



LIA TODAY

THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA

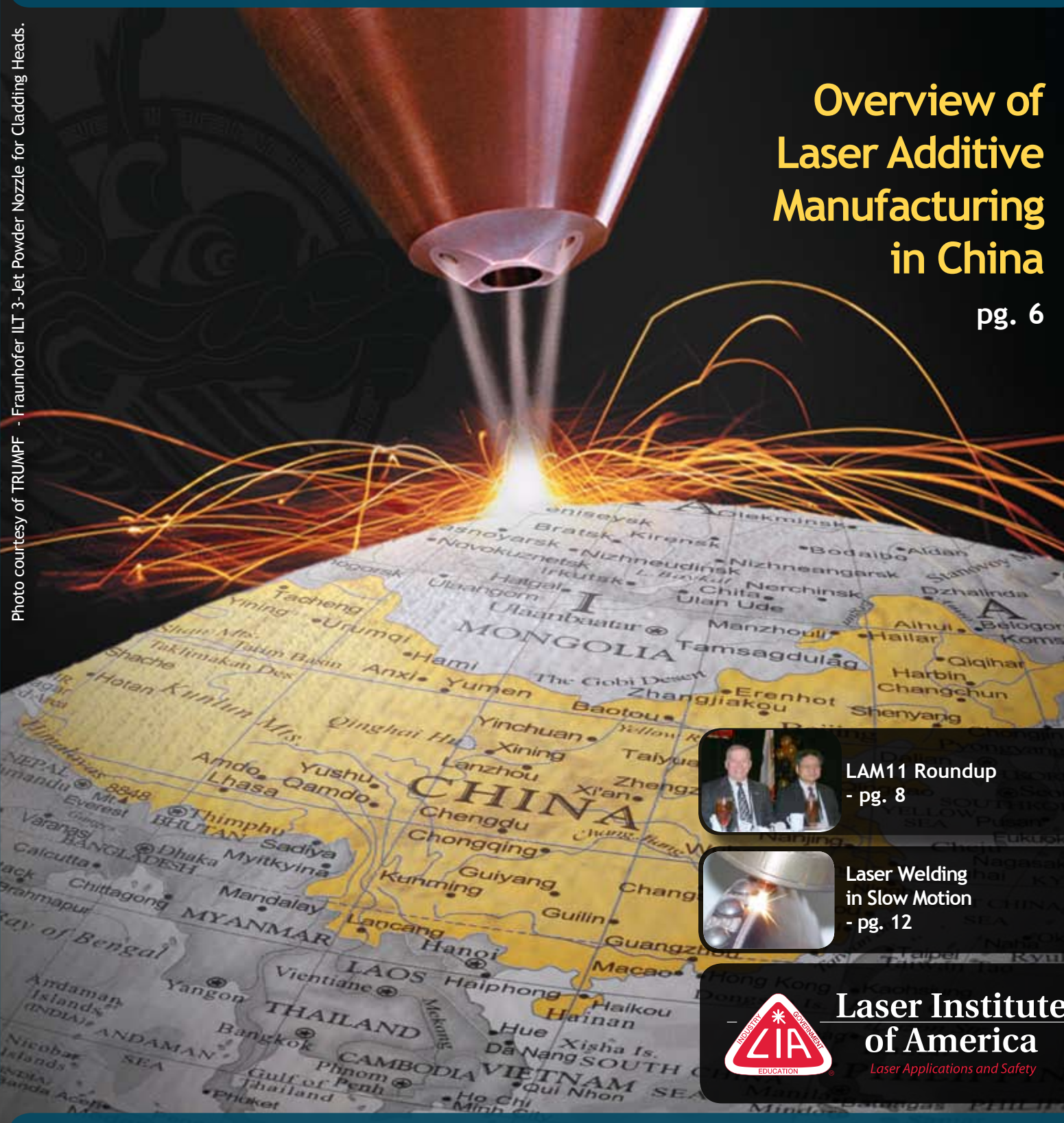
The international society dedicated to fostering lasers, laser applications, and laser safety worldwide.

FOCUS: LASERS FOR MANUFACTURING | VOLUME 19 NO. 2 | MARCH / APRIL 2011

Photo courtesy of TRUMPF - Fraunhofer ILT 3-Jet Powder Nozzle for Cladding Heads.

Overview of Laser Additive Manufacturing in China

pg. 6



LAM11 Roundup
- pg. 8



Laser Welding
in Slow Motion
- pg. 12



Laser Institute of America
Laser Applications and Safety

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.

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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.

We believe in the importance of sharing new ideas about lasers. In fact, laser pioneers such as Dr. Arthur Schawlow and Dr. Theodore H. Maiman were among LIA's original founders who set the stage for our enduring mission to promote laser applications and their safe use through education, training and symposia. LIA was formed in 1968 by people who represented the heart of the profession—a group of academic scientists, developers and engineers who were truly passionate about taking an emerging new laser technology and turning it into a viable industry.

Whether you are new to the world of lasers or an experienced laser professional, LIA is for you. We offer a wide array of products, services, education and events to enhance your laser knowledge and expertise. As an individual or corporate member, you will qualify for significant discounts on LIA materials, training courses and the industry's most popular LIA conferences and workshops. We invite you to become part of the LIA experience – cultivating innovation, ingenuity and inspiration.

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CALENDAR OF EVENTS

Laser Safety Officer Training

July 12-14, 2011 | St. Louis, MO
Dec. 6-8, 2011 | Orlando, FL

Laser Safety Officer with Hazard Analysis*

June 13-17, 2011 | Chicago, IL
Sept. 12-16, 2011 | Washington, DC
Oct. 24-28, 2011 | Orlando, FL

*Certified Laser Safety Officer exam offered after the course.

Medical Laser Safety Officer Training*

Sept. 17-18, 2011 | Washington, DC
Nov. 12-13, 2011 | New Orleans, LA

*Certified Medical Laser Safety Officer exam offered after the course.

Advanced Medical Laser Safety Officer Training*

Sept. 8-11, 2011 | Atlanta, GA
*Certified Medical Laser Safety Officer exam offered after the course.

LME 2011

Sept. 27-28, 2011 | Chicago, IL

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Oct. 23-27, 2011 | Orlando, FL

Visit www.lia.org for all course and event listings.



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Also included in this package is a copy of LIA's popular *CLSOs' Best Practices in Laser Safety*, as well as our practical quick reference guides, *LIA's Laser Safety Guide* and *LIA's Guide for Selection of Laser Eye Protection* — all essential to ensure your Laser Safety Program is compliant!

