fabrication in UHV,** S. Egger, National Institute for Materials Science (Japan) . [6340-33]

1:20 pm: **Nanofabricated array catalysts,** H. You, Argonne National Lab. . . . . [6340-34]

1:40 pm: **Fabrication of efficient phocatalytic devices for H2 generation,** H. Lindstrom, L. Vayssieres, National Institute for Materials Science (Japan) . . . . . [6340-35]

SESSION 15

Conv. Ctr. Room 6E . . . . . Thurs. 2:00 to 3:40 pm

Solar Hydrogen Systems and Nanodevices

Chair: **Lionel Vayssieres**, National Institute for Materials Science (Japan)

2:00 pm: **Specifically engineered semiconductor thin-film electrodes in solar water splitting tandem cell™ *(Invited Paper)*,** K. G. U. Wijayantha, Hydrogen Solar Ltd. (United Kingdom); X. He, Hydrogen Solar LLC; A. Stevenson, Hydrogen Solar Ltd. (United Kingdom) . . . . . [6340-36]

2:40 pm: **Development of a 10-Kw PV-hydrogen system at the Energy Research Center, UNAM, Mexico *(Invited Paper)*,** P. J. Sebastian, A. S. Gamboa, J. Campos, A. Sanchez, J. Ortega, X. Mathew, Univ. Nacional Autónoma de México (Mexico) . . . . . [6340-37]

3:20 pm: **Solar hydrogen production: renewable hydrogen production by dry fuel reforming,** J. E. Bakos, Giffels Associates Ltd. (Canada) . . . . . [6340-38]

Courses of Related Interest

For course descriptions or to register go to the SPIE Registration Desk.

SC011 **Design of Efficient Illumination Systems** (Cassarly) Tues. 15 Aug., 8:30 am to 12:30 pm

SC014 **Introduction to Optomechanical Design** (Vukobratovich) Tues.-Weds. 15-16 Aug., 8:30 am to 5:30 pm

SC321 **Thin Film Optical Coatings** (Macleod) Mon. 14 Aug., 8:30 am to 5:30 pm

SC388 **Non-Imaging Optics** (Winston) Tues. 15 Aug., 1:30 to 5:30 pm

SC781 **Optomechanical Analysis** (Hatheway) Tues. 15 Aug., 8:30 am to 5:30 pm

SC796 **Allowable Stresses in Glass and Engineering Ceramics** (Pepi) Weds. 16 Aug., 8:30 am to 12:30 pm

SC797 **The Science and Technology of Organic Solar Cells** (McGehee) Tues. 15 Aug., 1:30 to 5:30 pm

SC798 **Practical Radiometry** (Strojnik) Sun. 13 Aug., 8:30 am to 5:30 pm

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Innovation Forum: Opportunities in Optics Instrumentation, Detectors, and Imaging from Eurasia

Wednesday, August 16
1:30-3:30pm
Exhibit Hall Forum

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Onsite Registration and Information Hours

San Diego Convention Center
Exhibition Hall A

Sunday 13 August . . . . . 7:00 am to 5:00 pm
Monday 14 August . . . . . 7:15 am to 5:00 pm
Tuesday 15 August . . . . . 7:30 am to 5:00 pm
Wednesday 16 August . . . . . 7:30 am to 5:00 pm
Thursday 17 August . . . . . 7:45 am 4:00 pm

Exhibition Hours

San Diego Convention Center
Exhibit Halls A & B1

Tuesday 15 August . . . . . 10:00 am to 5:00 pm
Wednesday 16 August . . . . . 10:00 am to 5:00 pm
Thursday 17 August . . . . . 10:00 am to 2:00 pm

Speaker Audiovisual Desk / Preview Station

Convention Center Upper Level Foyer

Sunday through Thursday . . . . . 7:30 am to 5:00 pm

All Conference rooms will have an computer, LCD projector, screen, lapel microphone, and laser pointer. Speakers are requested to come to the Audiovisual Desk to confirm display compatibility prior to their presentation. Speakers that did not pre-request special audiovisual equipment are asked to stop at the Audiovisual Desk upon arrival to see if these special requests can be fulfilled.

