LIA TODAY

THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA

The international society dedicated to fostering lasers, laser applications, and laser safety worldwide.

FOCUS: PICALO 2010 | VOLUME 18 NO. 1 | JANUARY / FEBRUARY 2010

Photovoltaics

PV Production Looking to Make a Mark in 2010 pg. 6

The Future of Laser Cladding - pg.13

PICALO 2010 Conference Preview - pg. 12

Laser Institute of America

Laser Applications and Safety

13501 Ingenuity Drive, Suite 128 | Orlando, FL 32826 | Phone: 407.380.1553 | Fax: 407.380.5588 | www.laserinstitute.org

IN THIS ISSUE

FEATURES

DEPARTMENTS

ADVERTISERS

LIA TODAY

THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA

LIA TODAY is published bimonthly and strives to educate and inform laser professionals in laser safety and new trends related to laser technology. LIA members receive a free subscription to *LIA TODAY* and the *Journal of Laser Applications*® in addition to discounts on all LIA products and services.

The editors of *LIA TODAY* welcome input from readers. Please submit news-related releases, articles of general interest and letters to the editor. Mail us at *LIA TODAY*, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826, fax 407.380.5588, or send material by e-mail to lia@laserinstitute.org.

2010 LIA OFFICERS

EDITORIAL STAFF

BUSINESS STAFF

ABOUT LIA

Laser Institute of America (LIA) is the professional society for laser applications and safety. Our mission is to foster lasers, laser applications and laser safety worldwide.

Serving the industrial, medical, research and government communities for over 40 years, LIA offers technical information and networking opportunities to laser users from around the globe.

CALENDAR OF EVENTS

Laser Safety Officer Training
Mar. 9-11, 2010 | San Jose, CA
July 13-15, 2010 | Chicago, IL
Dec. 7-9, 2010 | Clearwater, FL

Laser Safety Officer with Hazard Analysis*
Mar. 8-12, 2010 | San Jose, CA
June 7-11, 2010 | Boston, MA
Sept. 27 - Oct. 1, 2010 | Anaheim, CA
Nov. 1-5, 2010 | San Antonio, TX
**Certified Laser Safety Officer exam offered after the course.*

Medical Laser Safety Officer Training
Feb. 20-21, 2010 | Atlanta, GA*
Mar. 13-15, 2010 | Denver, CO
Sept. 18-19 2010 | Boston, MA*
Nov. 6-7 2010 | San Diego, CA*
**Certified Medical Laser Safety Officer exam offered after the course.*

Advanced Medical LSO Training
Apr. 29-May 2, 2010 | Atlanta, GA
Sept. 9-12, 2010 | Atlanta, GA

Advanced Laser Safety Officer Training
May 11-13, 2010 | Orlando, FL

PICALO 2010
Mar. 23-25, 2010 | Wuhan, China

LAM 2010
May 11-12, 2010 | Houston, TX

ICALEO 2010
Sept 27-30 | Anaheim, CA

LIA SUPPORTED CONFERENCES

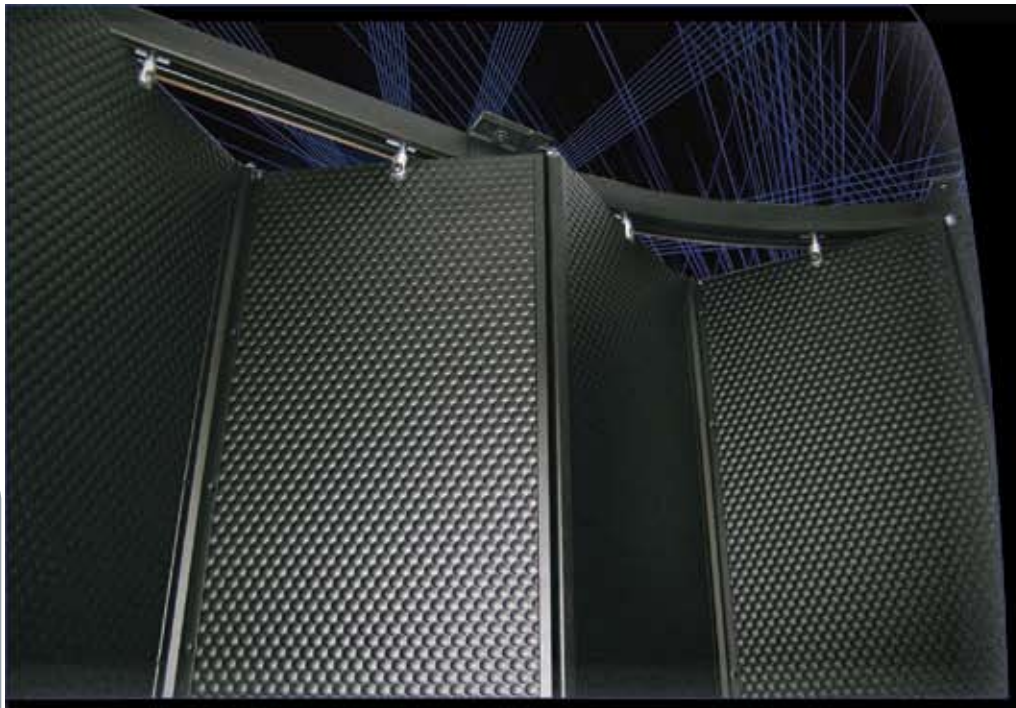
Laser Processing & Components at LASER. World of Photonics China
March 16-18, 2010 | Shanghai, People's Republic of China

Symposium for Advanced Laser Applications (SALA)
April 14, 15 2010 | East Hartford, CT

Lasers in Action at LASYS
June 8-10, 2010 | Stuttgart, Germany

ANGEL 2010 EOS Conference on Laser Ablation and Nanoparticle Generation in Liquids
June 29 – July 1, 2010 | Engelberg, Switzerland

*Visit **www.laserinstitute.org** for all course and event listings.*



LASER SAFETY BARRIERS

EVER-GUARD®
Laser Curtains

Ever-Guard® retractable curtains are the most protective laser barriers available commercially. Designed for low and high power laser radiation, these curtains offer the flexibility of a fabric curtain with the protection of a metal barrier. Each system is built to individual requirements and is rated for 1200 W/cm² for 3 minutes. Available in stock sizes any width and height up to 8 feet. Custom sizes also available.

FLEX-GUARD™
Laser Curtains

Flex-Guard™ heavy duty matte finish fabric is ideal for blocking diffuse and low power laser radiation. Durable and flame retardant materials are suspended from ceiling- or floor-mounted coated black steel track engineered for low-friction operation. Virtually any configuration is possible using curves, by-pass rollers and other accessories. Each system is rated up to 200W/cm² for 100 seconds and is available in stock and custom sizes.

Inquire about our laser auditing, laser safety training, and laser consulting services presented by experienced laser experts.

KENTEK®
"Laser Smart Products"®

components accessories containment signs/labels education eyewear

Int'l: +1 603•223•4900 • Fax: 603 435•7441 – Email: info@kenteklaserstore.com • Web: www.kenteklaserstore.com

PRESIDENT'S MESSAGE

On behalf of the LIA membership I would like to thank Raj Patel for guiding LIA through a tumultuous economic year. Thanks are also due Peter Baker and the staff for implementing difficult policies that create a platform for the organization's growth. I also wish to welcome all new officers and board members.

A desired result this year for our membership is increased laser materials processing opportunities, and hence, market growth in this sluggish economy. Well, "the tough get growing" proclaims MIT Enterprise Forum, Inc. Creation and identification of applications where laser processing is the enabling technology, and not merely a process improvement, is a principal objective. We must "invent the future," not wait for it. Focused long-term industrial R&D investment based on agile strategic plans has been a proven path to long-term corporate growth.

Unfortunately, industrial R&D facilities and budgets in advanced economies are only moderate while in emerging economies they are growing rapidly during this economic downturn. I will cite the U.S. as an example. Dependence on government R&D funding in the U.S. has increased, creating more competition for limited resources. Government funding agencies require an increasing cost share from its awardees. Congress recently passed an amendment in the House to include photonics businesses in the Small Business Financing and Investment Act providing a focus on the laser community in this particular government initiative.

U.S. industry, particularly small business, must take an entrepreneurial lead to accelerate R&D and application development by forming international strategic R&D alliances and pooling resources for early enabling technology development. However, comprehensive technology roadmaps must be formulated that define critical in-house R&D investment versus private, government and academic laboratory outsourcing.

Energy needs drive new laser materials processing applications. New materials and new manufacturing approaches to create the materials and devices enabled by laser technologies can catalyze the energy revolution for the advanced economies.