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PRESIDENT'S MESSAGE



WHY NORTH AMERICA IS READY FOR A LASER-ONLY SHOW

To borrow from Twain, reports of the death of U.S. manufacturing apparently have been greatly exaggerated. According to figures from the United Nations, in a chart referenced on *The Enterprise Blog* by Dr. Mark Perry, the U.S. is still performing most admirably when it comes to manufacturing, despite the global

economic turmoil that has roiled just about every conceivable industry.

No doubt part of this resilience is the increasingly vital role lasers play in manufacturing. Time and again, North American industries that have employed lasers in a wide range of applications have realized tremendous return on investment and efficiencies; production lines can be reconfigured in a matter of hours instead of days or weeks, for example. Laser-based cutting and drilling systems vastly improve metalworking output, and powder and wire cladding methods allow for in-situ creation or repair of high-value parts.

It's benefits like these that LIA will tout Sept. 27-28 at the first-ever Lasers for Manufacturing Event (LME) in Schaumburg, Ill. Picking up where broader-reaching shows leave off, LME will offer a unique, hands-on view of laser processes dedicated exclusively to manufacturing in the aerospace, energy, defense, automotive, medical and other industries. Exhibitors will provide real-world examples and real-time displays of lasers' functionality and bottom-line practicality. Though LME is being staged in North America, the show will fully illustrate the global manufacturing partnerships critical to the success of enterprises large and small around the world. We at LIA have created LME with you in mind, as you explore the versatility of lasers at LME and our other highly popular conferences and workshops.



Stephen Capp
President, Laser Institute of America

EXECUTIVE DIRECTOR'S MESSAGE

MANUFACTURING WITH LASERS

A primary guidestar for LIA's strategy is to package our laser application knowledge to benefit the manufacturing community.

One example of this is the growing success of our Laser Additive Manufacturing (LAM) workshop, which was held for the third time in

Houston in February. The workshop had everything needed to understand and apply this vital and valuable technology in just two days. The plenary session featured a history of the technology by Dr. David Bourell and a fascinating overview of the growth and uses of LAM in China by Professor Minlin Zhong (see article on page 6). Sessions consisted of an excellent balance of technical features and practical applications of the various facets of the technology from sintering to direct manufacturing, dramatically illustrating its huge economic benefits.

The workshop was anchored by a comprehensive two-day exhibit where attendees could visit with a broad range of manufacturers and suppliers of laser additive technology. A more comprehensive report on LAM can be found on page 8.

LIA will continue its mission of providing practical and profitable applications of laser technology with our inaugural Lasers for Manufacturing Event (LME) scheduled for September. For more information, please visit www.LaserEvent.org.



Peter Baker, Executive Director
Laser Institute of America
pbaker@lia.org



OVERVIEW OF LASER ADDITIVE MANUFACTURING IN CHINA

By Minlin Zhong

The booming Chinese economy has created a favorable environment for the research, development, application and market in the area of high-power lasers and especially laser additive manufacturing (LAM) in China. In a so-called “world manufacturing center,” laser additive manufacturing, as a modern advanced manufacturing technology, plays an important role in the manufacturing and re-manufacturing areas. There are great needs in China to fabricate high-value components or difficult-to-fabricate components by conventional methods.

Re-manufacturing is also a huge market in China to refurbish used or worn high-value components like blades, rollers, molds and many other components, not only to save the value but also to save the resources and protect the environment. For these reasons, the Chinese government has launched a clear policy to strongly support the technology R&D and business development in the re-manufacturing industry as a green resource-recycle industry. In October 2009, China Technology Innovation Strategic Alliance for Resources Recycling Industry (CIAR) was established as a national alliance.

BREAKDOWN OF INDUSTRY

As a developing country, China pays intensive attention to lasers and laser applications. There are five national laser technology research centers, about 45 universities (research teams) and 20 research institutes focusing on R&D in the area. About 200 laser companies provide crystal, component, accessory, laser, laser system, application and technological service and about 130 laser job shops located in major cities in China.

This year, the Chinese lasers and laser applications overall market is estimated to reach 7 to 8 billion RMB (approximately \$1 billion). Many laser manufactures witnessed a 30 percent increase this year compared to last year. The forecasted laser and application market in China in the following five years is about 60 billion RMB.

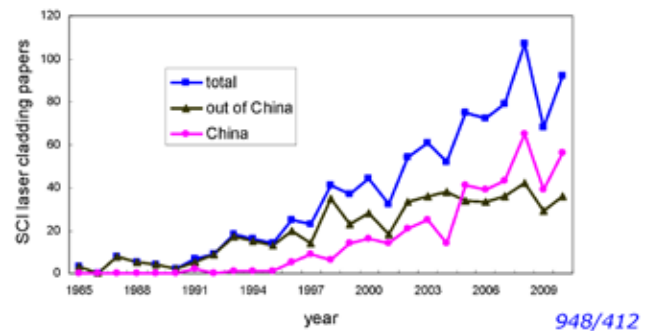
Among the various laser manufacturing technologies such as cutting, welding, drilling, marking, etc., the Chinese scientists and engineers spend much more time and efforts on LAM covering laser surface modification, laser remelting, laser alloying, laser cladding, selective laser sintering and melting and laser direct manufacturing based on multi-layer powder feeding cladding.

In the past 25 years, the Chinese authors have published the highest percentage of papers on laser cladding in international journals (43 percent of SCI indexed papers and 45 percent of EI indexed papers), in addition to about 1,700 papers published in Chinese journals. These continuous research efforts have resulted in some major technological developments and breakthroughs in the LAM area. For example, the direct additive manufacturing of large titanium components for airplanes (microstructure control and deformation control in layer upon layer additive manufacturing for large components), laser deposition repairing of various engine blades including the blades made by directional solidified nickel-based super alloy.

Additional examples are developments of particulate reinforced metal matrix composite coating materials for severe

wear, corrosion and fatigue environments, research on functional gradient materials or structures, laser deposition of micro/nano powder mixture, selective laser melting to produce complex and fine components and laser micro-cladding for circuit board,

25 years (1985 to 2010) Laser cladding papers cited by SCI

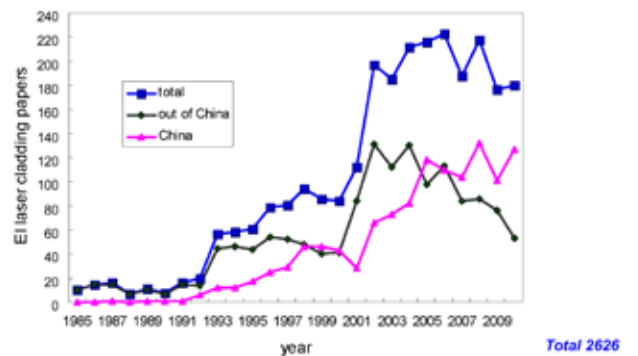


43% SCI cladding papers contributed by Chinese authors

micro-scale device and sensors. Some major universities in the LAM area include, but are not limited to, Tsinghua University, Huazhong University of Science and Technology, Beihang University, Northwestern Polytechnical University, South China University of Technology, Zhejiang University of Technology, Shanghai Jiaotong University and Institute of Metal Research, Chinese Academy of Sciences.