Audio/Video/Digital Recording Policy
In the Meeting Rooms and Poster Sessions: For copyright reasons, recordings of any kind are strictly prohibited without prior written consent of the presenter in any conference session, short course or of posters presented. Each presenter being taped must file a signed written consent form. Individuals not complying with this policy will be asked to leave a given session and asked to surrender their film or recording media. Consent forms are available at the SPIE Audiovisual Desk.

In the Exhibition Hall: For security and courtesy reasons, photographing or videotaping individual booths and displays in the exhibit hall is allowed ONLY with explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their film and to leave the exhibit hall.

Coffee Breaks at the Convention Center

Complimentary coffee will be served twice each day of the conference at approximately 10:00 am and 3:00 pm. Please check the individual technical conference listings for exact times and locations.

Cash Refreshment Purchases

For attendee purchase of light refreshments, including continental breakfast, specialty carts will be set up throughout the convention center Sunday through Thursday. These carts will include: Café Express, Starbucks, Pretzel Cart, and Mrs. Fields Cookies, and will be open through the busiest portions of the day each day.

Quicklunch Coupons

Full conference technical registrants will receive one Quicklunch coupon redeemable for a lunch of specified value purchased one day - Tuesday, Wednesday or Thursday - at the designated Quicklunch area or concession outlet in the back of the Convention Center, Hall A. Coupons will be accepted from 11:30 am to 2:00 pm each day. Some restrictions apply. Please refer to the coupon in your registration packet.

Cash Lunches and Exhibition Concessions

A cash sandwich bar will be available in the convention center at Bayside West Café located on the Mezzanine Level on Sunday and Monday from 11:30 am to 2:00 pm. Visit the Food Court located in the back of the exhibition halls on Tuesday, Wednesday, and Thursday featuring Café Express and International Cuisine. They will serve hot and cold snacks, beverages, deli-type sandwiches, salads, a few hot entrees, and pastries and will be open daily 11:00 am to 2:00 pm.

Course Materials Desk

Located near the SPIE Registration Area

Open during Registration hours

If you have registered to attend a course, please stop by the Course Materials Desk AFTER you pick up your badge, to obtain your course notes and to find out where the class will be located. You may also get a copy of the latest Education Services catalog to see the many courses SPIE has available at symposia, on video and CD-ROM, and to discover the opportunities of customized In-Company courses.

SPIE Marketplace

Two Locations in the Convention Center:
Exhibition Hall B1 and Upper Level Foyer in front of Room 6A.

The SPIE Marketplace is your source for the latest SPIE Press books, Proceedings, and Educational and Professional Development materials. You can become a member of SPIE, explore the Digital Library, and take home a souvenir.

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Poster Sessions

Convention Center Exhibition Hall B2

Monday 14 August . . . . . 6:00 to 7:30 pm

Tuesday 15 August . . . . . 8:00 to 10:00 pm

Wednesday 16 August . . . . . 5:30 to 7:00 pm

Conference attendees are invited to attend the poster sessions on Monday, Tuesday, and Wednesday evening. Each evening will represent a different set of conferences. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions.

Poster Setup:
Poster presenters may set up between 10:00 am and 5:00 pm on the day of their assigned presentation. Poster presenters who have not set up by 5:00 pm on the day of their presentation will be considered a "no show" and their manuscript will not be published. Presenters must remove their posters immediately after the poster session. Posters not removed will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session.

Luggage/Package Storage and Coat Check

Convention Center Hall A Foyer

Sunday through Thursday, 7:30 am to 6:00 pm

Complimentary luggage/package and coat storage will be available to attendees.

Please note hours of operation. If you intend to stay later than closing time, you will need to claim your checked items before it closes.