Nathaniel Quick
President
Laser Institute of America

EXECUTIVE DIRECTOR'S MESSAGE

As we welcome the new year and the new decade, I start by thanking 2009 President Raj Patel for his calm, thoughtful leadership which helped us deal with a very difficult year. It is a pleasure to welcome Nat Quick, who takes over the mantle of leadership as our 2010 President.

One of the things that we stress at LIA is to be "good partners" with all of the organizations and individuals that we interact with. President Bill Clinton, in a year-end interview in *Newsweek*, stressed that we are interdependent in the global economy and he views any potential global issue through this prism and asks "does this increase positive interdependence or reduce negative interdependence?"

It seems to me that lasers and their legion of applications throughout the global economy are a powerful tool for increasing positive interdependence. At the same time, sad to say, it seems that the U.S. is not "punching its weight" in the global economy or indeed the laser application industry. Our values are severely wrong when we prize complex financial maneuverings (with obscene compensation packages) over the manufacture of useful items that are of real value to the world. In order to have real value in our Gross Domestic Product (GDP) we need "P," "Product." We need to build things not just for the good of the U.S., but because we need to get our house in order so the U.S. can be a good partner in the world economy.

The LIA is already playing its role as a good partner in the world of lasers and applications. Our recent ICALEO® had participants from 26 countries who shared knowledge, research and best practices. On March 16-18 LIA will be an exhibitor in the Laser World of Photonics tradeshow in Shanghai and also be a partner in the Laser Processes and Components (LPC) conference (both for the fourth time) co-chaired by LIA leaders Andreas Ostendorf and Minlin Zhong. The following week we go to Wuhan, home of China's Optical Valley, to hold the fourth Pacific International Conference on Applications of Lasers and Optics (PICALO) chaired by Xiaoyan Zeng of Huazhong University of Science and Technology.

We can "build it better with lasers" and LIA will be a good partner in implementing this. As we celebrate the 50th anniversary of the laser, let's make this the decade where laser applications take off and lead the way. Happy New Year!

Peter Baker, Executive Director
Laser Institute of America

PHOTOVOLTAICS AND LASERS

PV PRODUCTION LOOKING TO MAKE A MARK THIS YEAR

By Geoffrey Giordano

After several years of steady growth, the photovoltaic (PV) market slowed along with the rest of the global economy in 2009. But experts say this year marks the beginning of a potential explosion in PV production — and laser makers are poised to expand their products' vital roles in researching, evaluating and producing solar cells.

The year 2008 was a record maker for PV production. According to San Francisco-based solar research group Solarbuzz (**www.solarbuzz.com**), global solar cell production reached 6.85 Gigawats (GW) in 2008, up from 3.44 GW the prior year with worldwide PV installations hitting 5.95 GW in 2008, up 110 percent from the previous year. By 2015, production could soar to as much as 30 GW, according to David Clark, senior director of strategic marketing for photovoltaics at Newport Corp. Spectra-Physics, based in Santa Clara, Calif.

This frenzy of supply and demand continues to spur a wave of innovation in laser processing, as manufacturers demonstrate the bottom-line benefits of techniques like laser scribing and soldering, edge isolation and deletion, metal and emitter wrap-through (EWT) and laser doping of selective emitters.

"The holy grail for the PV scientist is to produce devices with a low enough cost and high enough conversion efficiency to be competitive with traditional methods of generating electricity," says Clark, who presented "Lasers: An Enabling Technology in the Photovoltaics Revolution" at ICALEO 2009 in Orlando. "The drive to achieve this has created considerable interest in a range of emerging laser-based manufacturing processes," he wrote in a 2009 article.

"One of the overarching trends important to laser guys is you're not going to make money as solar cell manufacturer if you don't have scale," Clark says. "This is an industry that's starting to mature at a fast pace. If you look at the top 10 to 20 companies in the world, there are several that are in excess of a Gigawatt of production."

News of innovations and attempts to increase market share comes from all quarters. For instance, German disc-laser manufacturer Trumpf purchased fiber-laser maker SPI Lasers in 2008 to expand its base of expertise. Fiber-laser provider IPG Photonics, based in Oxford, Mass., has staked out the thin-film market with its high average power Q-switched laser and "green beam" 532 nanometer tools for PV cell scribing and thin-film removal. The Fraunhofer Institute for Laser Technology in Aachen, Germany, touts its advances in EWT, in which thousands of holes are drilled in crystalline silicon wafers, allowing electrical contacts to be moved to the back to increase the amount of light absorbed and converted to electrical current.

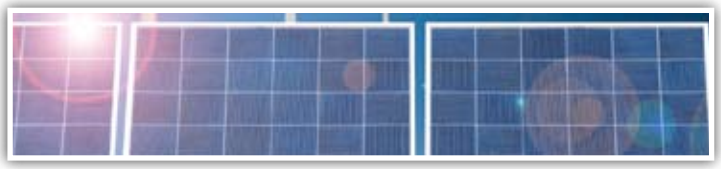
SILICON VS. THIN FILM

Mono- and multi-crystalline silicon wafers remain by far the dominant types of solar cells, accounting for roughly 90 percent of the market. High-purity ingots of silicon are grown and diced into cells strung together to form a module that's usually sandwiched in glass "to withstand 25 years on someone's roof," Clark says.

Single-crystal silicon is a semiconductor so pure silicon wafers must be doped with phosphorus or boron to enhance conductivity. Such wafers are optimally created with lasers of various types and wavelengths pulsed in short bursts to combine the electricity-conducting materials. Lasers are ideal tools for scribing delicate wafers, helping install electrical contacts, removing excess edge material from thin-film units, preventing current flow to the outer edges of PV cells using edge isolation, and more.

Thin-film PV technologies, of which there are three primary types, account for the rest of the market. These types of cells are constructed of glass panels joined with one of three semiconductor materials — amorphous silicon, cadmium telluride or copper indium gallium selenide (CIGS).

An average crystalline solar cell module reaches around 15 percent conversion efficiency, Solarbuzz says, as opposed to thin-film efficiency of approximately 6 percent. Even slight increases in efficiency — say to 17.1 percent from 17 percent — are a "big win," says Tony Hoult, general manager of IPG's West Coast operations in Santa Clara, Calif. According to Dr. Arnold Gillner, head of Fraunhofer's microtechnology department, his firm's goal is to improve cell efficiency to 20 percent or more by using lasers to drill at least 10,000 holes a second in each silicon wafer. Meantime, researchers at the Institut für Solarenergieforschung Hameln in Emmerthal, Germany, have reported conversion efficiencies up to 22 percent using lasers in their rear-interdigitated single evaporation (RISE) technique for manufacturing silicon back-contacted cells.



The solar cell industry is quickly maturing with production reaching 6.85 Gigawatts in 2008.

THE LASERS' EDGE

Lasers have been used in PV research since the mid-1990s, according to Clark, who says Spectra began selling lasers for thin-film scribing around 1995. He says Ohio's University of Toledo began intensive research in the mid-2000s that began finding its way into production lines.

"Generally, it is possible to produce a silicon solar cell without laser technology, but the request for higher efficiencies with correspondingly more complex technologies is high," notes Dr. Oliver Haupt of Laser Zentrum Hannover e.V. in Hannover, Germany. Lasers have been effective primarily in the thin-film market "because lasers are necessary to generate the serial connection," Haupt says. He notes PV manufacturers are taking advantage of such techniques as laser-fired contacts, local opening of AR coatings and etching barriers. "But often the question of (production) cycle time limits the implementation. In all cases

there is a competition between laser technology vs. etching technology."

Lasers employed in the solar-cell industry are used in somewhat atypical fashion.

"Typically, high-power lasers are used for large components and low-power lasers for small products or features;" explains Henrikki Pantsar, senior engineer at Fraunhofer USA Inc.'s Center for Laser Technology in Plymouth, Mich. "Solar-cell manufacturing in this respect is different. In many solar-cell laser applications … the aim is to use micromachining tools and principles on large components in high-volume production. Many of these processes deal with large surface areas that need to be treated using a laser beam focused to a tiny spot whose diameter is only some tens of microns. This gap between the scale of production and the scalability of the micromachining processes requires improvement of existing lasers, development of new laser sources and especially new optical concepts to deliver the speed needed now, and even more when the production lines continue to deliver more (megawatts) for customers."

EWT

One key consideration in PV manufacturing is that typical cells have electrical contacts on the front. "These contacts reduce the effective active area of the cell, thus reducing the efficiency," Pantsar explains. "Up to 10 percent of the cell area can be covered by contacts, consequently reducing the active area by this amount."