In China, about five Chinese companies provide high-power (1~20 kW) CO₂ lasers, 10 Chinese companies provide high-power laser processing systems (integrated with domestic or imported lasers) and about 50 job shops offer service related to LAM. The major companies in this area include, but are not limited to, Hans Laser, Huagong Laser, Unity-Prima Laser and Dalu Laser, etc.

25 years (1985 to 2010) Laser cladding papers cited by EI



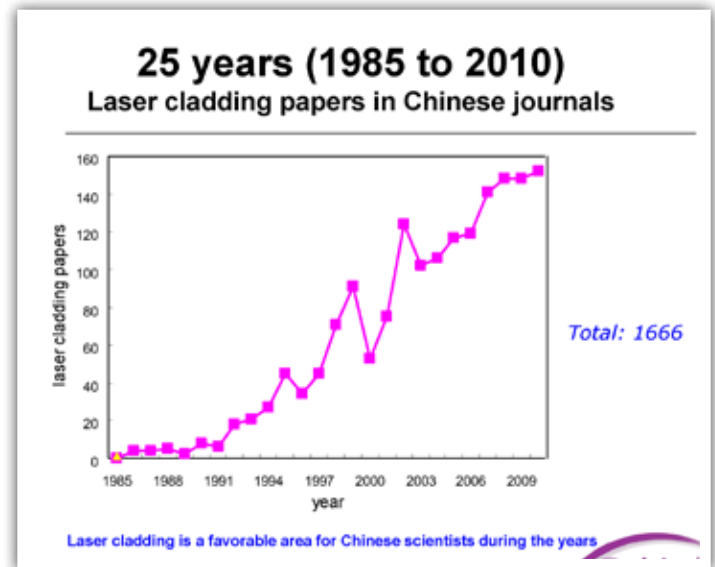
45% EI cladding papers contributed by Chinese authors

WHAT'S NEEDED

Based on the many years of development, China has established a favorable environment such as a favorable government policy, a huge current and potential market, a strong fundamental and application-oriented research, some proven technologies for materials, coatings and additive manufacturing of components (manufacturing and re-manufacturing), system engineering and equipment development, equipment or technological products and some successful industrial applications and business demonstrations.

What is needed in China in the LAM area includes high quality/cost-effective lasers dedicated for LAM like fiber lasers, disk lasers or diode lasers, high quality accessories such as integrated mirrors, scanning mirrors, beam optimization, such as optical components and coaxial nozzle/powder feeders, system engineering technologies like process monitoring and close-loop control and novel and proven application technologies. ■

Minlin Zhong is with the Laser Processing Research Centre, Tsinghua University, Beijing, China.



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LAM 2011 ROUNDUP

By Geoffrey Giordano

Laser professionals got a fresh global perspective and real-world look at laser-additive manufacturing during the Laser Institute of America's third-annual Laser Additive Manufacturing (LAM) workshop in Houston on Feb. 16-17.

Leading LAM practitioners like GE, Pratt & Whitney, Alstom, Caterpillar, Hardchrome Engineering and even the U.S. Navy, gave attendees a look at successful efforts in laser cladding, prototyping and in-situ repair. Meanwhile, keynote speaker Minlin Zhong discussed China's embrace of LAM for development and in production, detailing that nation's efforts in research and systems produced and noting the more than 50 companies providing cladding services. In fact, the Chinese government has launched a national remanufacturing program.

"There were a lot of new things presented at the conference that had not been addressed at the two previous LAMs," said General Chair Paul Denney, senior laser applications engineer at Lincoln Electric in Cleveland, Ohio. "The number of companies presenting on their interests and applications helped people realize that there are a number of success stories out there. There were also new technologies that may have an impact on the industry — Alabama Laser's efforts with hot-wire cladding, induction heating-cladding from Fraunhofer and (University of Cambridge professor) Bill O'Neill's efforts on supersonic laser deposition to name a few."

SHOWCASED AT LAM

The workshop — geared not only to showcasing the latest laser-cladding applications but also how those applications can boost profitability by trimming manufacturing costs — has grown consistently each year since its introduction in 2009. Texas has been the site of all three LAM workshops because of the state's critical role in the oil and gas, aerospace and agriculture industries — all of which derive major benefits from LAM.

For example:

- Caterpillar is undertaking extensive efforts in remanufacturing



Peter Baker presenting LAM General Chair Paul Denney with his plaque.

with laser cladding. The firm worked on 600,000 pounds of hardware a day with more than 115,000 pounds of cladding in 2010 at its facility in Fargo, N.D. The company is also investigating the use of laser cladding to increase the life of mining and construction equipment.

- Fraunhofer IWS uses induction heating in front of its cladding operation, allowing for higher deposition rates and lower-power (and lower-cost) laser systems. The firm believes it can achieve 30 kg-per-hour deposition rates with 10 kW in laser power by combining induction heating with high-deposition nozzle designs and optics, according to Executive Director Dr. Eckhard Beyer.

- GE Global Research is exploring LAM and direct-laser sintering for fabricating parts and prototypes in the broad range of industries GE is involved in, especially in aerospace.

- Hardchrome Engineering illustrated its success in using developments in LAM to benefit customers, particularly with in-situ laser-clad repair of steam turbine blades for power plants.

"Companies are realizing that it may be better to use lasers to shorten (production, prototyping and repair) time and lower the cost to produce functional prototypes," Denney said. "It is also a technology that can be used for extending the life of very high-value items."

Promoting the varied applications of LAM is a priority for Wayne Penn, president of platinum workshop sponsor Alabama Laser. "(We are) very interested ... in promoting the industry, the art and the science of laser cladding," said Penn, who gave the presentation, "A New Benchmark for Claddings to Improve Boiler Component Reliability" with Juan Nava of Alstom Power. "There's enough of the industry out there that all these different players are going to be needed; each one has its own niche — whether in net shaping, coaxial powder or side-feed powder, cold wire or hot wire. We see (laser cladding) as a game-changer."

EDUCATIONAL ELEMENTS

LIA once again ensured that the engineers and managers, precision-parts specialists and original-equipment manufacturers, system integrators, academic and government researchers and representatives of national labs who came to the workshop learned:

- How to apply laser-additive manufacturing in a broad range of industries, including automotive, biomedical, defense, heavy equipment, agriculture, offshore, mining and power generation.
- New cladding techniques for component repair and general



LIA Executive Director Peter Baker giving welcome remarks during the opening session of LAM.

manufacturing.