SPIE Copy Center

Sunday through Thursday during registration hours San Diego Copy will provide a copy service during the week for symposium attendees. The rates are 5 cents per copy and $1 per transparency ($2.50 for color). The Copy Center will be located near registration.

Copy and Business Center

Fedex Kinko's is the in-house business center for the San Diego Convention Center. It is located inside Lobby D. The company provides small package Fedex shipping, packing supplies, B & W & color copying services, fax services and office supplies. Phone (619) 525-5450, Fax (619) 525-5477.

SPIE Message Center

The SPIE Message Center telephone number is (619) 525-6200. Messages will be taken during registration hours Sunday through Thursday. Please check the message board at the message center near SPIE registration daily to receive your messages.

Internet Access

Convention Center - Hall A/B Lobby

During registration hours Sunday through Thursday.

Multiple internet access terminals will allow attendees to access their internet e-mail during the conference. There will be a 10-minute time limit per each person's internet session.

Complimentary Internet Wireless Access

SPIE is pleased to provide complimentary wireless access to the Internet for all conference attendees bringing 802.11b wireless-enabled laptops or PDAs. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop.

Coverage locations and connection settings will be posted on-site.

Media Center

The on-site Media Center provides press conference facilities, refreshments, and convenient one-stop-shopping for press releases. Credentialed media are invited to communicate news via the provided telephone, and high-speed internet connections. Registration and exhibition fees are waived for working journalists and editors. You are encouraged to pre-register by e-mailing: name, organization, title, address, e-mail, and phone number to media@spie.org. For more information about SPIE media services, see http://spie.org/info/media.

Child Care

The San Diego Marriott Hotel & Marina does not provide child care services, however, a child sitting service is available in San Diego and recommended by the San Diego Marriott Hotel & Marina is:

Marion's Child Care,
email marionschildcare@gmail.com, within San Diego call (619) 303-4379, or 1-888-891-5029, www.hotelchildcare.com

SPIE does not imply an endorsement or recommendation of this service. It is provided on an "information only" basis for your further analysis and decision. Other services may be available.

Guest Hospitality Suite

Guests of attendees are invited to meet, relax, and enjoy a cup of coffee and breakfast breads in SPIE's Guest Hospitality Suite, located in the SPIE Suite 2573 of the San Diego Marriott Hotel and Marina. The hospitality room will be open Monday through Thursday from 8:30 to 10:00 am. This event is for guests of Optics & Photonics attendees only. The hotel concierge will be available during a portion of this time to answer travel, shopping, and tourist questions. This hospitality room is sponsored by SPIE.

Restaurant Reservations and Information Desk

The San Diego Convention Center Corporation operates a Restaurant Reservations and Information Desk in the Hall B lobby of the Convention Center. It will be open during the convention to assist attendees with restaurant, theater and sport information and reservations; shopping and sightseeing information. Many fine restaurants are located in the Gaslamp Quarter, downtown and along the waterfront of San Diego in close proximity to the Convention Center. The desk will be staffed Sunday through Thursday, during the convention from 9:00 am to 6:00 pm. If you wish to pre-plan your individual or group dining arrangements, you may call Laurie Peters at 619-525-5291.

San Diego Information and Entertainment

To help introduce you to all the wonderful attractions and events in San Diego, please check the website below for information and entertainment. To access this link, please visit SPIE Web at www.spie.org/events/op
or, www.seeyouinsandiego.com

Car Rental

Hertz Car Rental has been selected as the official car rental agency for this Symposium. To reserve a car, identify yourself as an Optics and Photonics Conference attendee using the Hertz Meeting Code CV# 029B0009. Call 1-800-654-2240.

Parking

(Note: All rates are subject to change)

Convention Center: For underground parking, the Convention Center parking entrance is at the north end of Harbor Drive off Convention Center Way. A special convention parking rate of $8 per day will be in effect at the San Diego Convention Center for the duration of the meeting. Exhibitors may purchase a parking permit at the parking office inside the garage which allows in and out privileges for move-in/move-out days only. Exhibitors should purchase their $8 parking ticket at the gate, proceed to the parking office inside, hand in the $8 parking ticket along with an additional $4 to receive the $12 Parking Pass (with in & out privileges only on move-in/move-out days). Exhibitor badge ID is necessary to obtain the permit. They are open from 5am to 11:00 pm, with no overnight parking. For further information contact Ace Parking at 619-237-0399.