One solution is emitter wrap-through cells. "EWT cells are a type of back-contact solar cells, in which the holes enable transferring the contacts to the back of the cell, increasing the active area of the cell. During the manufacturing of the cell lasers are being used to drill a grid of small holes through the wafer. Depending on the design the hole density is 0.5 to 1 holes per square mm, resulting in a total number of up to 25,000 holes per cell (156mm wafer)."

As always, the greatest challenge is driving down production costs by improving the efficiency of laser drilling. "Currently a 100-megawatt production line would require four 60-to-100-watt disc lasers to reach in-line production speed. With the new developments using master oscillator power amplifier fiber lasers, the drilling rate and efficiency can be improved significantly. Fraunhofer CLT's latest record is more than 4,500 holes per second using less than 15 watts of average power."

THIN-FILM SOLUTIONS

Constituting only about 10 percent of the PV market means thin-film cells have great room for growth. As Fraunhofer's Gillner notes, thin-film cells can be used anywhere that non-transparent glass panels can be mounted, such as on house facades or sound-insulating walls. The trick is to overcome the cells' relatively low efficiency — about half that of silicon wafers — although thin-film is generally recognized to offer cost savings vs. silicon processes.

Of the three primary types of thin-film PVs, cadmium telluride is the current leader. CIGS is the emerging technology, with Clark expecting lasers to take over more of the currently mechanical scribing applications.

IPG's Hoult feels lasers are the best way to scribe thin-film cells and are optimal tools for other functions. "High average power Q-switch lasers are ideally suited for large-area thin-film removal. IPG has a Q-switch at that power level that is particularly appropriate for thin-film removal processes." He touts the company's 5-watt 532 nanometer lasers, which generally can perform narrower scribing work than 1064 nanometer lasers, all other factors being equal.

THE FUTURE

Despite 2009's global economic downturn, laser makers were busy refining and demonstrating their latest PV applications. According to Science Daily, Fraunhofer demonstrated a 400-watt ultrashort pulse laser at the Laser 2009 show in Munich in June. The company claims the pulse laser, with a frequency of 80 MHz, can process thin-film solar modules 10 times faster than diode-pumped solid-state versions and process a 2-by-3-meter glass panel in under two minutes.

(con't page 18)

LOOKING AT THE FUTURE

Materials of the future include wide bandgap semiconductors that have an energy gap from 2 eV to 6.5 eV, far exceeding the energy gap of silicon, which is 1 eV. This property allows these materials to absorb a wider region of the electromagnetic spectrum resulting in a higher conversion of ambient energy to electricity. They can be in the form of crystalline substrates, thin films, multiquantum well structures, quantum dots or nanostructures. Many of these materials are compounds that are not fully compatible with existing silicon foundry processes. Laser technology is the processing of the future for these materials.

AppliCote Associates, LLC teaming with UCF-CREOL and Lee Laser Inc., is developing laser technology to inject impurity atoms into lattice sites of wide bandgap materials to adjust their semiconductive properties without melting or recrystallizing the substrate.

Wide area semiconductor solid-state doping of entire wafer and substrate surfaces is an advance over thermal diffusion, which is limited by the high diffusion temperatures of these materials, and ion implantation, which introduces lattice structural defects in these materials, enabling injection of a wide range of elements and achievement of higher concentrations and greater depths. The doped atom sources can be solid, liquid or gas. This laser processing can be tuned to induce solid-state phase transformations in these compounds creating embedded conductors. The combination of these laser processes enables direct writing of embedded circuits resulting in dramatically lower capital equipment requirements. Laser processing represents a green semiconductor device fabrication technology eliminating the use of toxic chemicals and allowing the use of recyclable low cost materials; embedded regions of wide bandgap materials, having an energy gap greater than 6.5 eV, can be converted to wide-area semiconductors for photovoltaics and direct energy conversion.

MEET LIA'S 2010 PRESIDENT & BOARD

Nathaniel Quick is the Laser Institute of America's (LIA) 2010 president. He is president and chief technical officer of AppliCote Associates, LLC, located in Lake Mary, Fla., a materials and process technology development company whose focus is on energy and eco-safe materials, as well as energy efficient and eco-safe processing technologies based on laser technologies. AppliCote collaborates with laser research laboratories, product development operations and academic institutes, and is an affiliate of the University of Central Florida/CREOL.

EXPERIENCE

Quick has a Ph.D. from Cornell University in materials science and engineering and is a UCF Florida Photonics Center of Excellence advisory board member, UCF Industrial Advisory Committee member, member of the Florida Photonics Cluster, a fellow of the African Scientific Institute, a past guest researcher at NIST and past member of the Army Science Board. He is currently a member of the MRS and ASM International. He currently holds 42 U.S. patents and has over 60 publications.

Quick learned about LIA from long-time society icons Sid Charschan and Terry Feeley back in 1986 and has been involved ever since. He served on LIA's Board of Directors for years and then as secretary before serving last year as president elect.

Quick stepped up the executive committee ladder for the opportunity to continue execution of the strategic plan that has evolved over the past few years as well as being able to support LIA's mission to drive new applications development through technical networking. The enthusiasm and competency of the staff and Executive Committee to achieve results was also key.

CONFERENCE MAINTENANCE

In recent years LIA has doubled the number of conferences it hosts from two to four plus added a workshop, so the time to supervise that growth is here.

" ICALEO® is the paramount brand and must be distinguished as such. The impact of secondary conferences must be closely monitored, particularly their economics, so timely decisions are made to merge or partner with similar efforts, redefine or terminate if the objectives are not met. Collapsed conferences can always be added as sections to ICALEO, the mothership, or offered as online workshops," said Quick.

Nathaniel Quick is the 2010 LIA President.

However, the diversity multiple conferences bring to LIA's members and the laser industry as a whole is the exchange of practical and viable ideas on new laser materials processing and laser device fabrication technologies, explained Quick.

"Also there arises international opportunities for sales, technology development and strategic partnerships and improved understanding and comprehension of these international opportunities through face-to-face meetings and discussions."

The Laser Additive Manufacturing (LAM) Workshop, which is returning for the second time in May 2010, is the newest LIA addition. "LAM is the new model based on industry demand for establishing an applications workshop, seminar or ICALEO conference section. The team of Paul Denney, Bill Shiner, Jim Sears and Jim Naugle defined and executed the initiative rapidly and efficiently; they are to be commended. LAM and other applications workshops following the LAM model should become mainstay programs," he said.

Attendees can expect to see some of Quick's influence at ICALEO in September, as he aims to help guide the conference to address applications for not only existing applications but emerging applications, and to address emerging research and inventions that impact the laser community.

"ICALEO should attract more participants from developing countries, particularly from the continents of Africa and South America, and broaden participation from U.S. academic institutions, national labs and companies as U.S./North America participation has lagged in previous years," he said.

During these tough economic times, Quick believes that LIA is holding up well. "LIA has established a sound reserve and growth strategy and must continue to pursue growth initiatives," he said.

Although Quick runs a company and an international society, he still finds time for other pursuits. He has consolidated all of his past sports participation into daily martial arts for health training (Chinese arts), does boat repair/maintenance and boating, goes salsa dancing with his wife Laura ("I am her prop," he says) with whom he has four grown children.

Here's wishing Nathaniel Quick a successful year as LIA president.

TERM GOALS

During his term as LIA 2010 president, Nat Quick would like to accomplish the following goals:

- Increase U.S. industry, academic and National Lab participation
- Define new and emerging laser-based technologies
- Incorporate technologies into our community related to laser technology including high-energy plasma
- Continue growth under tight economic conditions
- Continue to evolve LIA as the portal to the entire laser community

2010 OFFICERS

President-Elect Stephen Capp is CEO of Laserage Technology Corporation. He previously held positions as plant manager and president of operations. Laserage is an international supplier of laser-processed materials growing to one of the largest laser job shops in the U.S. He graduated from Milwaukee School of Engineering in 1978 with degrees in electrical power engineering technology and industrial management and has worked in the laser industry for more 30 years. He has been a member of the LIA since 1992.

Treasurer Yongfeng Lu is currently the Lott Chair Professor of Engineering at the University of Nebraska Lincoln. Lu received his BEng degree from Tsinghua University (China), M.Sc. and Ph.D. degrees from Osaka University (Japan) in 1984, 1988, and 1991, respectively. Besides the fundamental research work that led to a large number of publications and a number of national and international awards, he also has successfully developed a number of laser-based material processing technologies and commercialized them in industries. In the past few years, he received around $10 million of research funding from DoD, NSF, DOE, NRI, private foundations, and industry, including a MURI grant from ONR. He served as the general chair for ICALEO in 2007 and 2008.