• Powder specifications, emerging applications, high-deposition cladding, turbine repair and selective laser-melting technology.

- The relative merits of powder vs. wire applications.
- How to maximize return on investment.

This year's workshop drew 170 attendees from across the U.S. and 10 other countries, as well as 25 vendors.

"Word of mouth from previous attendees is what is bringing more people to this workshop," Denney says. "Many of the people I spoke to talked to someone who had been and heard about the presentations and thought that is was a good idea to attend."

Added Bill Shiner, sponsor committee chair and vice president of industrial markets at IPG Photonics in Oxford, Mass., "Many of this year's attendees were companies looking to utilize and expand their use of cladding technologies. The papers were very well attended right up to the conclusion of the workshop. The vendor exhibits were very active and lasted longer than the allotted time due to interest. The overall opinion was that the conference has now reached the level where it will continue to grow on its own momentum."

To maintain that momentum, Denney says, "We are looking to continue to bring new application examples where laser additive manufacturing is being used successfully. We also hope to present some of the economics of when and where LAM is the best process to utilize."

The fourth LAM in 2012, also slated to be held in Houston, might feature a special addition – a visit to a laser-cladding shop for those who have not seen the process in action.

LAM APPLAUSE

"The best part of LAM was the rich mix of users, operators, manufacturers and researchers who came together for discussion and understanding," said Dr. David Bourell of the University of Texas in Austin, who presented an overview of the history of rapid prototyping to direct manufacturing. "The exhibit was a focal point for discussion and learning about what is available commercially.

Applications development presenter Dr. Emma Ashcroft of the TWI Technology Centre in Yorkshire, U.K., also applauded LIA's effort. "The LAM workshop was very successful, covering a wide range of topics and applications. I thought Pratt and Whitney's presentation gave great insight into aerospace approaches to LAM," she said.

"LAM's continued growth should be credited to the overwhelming support from the 25 companies who shaped the exhibit like Alabama Laser, IPG Photonics, Fraunhofer ILT, Joining Technologies, Fraunhofer IWS, Coherent, Huffman, Laserline and Rofin-Sinar," says LIA's Marketing Director Jim

Naugle. "Without the support of industry leaders including TRUMPF, Optomec, POM Group and Stratronics, this workshop would not be a success."

We would also like to thank the LAM 2011 vendors: American Laser Enterprises, Carpenter Powder Products, HIGHYAG Lasertechnologie, Irepa Laser, LASERVISION USA, North American Hoganas, Precitec, Preco, RPM, TECHNOGENIA/ Lasercarb Technology, Titanova Inc. and Wall Colmonoy Corporation.

To learn more about the conference, visit the LAM website at www.LIA.org/LAM. The site includes detailed explanations of cladding and rapid manufacturing. ■

Geoffrey Giordano is a freelance writer.



Plenary speaker Minlin Zhong addressing the audience, top, Paul Denney also at the plenary session, above, and sessions were well attended and provided valuable insight, below.



Vendor Night provided a great networking opportunity in a relaxed and informal setting.

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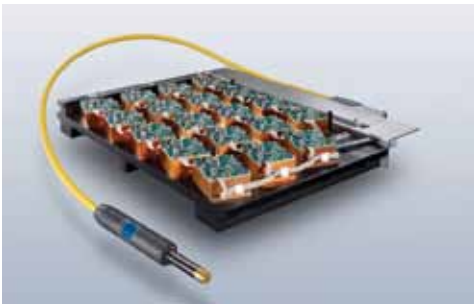
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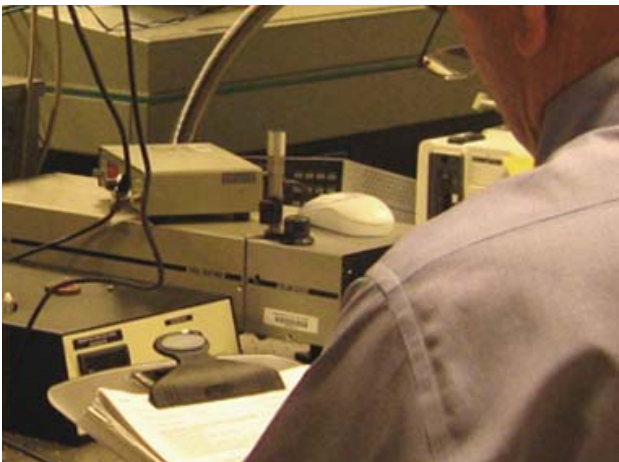
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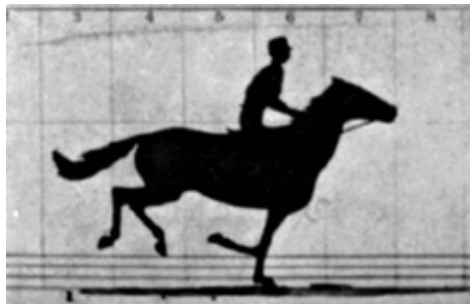
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LASER WELDING IN SLOW MOTION

By Ingemar Eriksson, Luleå Tekniska Universitet

After the invention of photography, it was not long before a scientist realized the power of freezing motion and created high-speed photography. The first known case is the famous galloping horse published in 1887 by Eadweard Muybridge. Muybridge proved that, at certain points during a horse's galloping cycle, all the hooves were in the air. These high-speed images were created with a single camera for every frame. This reduced the number of frames in the final movie to the number of cameras, but the frame rate in such a system is theoretical unlimited.



High speed photography was quickly developed to high frame rates. In the 1930s a rate of 1,000 frames per second (fps) captured thru a single lens onto film. By introducing the rotating prism technique 40,000 fps was achieved soon afterwards. By the conversion of photons to electrons, images could be stored on a phosphorescent screen. With electrical deflection to store the images on a phosphorescent screen frame rates over 100,000,000 fps were reached in the 1960s.

TODAY'S CAMERAS PROVIDE INSIGHT

Today, digital CCD and CMOS cameras dominate the high speed photography market. The cameras save the image to an internal random access memory capable of storing several thousand frames. This enables us to capture a long sequence of high speed photographs to isolate events of interest. In CMOS cameras the frame rate can be increased by reducing the number of pixels saved in every frame. The price of high speed photography equipment has lowered considerably the last decade. Today, consumer cameras capable of 1,000 fps are sold for \$250.