San Diego Marriott Hotel & Marina: Marriott guest parking is $18 per night. Valet parking is $26

San Diego Marriott Gaslamp Quarter: Valet parking only $24 with in/out privileges.

Holiday Inn on the Bay: Self parking for guests: $18 for 24 hrs with in/out privileges
Valet parking for guests: $22 for 24 hrs with in/out privileges. Non-registered guests pay regular posted parking rate.

Embassy Suites: Valet $22, no self parking

Omni San Diego Hotel: Self $14, Valet $24. Valet has in/out privileges, Self does not.

Town & Country Resort & Convention Center: Complimentary parking will be available to guests who booked within the SPIE block. Guests who book through an outside hotel reservation service and outside the SPIE block will not receive complimentary parking.

Quality Inn & Suites: Parking is $9.00 overnight with in/out privileges.

Comfort Inn: Complimentary parking will be available to guests who book within the SPIE block.

High-Speed Internet in Hotel Guest Rooms

San Diego Marriott Hotel & Marina - Internet Access $9.95 + tax for 24 hours in guest rooms.

San Diego Marriott Gaslamp Quarter - Internet Access in guest rooms is $9.95 + tax for 24 hours, which includes local calls and domestic long distance. No wireless available.

Holiday Inn on the Bay - Complimentary high speed wireless in all guest rooms.

Embassy Suites - High speed internet for $9.95 + tax for 24 hours in guest rooms.

Omni San Diego Hotel - Complimentary high speed wireless and wired internet access in all guest rooms.

Town & Country Resort & Convention Center - High speed internet for $4.95 per 24 hours for Optics & Photonics attendees, with call-in registration on check-in.

Quality Inn & Suites - complimentary high speed internet in guest rooms.

Comfort Inn - complimentary high speed internet in guest rooms.

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1. SAN DIEGO MARRIOTT HOTEL & MARINA
333 West Harbor Drive, San Diego, CA, 92101
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Guest Fax: 619-234-8678

2. HOLIDAY INN ON THE BAY
1355 N. Harbor Drive, San Diego, CA, 92101
(one mile from the convention center)
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Guest Fax: 619-232-4924

3. EMBASSY SUITES SAN DIEGO BAY
601 Pacific Hwy., San Diego, CA, 92101
(4 blocks, 10 min. walk to the convention center)
Hotel Phone: 619-239-2400
Guest Fax: 619-239-1520