Secretary Klaus Löffler graduated from the University of Stuttgart with a master's in mechanical engineering. His expertise in lasers extends from resonator design, excitation methods, beam delivery and sensor systems to laser material processing. In 2004 he founded the Automotive Laser Conference in Wolfsburg, Germany, which together with ALAW and JALAW builds a global conference partnership. In 2006 he took over international sales at TRUMPF Lasers and Systems and in 2007 became an LIA board member. Besides LIA he serves on the board of the SLT conference and other events with the goal to ensure the global growth of laser technology.

Immediate Past President Rajesh Patel has accumulated 20 years of experience in the laser material processing field. He is currently a manager at Spectra-Physics, a division of Newport Corporation, and is responsible for managing the laser processing applications lab and new laser product development project. He received his Ph.D. in mechanical engineering from the University of Illinois at Urbana-Champaign in 1989. He is an author of 22 U.S. patents related to laser processing, optics and the mask technology field and has published and presented more than 40 technical papers. He is a member of LIA and SPIE, was LIA's president in 2009, co-chaired LIA's ICALEO 1997, 1998, 1999 and 2002 conferences, and was conference chair of ICALEO 2004.

2010-2012 BOARD OF DIRECTORS

Magdi Azer completed his master's and Ph.D. from the University of Illinois in Urbana Champaign in 1989 an 1996, respectively. In 1995 he joined GE Aircraft Engines and in 2003 moved to GE Global Research, serving as project leader for laser applications. In this role, he has worked with the GE's research laboratory in Shanghai, China to deliver solutions to customers in GE Aviation, Lockheed-Martin and NIST. Since 2005, Azer has been the lab manager for the Laser and Metrology Systems Lab at GE Global Research in Niskayuna, NY. He has authored or co-authored 23 publications and holds seven patents related to laser-materials processing. Azer has served as an author, a session chairman, and a planning committee member for several ICALEO conferences.

Craig Blue is a Distinguished Research Engineer, director of the Energy Materials Program and the Industrial Technologies Program manager at Oak Ridge National Laboratory (ORNL). He received his Ph.D. in materials science from the University of Cincinnati while under a NASA Fellowship at Lewis Research Center. He came to ORNL in 1995, where he initiated and developed the Infrared Processing Center. The center has two of the most powerful plasma arc lamps in the world, and has projects with DARPA, the U.S. Army, DOE, NASA and industry for functionalization of nano-materials. He has over 90 open literature publications, 11 patents and 80+ technical presentations. He has received numerous honors including three R&D 100 Awards for Development of Advanced Infrared Heating, Metal Infusion Surface Treatment (MIST), and Armstrong Process CP Ti and Ti Alloy Powder and Products. He has been UT/Battelle Distinguished Engineer of the Year and has been an Adjunct Faculty at the University of Tennessee in the Department of Materials Science and Engineering since 2001.

Paul Denney is the acting director for the Laser Applications Laboratory at the Connecticut Center for Advanced Technology (CCAT) in East Hartford, Conn. Previously he was the laser technology team leader at the Edison Welding Institute, the head of the High Energy Processing Department at ARL Penn State, a research engineer at the Westinghouse Electric Research & Development Center in Pittsburgh, a metallurgist at the Naval Research Laboratory, Washington, D.C. and a product metallurgist at C.F. & I Steel Corp. in Pueblo, Co. He is a fellow member of LIA and has been general chair and the laser materials processing chairperson for ICALEO. He was also co-chair of LIA's Laser Additive Manufacturing (LAM) Workshop in 2009.

(con't next page)

Larry Dosser founded the Mound Laser & Photonics Center, Inc. (MLPC) in 1995 and serves as its president and CEO. Dosser possesses more than 40 years of hands-on experience in laser applications and physical chemistry and has guided the company to consistent profitability and growth following a strategy that combines commercial laser-based manufacturing services with successful R&D programs funded by the federal government, the State of Ohio and corporate America. Dosser works to promote STEM education and enhance the collaboration between defense, commercial and educational institutions. He obtained his B.S. in chemistry (1966) and M.S. (1970) in physical chemistry from Michigan State University, and a Ph.D. in physical chemistry from the University of Arkansas (1975).

Thomas J. Lieb is president of L*A*I International, an independent company providing consulting, engineering and laser system equipment, including large laser/robot safety containment systems. He is a senior member of SME, a member of LIA, delegate to AWS C7C and on various ANSI committees on lasers, including ANSI Z 136 ASC, and delegate to laser committees in ISO and IEC. He is currently U.S. delegation leader to ISO TC 172/SC 9; convener of IEC/TC 76 WG 10 and the technical committee liaison for IEC/TC 76. Lieb has authored a variety of articles on industrial lasers and lasers for use in the EC. He is a BLS Certified Laser Safety Officer providing U.S. and EC laser safety guidance worldwide; and was selected as a 2008 recipient of the International Electrotechnical Commission's "1906 Award" for contribution to furthering the interest of electrotechnology and the work of the IEC. Lieb holds BS/BA from the University of Redlands, with graduate studies in optical physics and mathematics.

Xinbing Liu has been the director of Panasonic Boston Laboratory (PBL) of Panasonic R&D Company of America since 2006. He joined PBL in 1998. Liu obtained his Ph.D. in applied physics from the University of Michigan and did his graduate work at the Center for Ultrafast Optical Science (CUOS). When he joined PBL he became responsible for the overall technical work of the lab and led several successful projects developing key technologies in laser processing and micro-optics. He holds patents at the University of Michigan and Electro Scientific Industries, in addition to over 40 patents at Panasonic. Liu has been actively involved in the LIA sponsoring conferences, serving as chair of the Laser Microprocessing Conference of ICALEO in 2007 and 2008 and was general chair of ICALEO 2009.

Andreas Ostendorf studied electrical engineering at the University of Hannover, Germany. In 1995 he joined Laser Zentrum Hannover (LZH) as a scientist dealing with micro-machining using UV and ultrafast lasers and in 2000 he finished his Ph.D. In 2001 he became LZH's CEO and a member of the board of directors. In 2008 he left LZH for Ruhr-University Bochum, Germany, where he is the chair of applied laser technology. Ostendorf was chair of ICALEO in 2002, 2003, and in 2004 he was responsible for the microfabrication conference. In 2005 and 2006 he was the general chair of ICALEO, and LIA's president in 2008. Ostendorf is also a member of the WLT German Scientific Laser Society, which cooperates internationally with LIA.

Reinhart Poprawe holds an M.A. in physics from California State University in Fresno (1977). After completion of his Ph.D. in physics (Darmstadt, 1984) he joined the Fraunhofer Institute for Laser Technology (FILT) in Aachen, Germany where he began working as head of the department for laser oriented process development. Since February 1996 he has been managing director of the FILT and is university chair for laser technology at the RWTH Aachen. He is a member of the board in the AKL Arbeitskreis Lasertechnik e. V. Aachen and is a founding member of the company ACLAS Lasertechnik und Maschinenbau GmbH. Poprawe is a fellow in the Society of Manufacturing Engineers and LIA. Since 2001 he has been a member of the LIA board and serves in many national and international boards as advisor, referee or consultant.

Bahaa E. A. Saleh has been dean of CREOL, The College of Optics and Photonics at the University of Central Florida, since January 2009. He was a faculty member in the Department of Electrical and Computer Engineering at Boston University from 1994-2008, and served as department chair from 1994-2007. He received a Ph.D. in electrical engineering from Johns Hopkins University in 1971 and held faculty and research positions at the University of Santa Catarina in Brazil, Max Planck Institute in Germany, the University of California-Berkeley, Columbia University, University of Vienna and the University of Wisconsin-Madison. He is the author of more than 500 papers in technical journals and conference proceedings and is editor of the Optical Society of America Advances in Optics and Photonics. Saleh is a fellow of the IEEE, OSA and the Guggenheim Foundation.