The laser welding community has used the technology of high-speed photography for a long time. In the early 1980s, high-speed film cameras were used at Osaka University, recording events at 6,000 fps, and new information about the laser welding process was captured. As the camera technology developed, more phenomenas could be observed in detail. Lately, the development of high-power diode laser illumination has made it possible to visualize the welding process in completely new ways. The illumination of today is powerful enough to outshine the plume of evaporated metal and plasma created during keyhole laser welding.

The importance of high-speed photography is best described by showing the results. The four frames (included here) are from a much longer video sequence recorded at 4,000 fps and show a

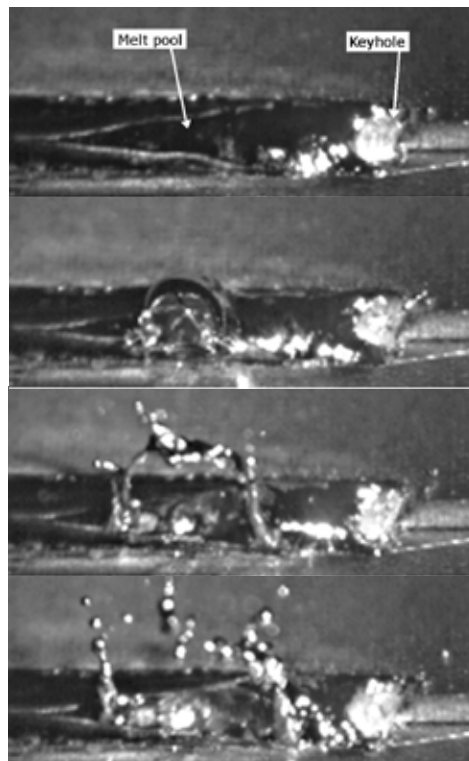
blowout event. A blowout is a small explosion in the weld that creates a hole. This hole weakens the weld strength, and gives a bad cosmetic look to the final product.

This blowout was deliberately produced by laser welding a lap-joint of two 0.8mm thick Zn-coated steel plates, with zero-gap configuration. The welding was performed by a HAAS 3006D Nd:YAG welding 100mm/s with 2.5 kW laser power. This welding configuration is known for the blowout problems, but is highly interesting to the automotive industry.

Several thousand frames of high-speed video were recorded, and on one occasion this blowout event of the melt pool was captured.

With help of the high-speed camera, it is easy to see that the blowout is a millisecond event. It is also clear that the laser keyhole is almost unaffected as the blowout is in the melt pool. This is important information to anyone that tries to create a blowout detection system. The system must be fast enough to detect the blowout that is over in a few milliseconds. And, there is little point in monitoring only the keyhole if you want to detect 100% of the blowouts.

In the laser community there are still many exciting unexplained phenomenas, which today are debated just as much as the gallop of the horse was before Eadweard Muybridge provided the final proof. By using high-speed cameras, a lot of of these discussions could be ended. ■



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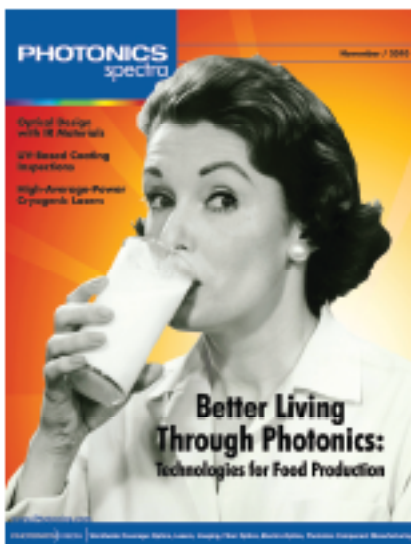
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LASER WORLD OF PHOTONICS 2011

A marketplace for lasers and laser systems, a gathering for providers of efficient manufacturing solutions, a source of momentum for increased productivity, a knowledge forum, a think tank and a networking platform: When it comes to LASER World of PHOTONICS, everyone's focus is a little bit different. But they all appreciate one thing: its consistent orientation to applications. The new claim, i.e. "Light applied," also emphasizes that aspect. It also shows that, when it comes to theory, thoughts automatically turn to practice. And when it comes to research, they automatically turn to developing solutions further until they are ready for application. To a great extent, that works because the fair is so closely linked to the World of Photonics Congress. This is where knowledge becomes business and where projects are realized directly at the fair. The world's leading trade fair for lasers and photonics covers all application sectors for lasers and photonics.

The international optical technologies industry will meet at the 20th LASER World of PHOTONICS, the world's leading platform for the laser and photonics industries, in Munich from May 23 to 26, 2011. Held concurrently with the world's leading trade fair, the renowned World of Photonics Congress will act as a platform for scientific dialogue. The supporting program, featuring practice-oriented talks at the Photonics Forums and many other highlights, such as the CEO Round Table, will complete the portfolio of events.

LASER WORLD OF PHOTONICS 2011 IN MUNICH

LASER World of PHOTONICS, which will celebrate its 20th anniversary this year, is the leading international event for optical technologies. This year it is also expected to attract more than 1,000 exhibitors, who will present their products and innovations from the areas of lasers and optronics, lasers and laser systems for production engineering, biophotonics and life sciences, optics, imaging and measurement systems. A new application



LASER World of PHOTONICS in Munich is home to the global laser and photonics industry.

area, "Security and Defense," has been added. Companies will show their products and solutions for applications in aerospace, for transport and traffic, and for defense technology or astronomy.

HOT TOPICS AT THE SHOW

Since it began, LASER World of PHOTONICS has covered the entire spectrum of lasers and laser systems in production engineering. This segment will be reflected in 2011 in the traditional exhibition area and additionally in the conference "Lasers In Manufacturing (LIM)" within the World of Photonics Congress. In the special show entitled "Photons in Production," visitors will also be able to obtain information on rapid manufacturing using lightweight construction materials and on welding and milling of different materials.

World OF Photonics Congress 2011

The focus topic "Green Photonics" will describe potential solutions where photonics makes a contribution in the areas of photovoltaics manufacturing, energy-conserving lighting, utilisation of renewable energy sources, energy efficiency and climate protection. The special show entitled "Photons in Production" will also examine the topic under the motto 'Green Solutions' and will demonstrate the potential uses of lasers in electromobility, for example to produce lithium-ion cells and high-performance batteries.

With regard to the focus topic of "Biophotonics and Life Sciences," exhibitors and research institutes will present biophotonic applications, methods and processes. The Biophotonics Forum and the ECBO Conference "European Conferences on Biomedical Optics," which will be held as part of the World of Photonics Congress, will illustrate state-of-the-art applications and give visitors insights into future trends.