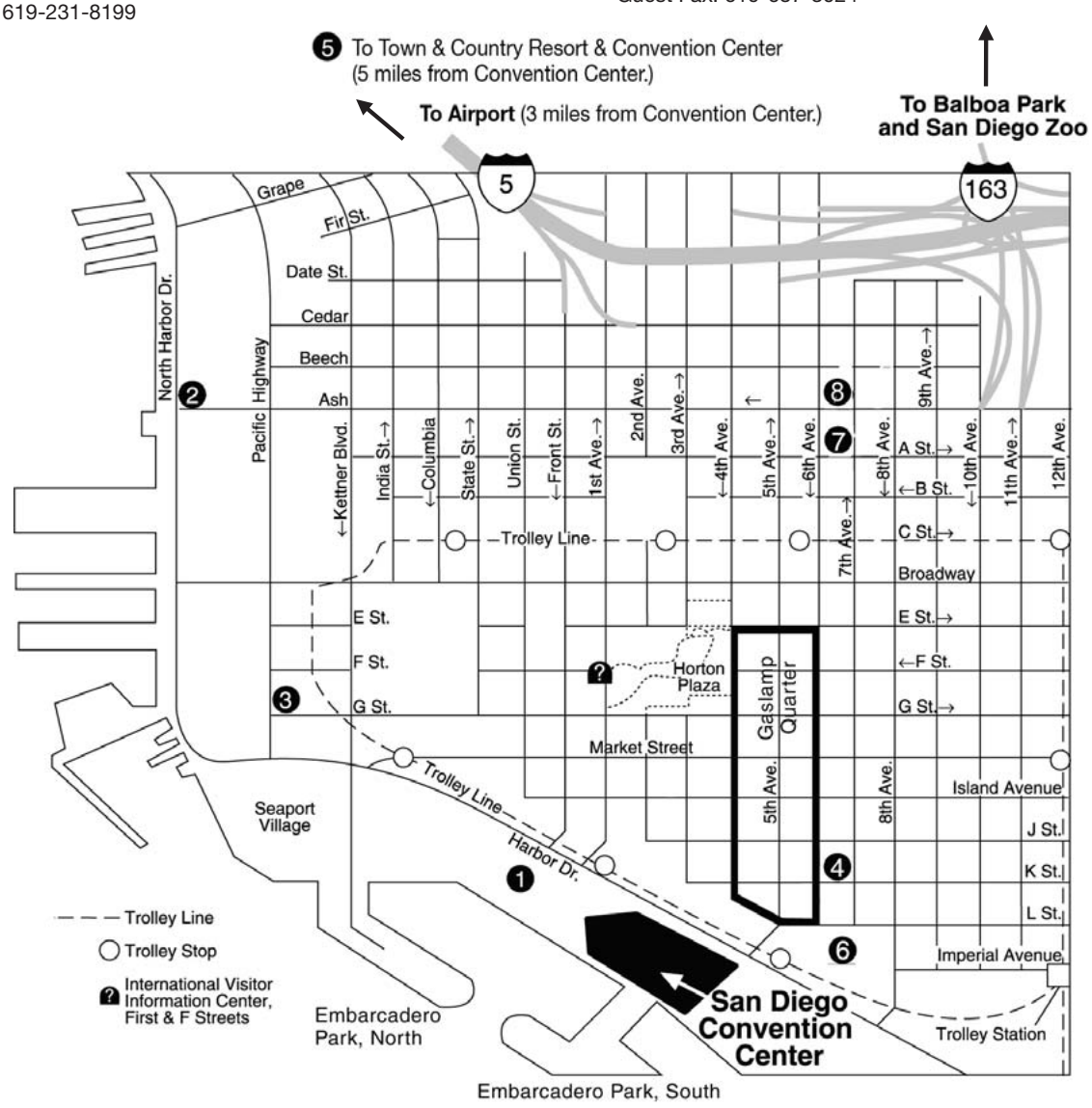
4. SAN DIEGO MARRIOTT GASLAMP QUARTER
660 K Street, San Diego, CA 92101
(2 blocks from the convention center)
Hotel Phone: 619-696-0234
Guest Fax: 619-231-8199

5. TOWN AND COUNTRY RESORT & CONVENTION CENTER
500 Hotel Circle North, San Diego, CA 92108
(5 miles, 10 min. drive from the convention center)
Hotel Phone: 619-291-7131
Guest Fax: 619-291-3584

6. OMNI SAN DIEGO HOTEL
675 L Street, San Diego, CA, 92101
(across the street from the convention center)
Hotel Phone: 619-231-6664
Guest Fax: 619-231-8060

7. QUALITY INN & SUITES
1430 Seventh Ave., San Diego, CA 92101
(1 mile, 9 blocks, 5 minute drive to Convention Center - Comfort Inn is across the street from Quality Inn & Suites)
Hotel Phone: 619-696-0911
Guest Fax: 619-239-0138

8. COMFORT INN
719 Ash Street, San Diego, CA 92101
(1 mile, 9 blocks, 5 minute drive to Convention Center - Quality Inn & Suites is across the street from the Comfort Inn)
Hotel Phone: 619-232-2525
Guest Fax: 619-687-3024