Michael Schmidt is professor at the Friedrich-Alexander University Erlangen-Nürnberg and CEO of the research company Bayerisches Laserzentrum GmbH (blz). He received his Ph.D. on "process control for laser spot welds in electronics production" from Friedrich-Alexander University Erlangen-Nürnberg. As CEO of the blz, Schmidt has been working on further developing the exchange between academic basic research and industrial application. He is also engaged in several academic and economic committees – chairman of the board bayern photonics e.V., member of the advisory board of palladio Systeme GmbH and speaker of the Bavarian research cooperation "ForPhoton." ■

2008-2010 BOARD OF DIRECTORS

David Clark, Newport - Spectra-Physics
Paul Crosby, Coherent, Inc.
Klaus Kleine, Laserline Inc.
William Lawson, New Tech Development
John Marshall, The Rayne Institute, St. Thomas Hospital
Islam Salama, Intel Corporation
John Tyrer, Loughborough University
Frank Vollertsen, BIAS GmbH
Richard Walker, Northrop Grumman, Cutting Edge Optronics, Inc.
Dean Wilson, Wilson Industries, a Division of Kimberly Clark Global Safety

2009-2011 BOARD OF DIRECTORS

Milan Brandt, Swinburne University of Technology - IRIS
Ben Edwards, Duke University Medical Center
Bo Gu, IPG Photonics Corporation
Shaparak Kamarei, Solaris Laser Institute
Lin Li, University of Manchester
William O'Neill, University of Cambridge
Chuck Ratermann, RPMC Lasers, Inc.
Koji Sugioka, Riken
Sri Venkat, Coherent, Inc.
Sheldon Zimmerman, Naval Surface Warfare Center

PICALO APPROACHES

LIA CONFERENCE SET FOR PACIFIC REGION

The Pacific International Conference on Applications of Lasers and Optics (PICALO), which focuses on the growth and application of lasers and optics in the Pacific region, will be held Mar. 23-25 at the Shangri-La Hotel in Wuhan, People's Republic of China. PICALO brings together researchers, engineers, equipment suppliers and industry personnel to hear the latest developments and progress in lasers and applications and to share knowledge, experiences and visions. PICALO 2010 is presented by the Laser Institute of America in cooperation with Laser Processing Committee of the China Optical Society and Huazhong University of Science & Technology.

PICALO 2010 includes two separate conferences – the Laser Materials Processing Conference and the Laser Micro, Nano, and Ultrafast Fabrication Conference. In addition, the popular International Enterprise Summit, a business-focused forum highlighting laser industry development during the current global financial crisis, will return. This year's PICALO General Chair is Xiaoyan Zeng, Huazhong University of Science & Technology, Wuhan, People's Republic of China, the Steering Committee Chair is Minlin Zhong, Tsinghua University, Beijing, People's Republic of China and the General Co-Chairs are Bo Gu, IPG Photonics Corporation, Oxford, Mass., Yongfeng Lu, University of Nebraska-Lincoln, Lincoln, Neb. and Andreas Ostendorf, Ruhr-University of Bochum, Bochum, Germany.

China's "Optical Valley" is located in Wuhan, where the largest laser companies and laser processing system integrators in China are located. This is an unprecedented event for the city to host such an event as PICALO, with the presence of world-class scientists and engineers with so many fresh ideas and techniques. This conference will provide rich information on advanced science and engineering in laser materials processing, and build a bridge strategically linking Wuhan with the rest of the world.

Anyone interested in lasers and materials processing, from the basic understanding of the interaction between a laser beam and a material to those interested in how a process can be integrated and optimized for an application, should attend. The organizing committee's goal for PICALO is to bring both academic and industry people together who may benefit from laser technology. This includes researchers and end-users as well as engineers and technicians engaged in developing laser technology.

FEATURED AT PICALO

The PICALO 2010 plenary session highlights the theme of "superfast laser/laser applications." This plenary session starts with an impressive talk on multi-hundred-watt femtosecond lasers and their applications in material processing. This type of laser may bring significant novel results that may have profound impact on future material processing techniques. The evolution of the femtosecond laser pulses after passing an AOD scanner, and the experiments with models to validate its applications in neuroscience will be presented in the second part of the plenary session.

The Laser Materials Processing Conference features the latest developments across the world in laser cutting, machining, surface modification, welding, additive manufacturing, laser modeling and simulation, drilling and forming, and industrial applications. Invited speakers from leading research groups and companies worldwide will present their recent findings and future prospects. The Laser Materials Processing Conference are chairs are Lin Li, University of Manchester, Manchester, UK and Minlin Zhong, Tsinghua University, Beijing, People's Republic of China.

The Laser Micro, Nano and Ultrafast Fabrication Conference is a global forum for engineers and scientists from a variety of industry segments and institutes to meet and discuss the use of laser micro, nano and ultrafast fabrication and diagnosis as a key technology for various applications. Attendees will find innovative ideas and solutions for laser micro, nano and ultrafast fabrication in opto- and microelectronics, electronics, microsystems, material processing and biomedical industries. Yongfeng Lu of the University of Nebraska-Lincoln, Lincoln, Neb. and Henry Peng, GE (China) Research & Development Center Co. Ltd., Shanghai, People's Republic of China, are the Laser Micro, Nano and Ultrafast Fabrication Conference Chairs.

Now that 2009 is behind us, people are looking ahead to 2010 searching for signs of economic recovery in the laser industry. The International Enterprise Summit has invited executives and experts from the laser industry worldwide to Wuhan, the "Optical Valley" of China, to discuss the current status and future trends of our industry. This session's theme is Advanced Lasers and Laser Processing Systems. CEOs and CTOs of laser industry will present their latest research and development activities, showcase their new products and predict the markets. The speakers will put forward their insights on how to break through the down turn economic cycle in order to be ready for future growth. The International Enterprise Summit chairs are Bo Gu and Rangda Wu, Chutian Laser Group, Wuhan, People's Republic of China.

SPONSORSHIPS AVAILABLE!

PICALO offers various level sponsorship opportunities to give your company or organization added promotional exposure. The sponsorship program is open to all companies and institutions (industrial, medical and educational) within the laser industry. Visit **www.laserinstitute.org/PICALO** to download the PICALO 2010 sponsor brochure and for more conference information, or contact David Evans at 1-407-380-1553 or e-mail PICALO@laserinstitute.org. Registration for PICALO 2010 is now open at **www.laserinstitute.org/PICALO**. ■

ADVANCE PROGRAM AVAILABLE

The PICALO 2010 Advance Program is now available. The Advance Program provides details for the technical sessions, plenary session, Laser Materials Processing, Micro, Nano and Ultrafast Fabrication Conferences, International Enterprise Summit and poster presentations offered during PICALO. Visit **www.laserinstitute.org/picalo** to download a program.

LAM 2010

THE FUTURE OF LASER ADDITIVE MANUFACTURING

By Geoffrey Giordano

William Steen was there when an impromptu experiment at Rolls Royce in the early 1980s sparked what is growing interest in the field of laser-additive manufacturing (LAM).

In the beginning days of laser cladding, Steen recalls, putting powder down often proved problematic. "In frustration," he says, the automaker asked if powder might be blown into the application field. "So we blew it in by filling up a drinking straw with powder. This rather simple experiment worked extremely well, so Rolls Royce patented it." Since then, LAM has been an "answer looking for a problem," says Steen, a chartered engineer, emeritus professor with Liverpool University and a Fellow of the Laser Institute of America (LIA).

Almost 30 years later, the LIA is recreating the same sense of excitement and discovery with its second-annual LAM workshop. Industry experts from the automotive, aerospace, oil and gas, biomedical, construction and other fields will converge in Houston, Texas, from May 11-12 to hear plenary speaker Steen, the keynote presentation, and others tout LAM's vast potential. Lasers' low heat and precision mean a world of possibilities and efficiencies for additive manufacturing, and LIA assures that the show will "have a significant impact on the widespread industrial implementations."

"We recognize that additive manufacturing is a very broad topic area and at this point is hot in a number of industries," notes Paul Denney, general chair of the LAM workshop and director of the laser applications lab at the Connecticut Center for Advanced Technology in East Hartford. "That's one reason we're going to be in Houston. Tailoring surfaces for performance is a big issue for the oil and gas and energy industries located in that area, so that's why we're taking the show to them."

ON THE CUTTING EDGE

Denney hopes to build upon the success of last year's inaugural show, which drew about 100 attendees despite trying economic conditions. "We think the buzz coming out from a lot of people is they want to see the show again," he says. "We'll probably touch on all the industries, but there are common threads that run through all industries — what material are you putting down, how do you get the material there, what lasers are you using, (what are) the advantages of different laser technology and how do you know you've got the product that you want as you deposit (the material)."

The workshop is geared to manufacturing engineers and managers, process and R&D engineers, applications and construction engineers, precision-parts specialists and OEMs, among others. "We'd like to see a lot of the end users," Denney urges. "We'd like to see the conference as almost like the risk-mitigator. While everyone wants to be on the cutting-edge, no one wants to be at the edge. The idea is to get people out there to talk about how the technology's been implemented and look at cross-fertilization from industry to industry and application to application so people who may want to get into an area feel more comfortable that the technology is more mature."

In addition to Steen, one of the plenary speakers will be Fraunhofer's Ingomar Kelbassa, who will discuss cutting-edge aerospace applications.