PHOTONICS CONGRESS: SCIENTIFIC DIALOGUES AT TOP-LEVEL

Ranked among the top 3 in the world's leading photonics congresses and the number one photonics event in Europe, the congress will be held from May 22 to 26, 2011 at the International Congress Centre Munich (ICM) on the grounds of the New Munich Trade Fair Centre. With more than 3,000 delegates from over 50 countries, the World of Photonics Congress is an important international network platform. The Congress combines under one roof six conferences organized by leading international bodies and therefore covers the entire range of optical technologies. This year there will be a new conference entitled "Optofluidics."

The scientific discussions will be complemented by an application-oriented congress program at the forums in the exhibition halls. These forums will examine social trend topics such as production optimization, energy, the environment, health and security, and will present solution approaches through optical technologies.

The Photonics Forum “Biophotonics and Life Sciences” in Hall B1 will forge links between scientists, industry and medical experts in order to support the transfer of knowledge regarding new products. During the Photonics Forum “Optical Technologies” in Hall B2, visitors will have the opportunity to exchange information and experiences relating to different areas of photonics. “Latest applications of lasers and laser systems for production engineering” will be presented and discussed during the Photonics Forum in Hall C2. Come visit LIA’s booth in hall B1, booth #643. ■

AT-A-GLANCE INFORMATION

Date: May 23-26, 2011

Venue: New Munich Trade Fair Centre, Munich, Germany

Website: www.world-of-photonics.net

World of Photonics Congress:

www.photonics-congress.com

Online booking of tickets: www.world-of-photonics.net/link/de/16319068#16319068

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NEW MUNICH TRADE FAIR CENTRE

20TH INTERNATIONAL TRADE FAIR AND CONGRESS FOR OPTICAL TECHNOLOGIES—COMPONENTS, SYSTEMS AND APPLICATIONS

LIA SEEKING NOMINATIONS

The Laser Institute of America needs the help of its membership with nominations for officers for the year 2012 and board members for years 2012-2014, as well as for 2011 fellows and award recipients. Visit the LIA website at www.lia.org/nominations/2011 for complete details and nomination forms. You may submit your nominations online or send your suggestions to the LIA office via fax (407-380-5588) by May 16, 2011.

OFFICERS/BOARD

All nominees on the ballot are required to be current members of the LIA. Some responsibilities include attendance at board meetings, support of LIA’s courses, conferences and publications and encouragement of LIA membership.

FELLOW NOMINATIONS

The highest level of membership in the LIA is the grade of fellow. The award recognizes members who have attained unusual professional distinction in the mission areas of laser science and

technology, laser applications and/or laser safety, and have provided outstanding service to their field and LIA. Nomination packages must be completed and submitted to LIA by May 16, 2011 to allow review by the LIA Nominations Committee.

ARTHUR L. SCHAWLOW AWARD

The Schawlow Award recognizes individuals who have made distinguished contributions to applications of lasers in science, industry, education and medicine.



**Laser Institute
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Laser Applications and Safety

www.lia.org/nominations/2011



CORPORATE MEMBER PROFILE

LASER MECHANISMS, INC.

LIA Corporate Member Laser Mechanisms, Inc. is a recognized leader in custom laser processing solutions using beam delivery components and articulated arm systems for high power CO₂, YAG, fiber lasers and many other wavelengths to suit all facets of industrial applications. Laser Mechanisms' products are used in every type of industrial application including cutting, welding, drilling, scribing, surface treatment and other processes. The products are used with every type of laser.

The company also offers a variety of flexible solutions for connecting common industrial lasers to a variety of motion systems. Utilizing its proven articulated arm technology, these systems offer the industry's only turnkey beam delivery integration solution – whether for robots or flatbed cutters.

COMPANY DEVELOPMENT

William G. Fredrick, one of the leading pioneers in the field of industrial laser processing, founded Laser Mechanisms in 1980 with an intent of being the world leader in laser beam delivery and laser processing solutions. Having innovated many of early laser applications, Fredrick envisioned his new company developing a building-block system of standard laser beam delivery components, including an articulated arm system that could be custom configured into integrated material processing solutions.

Over the years, the company has introduced many innovations to enhance the performance, safety, capability, ease-of-use and cost effectiveness of laser processing, such as the cartridge-style lens holder. These holders make it very simple to change,

replace and clean the focusing lens on a laser head. It is also possible to combine more than one of these holders within a single assembly to allow the use of

different focal lengths for different laser applications with a single piece of equipment.

"The two products that stand out and have helped shape our company are our articulated arm and multi-focal length (dual lens drawer) cutting head. In fact, after more than 30 years, both products are still very important to our overall sales performance," said Laser Mechanisms' President Mark Taggart.

Its corporate offices, sales and engineering departments are located in Novi, Michigan and consist of 46 employees. Laser Mech also has sales offices in Belgium and China. All of the company's beam delivery components are assembled individually by hand in the Michigan manufacturing facility. Additionally, with over \$2 million of inventory, Laser Mech can provide fast

response to orders and immediate delivery of spare parts.

TODAY'S GROWTH

"At Laser Mechanisms, many of our new technologies are derived from feedback and direct interaction with our global customer base. A recent example is our all-new FiberMini Zero Degree laser processing head. We had several customers, in different parts of the world, approach us with a similar need. We took their wish lists and engineered a universal product that exceeded everyone's expectations," explained Taggart.

In fact, Laser Mechanisms has managed to compete in today's ever changing and developing market by responding to the rapid utilization of fiber lasers, delivering custom-engineered systems and providing medical contract manufacturing services. Additionally, every beam delivery component Laser Mech builds goes through a rigorous testing procedure that's designed to meet or exceed all current quality control certifications. The company's medical manufacturing division, OXID Corporation, is ISO 13485:2003 certified.

Laser Mechanisms further stays on track by adapting to meet the just-in-time manufacturing needs of key OEMs and the economic instability in the marketplace by managing the swings in product demand from high to low and back again. "In addition, going from a uniquely CO₂ company to having the ability to deliver any wavelength across our entire product line whether for industrial or medical keeps us competitive," explained Taggart.

LIA ALL ALONG

Laser Mech's involvement with the LIA goes back to Founder William Fredrick, who was an individual member before changing over to a corporate membership. Fredrick's membership goes all the way back to the beginnings of the LIA.

"In the U.S. and now internationally, the LIA brings another facet of credibility to member organizations. Being a corporate member is another self-certifying piece of information to a prospective customer. In addition, supporting the original objective of the LIA is important for all the members of our industry," said Taggart.

For more information, visit www.lasermech.com. ■



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EMPLOYERS

Target your recruiting to reach qualified professionals quickly and easily. Search the resume database to contact candidates, and get automatic email notification whenever a candidate matches your criteria.

Visit <http://careers.laserinstitute.org> today to post your job or search job listings.