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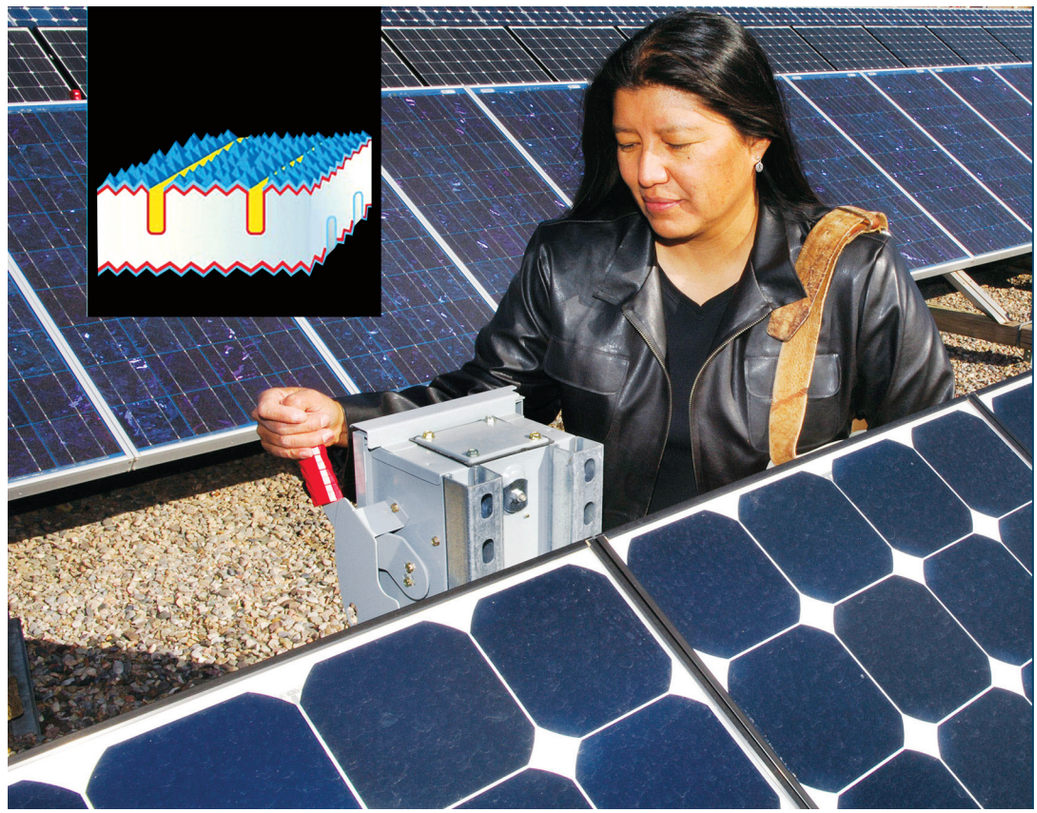

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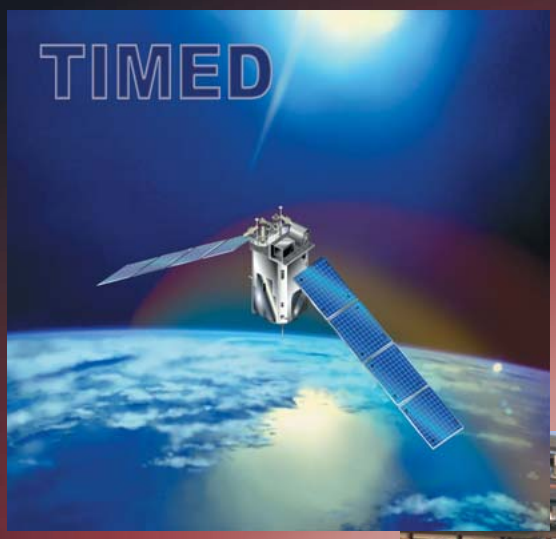

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