"We were fortunate last year that we had some people who were brave enough that they stepped up and talked in general terms about what they're doing," Denney says. "There was a gentleman from Praxair (who) I think blew people away because he's putting down tons of clad material per year on very large structures. When you get people who are doing small-component repair or little valve repairs for the oil and gas industry, where they may be putting down a pound or two of material on a part if that, to see someone who may be putting down hundreds of pounds of powder on a component is phenomenal."

That kind of real-world information makes the workshop a valuable source of information about a compelling force behind technological innovation: the benefit to the bottom line. Depending on the industry and process in question, LAM is very cost-effective "especially when you start looking at life-cycle costs and being able to repair versus replace, which is a big driver for the aerospace industry," Denney says. "They're demanding more and more out of engine components. Laser, because it tends to be a low-heat process, allows them to make these repairs without giving up performance."

Steen concurs that in-situ parts repairs are a significant advantage with LAM. For example, aircraft parts could be made on aircraft carriers equipped with barrels of powdered metal, a LAM unit and lots of software discs describing the casting routine for each part — obviating the need for holding large inventories of parts.

"A further development could come from the availability of optical power from a relatively small fiber that would allow a LAM tool to be fitted as part of a standard lathe," he says. "Another area of development comes from LAM's ability to change the composition while cladding, leading to completely new styles of cast structures. This requires considerable imagination to think up the potential applications." He even foresees the potential of a hand-held LAM device for artists' use.

The workshop's cutting-edge value has been affirmed with sponsorships from major industry leaders like Alabama Laser, Coherent, Huffman, IPG Photonics, Laserline, Fraunhofer, Joining Technologies and Trumpf. Topics will include:

- Laser cladding for aerospace, automotive, DOD, heavy equipment, oil and gas, and power generation.
- New cladding techniques for component repair and general manufacturing.
- Research, development and international applications of additive manufacturing.

A special vendor reception will be held on May 11. For more information, visit **www.laserinstitute.org/lam**. ■

Geoffrey Giordano is a freelance editor and writer.

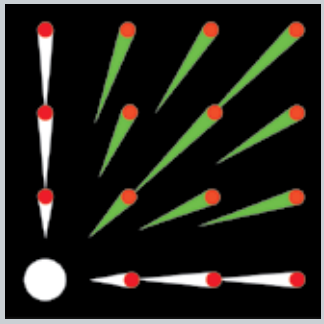
LASERFEST CELEBRATING 50 YEARS OF LASER INNOVATION

Watching your favorite movie on DVD. Surfing the web. Scanning barcodes at the grocery store. For the past 50 years, lasers have revolutionized the way we live. This milestone marks one of the greatest inventions of the 20th Century! Through a series of events and programs, LaserFest will help to showcase the prominence of the laser in today's world. Learn more at **www.laserfest.org**!

LASERFEST
CELEBRATING 50 YEARS OF LASER INNOVATION
WWW.LASERFEST.ORG

LASER WORLD OF PHOTONICS CHINA 2010

China's leading photonics exhibition, LASER World of PHOTONICS CHINA, began its yearly exhibitions in Shanghai in 2006. Over 200 exhibitors in 11,500 square meters of floor space presenting the latest technology and applications of laser and photonics are expected to make the fifth edition of LASER World of PHOTONICS CHINA another successful event when it takes place March 16-18, 2010 at Shanghai New Int, optical components and laser systems. For more information on the conference, visit **www.laser-zentrum-hannover.de/en/lpc/2010**.



LIKE NO OTHER

The new Sperian New York™ offers unrivalled laser protection with the perfect blend of comfort and style. We have combined the timeless look of the tortoise shell pattern with spring hinges and wire core temples for the ultimate in comfort and high-end styling. Intricate metal accents not only enhance the design, but also create a highly protective laser-resistant frame…like no other.

For more information, call 1-800 500-4739 or visit www.sperian.com

SPERIAN
Protection you can trust

CORPORATE MEMBER PROFILE | LASERLINE INC.

LIA Corporate Member Laserline Inc. is a leading manufacturer of high-power diode lasers up to 12 kW. The products are used in a wide range of industrial applications such as cladding, heat treatment, brazing and welding, and as solid-state and fiber laser pump sources.

COMPANY BACKGROUND

Founded in 1997, Laserline is headquartered in Muelheim-Kaerlich, Germany, with a subsidiary in Santa Clara, Calif. Currently the company has 75 employees in Germany, the U.S. and Japan. The founders and owners are Volker Krause and Dr. Christoph Ullmann.

The company was founded with the mission being to strive for customer satisfaction through technical excellence, thus reaching new markets and applications with leading edge high-power diode technology

"One of our first applications was a cladding head integrated into a high-speed milling machine. The resulting system was used for rapid prototyping, where the laser was used to add material, and the mill was used to get the material to net shape. One of our most exciting early applications was a plastic welding machine consisting of about 100 independent laser heads, quite an ambitious product for a young company!," explained Silke Pflueger, director of marketing and sales with Laserline.

Laserline's R&D department at the company headquarters in Germany consists of 15 people that are driving the development of new products such as the 4 kW welding laser, offering the same beam quality as lamp-pumped YAGs.

"This is something we could only dream about when we started in 1997," said Pflueger. "We hold about 20 patents protecting our intellectual property."

COMPANY PRODUCTS, GROWTH

Today, Laserline focuses its attentions mostly on the automotive industry, using its industrial LDF series lasers.

"Several manufacturers use our lasers for brazing and welding in body-in-white manufacturing. Heat treatment and cladding are mainly used to build and refurbish tools and dies," she explained.

"While our first laser was used for cladding, it wasn't a very important segment in the early years. However, in the last five years that application has picked up tremendously, with the main applications being in the oil industry, and in repair work for turbines, using lasers from 1 kW to 10 kW.

Laserline has also responded to the industry's needs and provided practical solutions through product introductions and innovations.

"Most of our early lasers were direct diodes, using the diode stack with beam shaping optics in the machine. That is not only impractical because you expose the laser head to motion and less than clean environments, but we also realized that our competition are fiber-coupled YAG, disk and fiber lasers. This led us to develop an all fiber-coupled product line.

Laserline's LDF series lasers were designed to serve the automotive market and other high power industrial customers.

"Another main driver for our developments is an improvement of the overall efficiency of the lasers. The outcome is that we are able to offer the industry's most compact lasers, resulting in low floor space requirements and lower operating costs," she said.

LIA INVOLVED

Laserline has been an LIA Corporate Member since not long after the company's founding.

"First and foremost, LIA puts up the most important industry events, especially the ICALEO® and PICALO conferences. The LIA also reacts to market trends, as proven with the recent addition of LAM (Laser Additive Manufacturing Workshop). Furthermore, we rely on LIA for laser safety courses and literature, as well as support in bringing the laser community together," said Pflueger.

In fact, Klaus Kleine of Laserline is an LIA Board of Directors member. "We are proud to be a part of LIA and are excited that we help shape its future by serving on the board."

Visit **www.laserline.de** or **www.laserline-inc.com** for more information. ■

ASC Z136 UPDATE

Have you ever read a standard and thought, "What were they thinking?" Do you want to know how you can voice your opinion and influence change? Are you new to the laser safety community and want to know how to participate in the development of the very guidelines you are responsible for enforcing? Join the Accredited Standards Committee (ASC) Z136 for the Safe Use of Lasers!

There are two ways in which you can participate in the development and revision processes of the Z136 laser safety standards: membership in one (or more) standards or technical subcommittees and/or membership on the ASC Z136 consensus body.

Membership on the consensus body, referred to as the "Committee," consists of organizations, companies, government agencies and individuals, and is open to anyone with a direct and material interest in its activities. To join the Committee, request membership by contacting the secretariat (LIA); let us know your qualifications and willingness to participate actively.

The vast majority of members on the Committee belong to one or more of the standards and/or technical subcommittees. It is here at the subcommittee level that primary development, and later maintenance of the standards, actually takes place. Submit requests for subcommittee membership directly through the Z136 website, www.z136.org. Please apply by completing the application form and checking the subcommittees in which you have an interest.

ASC Z136
Safe Use of Lasers
Accredited Standards Committee

Contact Barbara Sams at the LIA, 407-380-1553 or bsams@laserinstitute.org, for more information. Please note, Board of Laser Safety CLSOs and CMLSOs earn certification maintenance points for active participation on ASC Z136 or any of its subcommittees. ■

(con't from page 7)

At Spectra, Clark says, "we look at probably 20 or 30 different lasers applications people come to us with in regards to crystalline silicon. Some of those have been in development for many, many years. While silicon remains the PV industry standard, "you can make a solar cell without a laser in that market," Clark notes. "Up until recently everybody has. (But) laser doping enables better contacts, better electrical performance and higher-efficiency cells."