FIND A JOB FILL A POSITION

Many job seekers and employers are discovering the advantages of searching online for industry jobs and for qualified candidates to fill them. But when it comes to making career connections in the field of laser technology, the mass market approach of the mega job boards may not be the best way to find exactly what you're looking for.

The **Laser Institute of America (LIA)** has created the **LIA Career Center** to give employers and job seeking professionals a better way to find one another and make that perfect career fit.



**Laser Institute
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Laser Applications and Safety

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www.LIA.org**

ASC Z136 UPDATE

The annual meeting of ASC Z136 was held on Sunday, March 13 in San Jose, California in conjunction with the International Laser Safety Conference (ILSC®). In addition to reporting officers' and chairs' appointments and reviewing the activities of the previous year, presentations were made on the topics of furloughing standards subcommittees, marking content of revisions [documents], content of vertical standards and technical subcommittees' coordination with standards subcommittees. The topic of membership recruitment was revisited, and items added in new business included a call to provide the public with advisory information on high-powered handheld lasers and whether a safety-rated advisory committee should be created.

FURLOUGHED STANDARDS SUBCOMMITTEES (SSCS)

- SSC-4 (Measurements) due to the nature of this Recommended Practice, Chair Sheldon Zimmerman recommended furloughing the subcommittee until the revision of the Z136.1 standard has been published.
- SSC-5 (Educational Institutions) Chair Fred Seeber recommended the subcommittee remain on furlough until publication of the Z136.1 revision.
- SSC-7 (Eyewear & Protective Barriers) Chair Jim Sheehy and member Mark McLear both spoke in favor of reconvening the subcommittee, with the intention of reaffirming the current document and then initiating a revision of the document. A ballot will be distributed to affirm reconvening the subcommittee.

MARKING FOR STANDARD CONTENT REVISIONS

There was discussion of whether drafts for vote should be marked line-by-line or if an executive summary of changes would be sufficient for voting members' review. The pros and cons of both approaches were discussed; the negative aspect of the executive summary was the possibility of overlooking a "minor" change that could be significant in retrospect, while the negative aspect of the line-by-line approach may include indecipherable change listings (points becoming lost among markings).

TECHNICAL SUBCOMMITTEES COORDINATION WITH SSCS

In an effort to resolve coordination between the technical subcommittees (TSCs) and the SSCs, possible solutions to keep the standards on their timelines included establishing and utilizing a formal coordination document, and limiting TSCs sectional revisions to the first year of standard development. It was noted that coordination may take different forms: sectional rewrites, review by chair, specific technical input and revision of non-normative areas. In the case of revision of non-normative areas, this material cannot be developed until the document is well underway.

Content of Vertical Standards, Membership Recruitment and High-powered Handheld Lasers will be reported in the May-June issue of the *LIA TODAY*. ■

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**Laser Institute
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BLS UPDATE

The Board of Laser Safety hosted a BLS Appreciation Reception on Monday evening, March 14 during the International Laser Safety Conference (ILSC®) in San Jose. The event was a “by invitation only” social mixer for CLSOs, CMLSOs and those who had expressed interest in becoming certified.

BROTHERHOOD AND APPLE PIE

BLS Board of Commissioners’ Chair Ben Edwards addressed the group, reminding the CLSOs and CMLSOs in attendance that certified individuals gain a competitive advantage for hiring and career advancement, recognition of their professionalism and dedication, and the enhanced credibility of their laser safety recommendations. He stated that the employment of CLSOs and CMLSOs can help an institution demonstrate its due diligence, thereby ensuring the legitimacy and adequacy of its laser safety program. Further, society gains more competent laser safety experts for the support of safety as laser applications continue to grow and evolve.

A TANGIBLE BENEFIT OF ATTAINING AND MAINTAINING CERTIFICATION

CLSO Tom Lieb then took the floor, asked to explain nuances that had recently come to light in the manufacturing community with respect to product certification. Major automotive companies

and their tier 1 suppliers are now writing acceptance procedures into their purchase orders for laser processing machinery. Among the requirements on the equipment is certification to 21 CFR, including Class

1 enclosure and provisions for “walk-in workstation” control measures, where applicable. The equipment supplier must provide the accession number and other documentation regarding the certification. In addition, the supplier must also document the qualifications of the person who provided the equipment assessment. Who better to provide that assessment than a CLSO?



RAFFLE PRIZES AND NETWORKING

BLS Executive Director Barbara Sams, with the help of LIA’s Director of Education Gus Anibarro, conducted the prize give-away, which included BLS ball caps, tins of cookies from the DoubleTree and well-received gift baskets that contained a selection of beer and assorted beer-related munchies. The obvious highlight of the evening? Networking amongst a community of colleagues with similar professional interests.

Then again, it could have been when Bob Sarason modeled the BLS t-shirt. ■

BLS
Board of Laser Safety

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The advertisement features a blue background with a white and yellow circular graphic on the right side. It includes three circular inset images: a person in a lab coat, a close-up of a laser beam, and a close-up of a person's face. The BLS logo is at the top left, and the CLSO and CMLSO logos are below it. The main title "CERTIFICATION for Laser Safety Officers" is in large, bold, yellow and white text. A list of four bullet points is in the center, and contact information is at the bottom.

LASER INSIGHTS

Laser Insights is a new feature to give insight into the very latest developments of laser materials processing and the possible applications. These overviews are designed to provide perspective on the content and applications of the papers presented at our conferences and workshops. Visit www.lia.org/laserinsights to begin your search.

LASER SURFACE TREATMENT AND ADDITIVE MANUFACTURING – BASICS AND APPLICATION EXAMPLES

by Dr. Ingomar Kelbassa

Laser surface treatment and additive manufacturing have a strong impact on classical manufacturing and repair tasks addressing markets such as turbo machinery, aeronautics, automotive, offshore and mining as well as tool, die and mold making and life science.

BEAM SHAPING OPTICS FOR ADDITIVE LASER TECHNOLOGIES

by Dr. Alexander Laskin

Homogenizing of intensity profile of laser beam brings to additive laser technologies effects that improve the performance of those technologies comparing to what can be achieved with “usual” non-

uniform laser beams: the processes become more stable, less tough positioning tolerances make the technologies easier to use, more efficient using of laser energy leads to costs reduction.

NEW ADVANCEMENTS IN DIRECT METAL DEPOSITION TECHNOLOGY

by Dr. Bhaskar Dutta

POM's patented close loop direct metal deposition (DMD) process allows precision metal deposition using a laser and a coaxial powder delivery system. Besides this, DMD systems include DMDCAM, a comprehensive six-axis CAM software solution to generate deposition paths for contour, surface and volume geometry, adopting different deposition path strategies required in additive manufacturing processes. ■

View complete articles at www.lia.org/laserinsights under the Featured Category.