Hoult concurs with Clark that the PV industry has its sights set on improving the doping process for selective emitters. "I've got strong suspicion all PV companies are looking at improving efficiency in that area." He also stresses the importance of lasers for edge deletion. "With thin film, when these films are deposited they go right to the edge of the glass to seal the panel in the polymer coating. You have to remove a 10mm strip around the whole panel so EVA coating sticks properly to glass and seals whole unit so can last as 25 years for Underwriters Laboratories ratings."

In terms of research, while facilities like the Department of Energy's National Renewable Energy Laboratory in Golden, Colo., use lasers to scan the surfaces of PV cells for quality control and to look at fundamental electronic interactions, "most of the solar cell producers are building their own research labs (so) a lot of research will be done in-house and not with institutes," predicts LZH's Haupt. Research is and will be "focused on less damage or damage-free laser processing where ultrashort pulse lasers are necessary." ■

Geoffrey Giordano is a freelance editor and writer.

BLS UPDATE

If you have been following the BLS updates, then you know we have just completed a certification maintenance (CM) cycle that boasted over 150 CMLSOs. To facilitate attainment of the necessary CM points required to remain certified, CM criteria were reviewed and revised by the BLS Review Board.

In previous newsletter issues, we have discussed the value of certification and explored reasons to become certified in a down economy. Logic dictates that remaining certified – holding on to your credentials – would be the obvious choice in today's economic climate.

Suppose staff reduction is under consideration; management may be more likely to retain a certified individual. Conversely, if you are displaced, having the credential of CLSO or CMLSO should be considered an asset to a potential employer, enhancing your opportunity to be chosen over a non-certified individual for the interview and perhaps for the position. Obtaining and maintaining your certification is a personal accomplishment that demonstrates pride in the laser safety profession and augments your professional reputation. It supports the desire for continued professional development and increases the opportunities for career advancement and potential increased earnings.

For those whose CM cycle ended Dec. 31, 2009, it is not too late to restore your active status. CM worksheets accompanied with the appropriate recertification and late fees will be accepted until May 31, 2010.

If you have any questions about the BLS or the recertification process, contact Hydee Cash at hcash@lasersafety.org or Barbara Sams at bsams@lasersafety.org, or call 407-380-1553. ■

JLA UPDATE

The *Journal of Laser Applications*® offers the latest refereed papers by leading researchers in the laser community. Look for the online version at **www.laserinstitute.org/subscriptions/jla**. To view the journal online, please make sure your membership is current. In addition, articles are now posted online as the production cycle is completed ensuring timely publication.

The JLA is published four times a year by the LIA in February, May, August and November. It is sent to all LIA members as a member benefit. For nonmembers of LIA, call the American Institute of Physics at 1-800-344-6902 for subscription information. To receive your JLA table of content e-mail alerts, sign up at **http://scitation.aip.org/jla/alert.jsp**.

WELCOME NEW MEMBERS

CORPORATE MEMBERS

- **CoxHealth, Springfield, MO**
- **DiOptika LLC, Ashburn, VA**
- **EdgeWave GmbH, Wurselen, Germany**
- **Irepa Laser, Illkirch, France**
- **University of Houston, Houston, TX**
- **Vytran Corporation, Morganville, NJ**

For a complete list of corporate members, visit our corporate directory at **www.laserinstitute.org/membership**.

INDIVIDUAL

Stephen Sutley, Fairbanks, AK
Rajan Bhatia, Tucson, AZ
Nicole Doumas, Irvine, CA
Bogdan Georgescu, Redwood, CA
Richard Heinemann, Avon, CT
Phil Harrington, Grinnell, IA
Patricia Dudgeon, Indianapolis, IN
Dana Patch, Norwood, MA
Homer Louya, Greenville, NC
Rowena Gonzalez, Las Vegas, NV
Richard Neff, Cincinnati, OH
Brian Baird, Portland, OR
Bruce Maddox, Lubbock, TX
Patrick Crowley, Pleasanton, TX
Monica Wymer, Burlington, ON, Canada
Nicholas Gagnon, Quebec, QC, Canada
Jean Brousseau, Rimouski, QC, Canada
Milan Honner, Plzen, Czech Republic
Jouni Partanen, Espoo, Finland
Heidi Piili, Lappeenranta, Finland
Felix Abt, Baden-Wurttemberg, Germany
Alexander Wolynski, Stuttgart, Germany
Fintan McKiernan, Clonmel, Ireland
Jianhua Yao, Hangzhou, People's Republic of China

MEMBER INNOVATIONS

NEWPORT'S NEW COMPRESSOR

Newport Corporation, Irvine, Calif., has introduced a compact, ultra quiet (30dB(A) at 1 ft.) ACWS Air Compressor. The ACWS is clean, portable and more convenient than bottled air supplies. The fast-filling, economical ACWS can supply air to any Newport IsoStation™ workstation or SmartTable™ -OTS® system. The supply tank is large enough to supply air for up to three workstations, making the ACWS a very economical choice for new labs or for upgrading existing nitrogen-bottle configurations. All required hardware, i.e. the safety valve, gauges, outlet port, fittings and drain, comes standard. For more information, visit **www.newport.com/ACWS**.

NEW LINE OF IPG FIBER LASERS

IPG Photonics Corporation, Oxford, Mass., has introduced four new fiber lasers designed to replace flash lamp-pumped long pulse YAG lasers. IPG's four new quasi continuous wave (QCW) fiber lasers feature peak pulse powers of 750 watts, 1,500 watts, 3,000 watts and 5,000 watts and energies from 7.5 joules to 50 joules per pulse. These air-cooled, compact units are substantially more cost-effective than conventional YAG lasers because of wall plug efficiencies greater than 30% and maintenance-free operation, in that there are no components that require replacement during ordinary operation over its useful life. Retrofit services, including engineers familiar with system integration, are available to help customers replace older production lasers with energy-efficient fiber lasers from IPG. For more information, visit **www.ipgphotonics.com**.

COHERENT INTRODUCES DIAMOND LASER, SENSORS

A new sealed 1 kW CO_2 laser from Coherent Inc., Santa Clara, Calif., is the most compact product available at this power level. The DIAMOND™ E-1000 measures less than 1497 mm x 471 mm x 384 mm, including its integrated power supply. Packed into this product are a host of high performance features, making it ideally suited for use in small machines or space-sensitive applications involving cutting, perforating and drilling of paper, plastic films, plastics, glass, carbon composites and even thin metals. The sealed DIAMOND E-1000 requires no external gas supply and the only connections to the laser are a power cord and a water hose, making this lightweight, high performance laser easily to mount on a moving robot arm.

The new PowerMax™ USB/RS sensors, also from Coherent, are the world's first laser power sensors that utilize state-of-the-art microelectronics miniaturization techniques and integrate an entire instrument within a USB 2.0 or RS-232 cable connector. Specifically, PowerMax USB/RS sensors have all the signal processing and power measurement electronics normally contained in a LabMax meter and connects directly to a PC with plug-and-play functionality. This new family of sensors eliminates the need for a separate meter box, thus delivering a significant savings in cost and space, but with no reduction whatsoever in performance. For more information, visit **www.Coherent.com**.

HUFFMAN INTRODUCES LASER WELDING SYSTEM

Huffman Corporation, Clover, SC, has introduced a laser welding system — model HP-245ACC — with a fully enclosed atmospheric welding chamber. The benefits of laser powder fusion welding are further enhanced with the addition of a fully enclosed atmospheric chamber for welding in an inert gas environment. The system is designed for welding oxygen sensitive or reactive materials like titanium. The system can be configured with a variety of features like antechambers, inert gas handling and purification systems, oxygen and moisture sensors and part handling devices to match the end user's specific needs.

Applications include weld restoration on worn surfaces on a variety of turbine engine components like blades, vanes, shrouds, seals and BLISKS or IBRs (integrally bladed rotors). For more information, visit **www.huffmancorp.com**. ■

CHAPTER CORNER

A meeting of the Northeast Chapter of LIA was held in Nashua, NH on Wednesday, Jan. 13, 2010. There were over 75 people in attendance coming mostly from New England, but also from as far away as California. New Hampshire Governor John Lynch could not attend the meeting, but sent a letter of support that stated: "On behalf of the citizens of New Hampshire, I would like to welcome you all to the Laser Institute of America's Northeast Regional Meeting. The Northeast Regional meeting brings together the brightest minds in the laser industry to exchange the most up-to-date information on laser technology."

The evening started with a social hour, then a sit-down dinner followed by a presentation by an invited speaker. The title of the talk was, "Laser Applications in Printed PhotoVoltaics." The speaker, Eitan Zeira, is vice president of Printed Photovoltaics at Konarka where he is responsible for the process development of printed organic photovoltaic products. Eitan's talk was a very down-to-earth look at the industry with a perfect mixture of technology, markets, great examples and stories. Some feedback:

Just a note of congratulations on a great LIA meeting; terrific speaker, great introduction (still smiling) and a very nice dinner. All-in-all, a very successful evening. Nice job.

Thanks for hosting the event last night. The guest speaker Eitan gave an excellent talk and provided some very interesting information.

The Northeast Chapter is very active in promoting both the laser industry as well as the Laser Institute of America by encouraging attendance at these regional events and explaining the benefits of LIA individual and corporate membership. Meetings are generally held three to four times per year. Anyone interested in hosting a future event should contact Bill Shiner of IPG (508-373-1100) or Ron Schaeffer of PhotoMachining (603-882-9944). ■

MEMBERS IN MOTION

IPG ANNOUNCES INTERNATIONAL SYMPOSIUM

IPG Photonics Corporation, Oxford, Mass., is organizing the 5th International Symposium on High–Power Fiber Lasers and Their Applications. The symposium will be chaired by IPG founder, chairman and CEO Valentin Gapontsev, and will be held June 28–July 1 in St. Petersburg, Russia, in conjunction with the 14th International Conference on Laser Optics, the largest forum in the field of laser sciences in Russia and Eastern Europe. Key topics of the symposium include high-power fiber lasers and delivery for material processing applications, high-energy fiber lasers, cutting and welding with kW fiber lasers and sintering and powder deposition. A complete list of topics can be found at **www.laseroptics.ru**, or contact Dr. Sergei Popov, the symposium's vice chair, at spopov@ipghotonics.com.

ANGEL 2010

The Laser Zentrum Hannover e.V. (LZH), Hannover, Germany, will host the first international conference on the generation of ultrapure nanoparticles. The international conference, ANGEL 2010, will be held from June 29 to July 1, 2010 in Engelberg, Switzerland, with the main goal of presenting bundled research results. ANGEL 2010 stands for "Laser Ablation and Nanoparticle Generation in Liquids," and its main topic is the generation of ultrapure nanoparticles from solids immersed in fluids. The conference is being organized by the European Optical Society (EOS) in partnership with the LZH and the University of Tokyo. Invited speakers will report about the current research results and trends in development. They will also highlight the fields of applications in nano-medicine, optics, biophotonics and electronics. The call for papers ends on February 26, 2010. In addition, the conference will be offering a prize for junior-researchers.

"We are very active in this field," says Dr. Stephan Barcikowski of LZH. "Participation in the exhibition in Munich as well as the conference in Switzerland show that ultrapure nanoparticles play a very important role at the LZH." For more information, visit **www.myeos.org/ANGEL2010**. ■

PICALO REGISTRATION OPEN

The Pacific International Conference on Applications of Lasers and Optics (PICALO) focuses on the growth and application of lasers and optics in the Pacific region and will be held Mar. 23-25 in Wuhan, People's Republic of China. PICALO brings together researchers, engineers, equipment suppliers and industry personnel to hear the latest developments and progress in lasers and applications and to share knowledge, experiences and visions. Registration for PICALO 2010 is now open at **www.laserinstitute.org/PICALO**. Register now to attend PICALO 2010; don't miss this prestigious event!

MEMBERSHIP DIRECTORY & LARG

LIA is pleased to announce the availability of its 2010 LIA Corporate Membership Directory and Laser Applications Resource Guide (LARG). The membership directory features listings of all current LIA Corporate Members' products and services while LARG not only correlates all LIA Corporate Members by areas of interest, but also contains a full-page capability statement of each company highlighting a more comprehensive listing of their services. This guide focuses on the following areas of interest: laser manufacturers, R&D, safety, beam delivery and system integrators. To learn more, visit **www.laserinstitute.org/laserguide/**. For the most up-to-date listings of all LIA corporate and individual members, visit **www.laserinstitute.org/membership/directory/**.

ROLLED BACK PRICES – LIMITED TIME OFFER!

It's the start of a new decade, but LIA is rolling back prices on laser safety training courses to the year 2000. Now is the time to take advantage of this limited time opportunity. For example, the 2009 Laser Safety Officer with Hazard Analysis course was $1595 for nonmembers and $1545 for members. The rolled back price is $1295/nonmembers and $1195/members. The Medical Laser Safety Officer course was $945 for nonmembers and $895 for members. The rolled back price is now $695/nonmembers and $595/members.

LIA has been delivering quality, trusted laser safety training for over 40 years and trains more laser safety officers and laser users than anybody else in the world. As secretariat of the ANSI Z136 series of laser safety standards, the foundation of laser safety programs nationwide, LIA has assisted laser users in developing and implementing safety programs throughout the country. Don't settle for less; come to the leading laser safety source and get your laser safety training. Visit **www.laserinstitute.org/education** to take advantage of this limited time opportunity. Register now!

LAM REGISTRATION OPEN

Registration is now open online for LIA's 2nd Laser Additive Manufacturing Workshop (LAM). LAM brings industry specialists, executives, users and researchers from around the world to show how cladding and rapid manufacturing can be applied effectively and affordably to today's manufacturing challenges. This workshop, to be held May 11-12, 2010 in Houston, TX, will have a significant impact on the widespread industrial implementations of laser additive manufacturing. Topics will include laser cladding for aerospace, automotive, DOD, heavy equipment, oil and gas and power generation, new cladding techniques for component repair and general manufacturing, and research, development and international applications of additive manufacturing. For more information and to register for LAM 2010, visit **www.laserinstitute.org/LAM**.

ICALEO 2010 SPONSORSHIP AND VENDOR OPPORTUNITIES

Early bird pricing is still available until April 1, 2010 for sponsors and vendors of the 2010 International Congress on Applications of Lasers & Electro-Optics (ICALEO®), which will be held Sept. 27-30 in Anaheim, Calif. Sponsor benefits include larger exhibit space during the Laser Industry Vendor Reception & Tabletop Display for platinum and gold sponsors, priority tabletop placement at Vendor Reception for silver and bronze sponsors, a FREE full-color ad in the ICALEO Advance Program for platinum, gold and silver sponsors and all sponsors receive a FREE black-and-white ad in the *Technical Digest*. Take advantage of this perfect venue to exhibit your organization and be the center of attention as this is the ONLY scheduled event during this time slot. As the world's premier conference on laser materials interaction, ICALEO attracts over 200 companies and organizations from more than 20 countries. With several value-packed sponsorship levels to choose from, there is an option at every budget. For more information on the sponsor and vendor programs, visit **www.ICALEO.org**, or call or e-mail Dave Evans at devans@laserinstitute.org, 407-380-1553.

Additionally, a call for papers for ICALEO 2010 has been announced. March 2 is the abstract submission deadline and submitted abstracts should contain original, recent, unpublished results of application research, development or implementation. Commercial papers will not be accepted. Topics to focus on should be in the realm of laser applications, processes and systems. For more information or a downloadable call for papers brochure, visit **www.icaleo.org**.

NATIONAL ENGINEERS WEEK IN FEBRUARY

"Discover Engineering" is the theme for the 2010 Engineers Week, which will be held Feb. 14-20. On schedule is the National Engineers Week Future City Competition for seventh and eighth graders, which is entering its 19th season. Engineers and other volunteers work with 5.5 million students and teachers in elementary through secondary school each year through classroom visits and extracurricular programs as part of National Engineers Week. For more information, visit www.eweek.org. The LIA is proud to be associated with the National Engineers Week and will continue its support as an endorsing society. ■

Laser Institute of America
Laser Applications and Safety

13501 Ingenuity Dr., Suite 128
Orlando, FL 32826

PICALO

PACIFIC INTERNATIONAL CONFERENCE ON APPLICATIONS OF LASERS & OPTICS

March 23-25, 2010
Shangri-La Hotel – Wuhan, People's Republic of China

THE PACIFIC PLATFORM *for Laser & Optics Technology*

Register Now!

PICALO brings together researchers, engineers, equipment suppliers and industry personnel to share the latest developments and progress in lasers and applications and to share knowledge, experiences and visions.

Presented by Laser Institute of America in cooperation with Laser Processing Committee of China Optical Society (LPC-COS) and Huazhong University of Science & Techology.

www.laserinstitute.org/PICALO
picalo@laserinstitute.org
+1.407.380.1553

Laser Institute of America
Laser Applications and Safety

China Optical Society