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JLA UPDATE

The JLA is published four times a year by the LIA in February, May, August and November. It is available electronically to LIA members as a member benefit. To view the journal online, please make sure your membership is current.



The Laser Institute of America has made its official publication the *Journal of Laser Applications*® (JLA), an online-only journal, complete with new features for a broader audience. JLA is hosted on AIP Publishing's robust Scitation online platform, providing the journal with greater functionality and the ability to leverage a wide range of valuable discoverability features. JLA now features eight topic sections, a faster peer-review process and a more functional website (<http://jla.aip.org>) that makes content easier to access and more interactive. Readers will find full-text HTML rendering featuring inline reference links and the ability to enlarge tables and figures by clicking on them. Among the new features are enhanced search functions with more options and better controls to explore returned content with more useful ways.

For non-members 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://lia.aip.org/alerting_services/toc_alerts

Research Highlights

Mechanical and microstructural characteristics of the dissimilar materials butt joints by hybrid CO₂ laser-gas metal arc welding

This paper intends to present the applicability of hybrid [CO₂ laser+gas metal arc (GMA)] welding process to dissimilar materials AH32 and STS304L by clarifying the mechanical and microstructural characteristics of hybrid welded joints.

Recent advances in laser surface treatment of titanium alloys

This paper reviews progress over the last five years in the field of laser surface modification of titanium alloys. The authors analyze the effect of new laser technologies and new materials as tools for improving surface properties—specifically, biocompatibility and resistance to wear, corrosion, and high temperatures.

[View complete articles at jla.aip.org.](http://jla.aip.org)

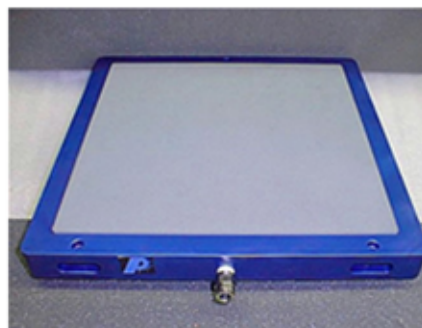


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MEMBER INNOVATIONS

COHERENT INTRODUCTIONS

Coherent Inc., Santa Clara, Calif., has launched a new family of highly integrated lasers featuring true plug-and-play simplicity. Based on direct diode and optically-pumped semiconductor laser (OPSL) technologies and using state-of-the-art miniaturized components, these lasers have all the control functions integrated inside its compact laser head, in contrast to the traditional architecture of head, dedicated cable and controller. Ranging in power up to 100 mW, the initial product offering includes models at seven wavelengths from the UV through near-IR: 375 nm, 405 nm, 445 nm, 488 nm, 640 nm, 660 nm and 785 nm, all with a circular TEM00 output beam.

Also from Coherent, a new carrier-envelope phase (CEP) stabilized, titanium:sapphire regenerative amplifier-based laser now offers much higher power than any previously available system of this type. Specifically, the Legend Elite Duo CEP delivers up to 10 Watts of power, as well as higher repetition rates (up to 10 kHz), yet it does not require the complexity of cryogenic cooling of the gain medium. For more information about these products, visit www.Coherent.com.

GIGE CAMERAS AND SHOCK ABSORBER

Ophir Photonics, San Francisco, Calif., has announced that BeamGage®, the company's next generation laser beam analysis software, now supports GigE cameras for high-speed applications. GigE (Gigabit Ethernet) cameras are low cost, high performance devices and provide high speed, up to 1 Gigabit/s transmission rates, in a robust, miniature package (34 x 34 x 69 mm). The GigE cameras work with BeamGage, the industry's first beam profiling software to be newly designed, from scratch, using the most advanced tools and technologies. Based on UltraCal™, Ophir-Spiricon's patented baseline correction algorithm, BeamGage provides high accuracy results, guaranteeing the data baseline (zero-point reference) is accurate to 1/8th of a digital count on a pixel-by-pixel basis.

Additionally, Ophir Photonics has introduced the Shock Absorber, the industry's first mounting post designed to allow the operation of sensitive pyroelectric laser power/energy sensors in an environment with vibration. This special mount smoothes out vibration and eliminates false triggering, reducing the sensor's susceptibility to vibration from two to 10 times. Visit www.ophiropt.com/photonics for more information.

REGENERATIVE AMPLIFIER AND ACCESSORIES

Spectra-Physics®, a Newport Corporation brand, Santa Clara, Calif., has introduced the Spitfire Ace, which according to the company, is the most technically-advanced, ultrafast regenerative amplifier commercially available. The Spitfire Ace amplifier sets a new industry standard for guaranteed long-term performance, and delivers superior average power of more than 5 W at 1, 5, and 10 kHz with excellent (M2 <1.3) beam quality. The new, highly stable ultrafast amplifier is ideal for pumping multiple optical parametric amplifier (OPA) systems and performing a wide range

of ultrafast nonlinear spectroscopy science.

Newport has also introduced an expanded offering of low-cost aluminum breadboards and accessories for basic photonic research and OEM optical assemblies. The SA2 Series of solid aluminum breadboards now includes more diverse sizes and vertical bracket accessories to provide a stable yet lightweight platform for optical components and sub-assemblies. For more information, visit www.newport.com. ■

MEMBERS IN MOTION

VU AT LASERVISION

As of January 2011, Huyen Vu has been made managing director of Laservision USA, LLC, Saint Paul, Minn. Laservision specializes in cutting-edge design, development and manufacture of laser protective technologies for the safe use of lasers.

OPHIR PHOTONICS GROUP RELEASES 2011 CATALOG

Ophir Photonics, Logan, Utah, has released its 2011 Laser Measurement Catalog. The catalog covers a wide range of laser power/energy sensors and meters and laser beam profiling systems for industrial, defense, medical and research applications. Designed as a "green" PDF-formatted reference book, the catalog includes tutorials, product data sheets and technology user guides. The 2011 catalog also provides an overview of the company's new sensor finder software application; it helps users find the best power/energy sensor that is guaranteed to work with their laser under the stated conditions. The catalog is available as a whole or in individual sections according to the category. It is free-of-charge and available for download at www.ophiropt.com/laser-measurement-instruments/laser-power-energy-meters/services/catalog-download.

LASERS IN SILICON PHOTOVOLTAICS WORKSHOP

On May 25, 2011 the Fraunhofer Institute for Laser Technology ILT, together with the consortium of the European project SOLASYS, is hosting a workshop "Laser for Photovoltaics" in Munich, Germany. In conjunction with the Laser 2011 World of Photonics event, experts from science and industry will present the latest research results and current applications, technological challenges and processing solutions for the precision machining of crystalline solar cells. The goal of this process is to considerably reduce the costs of generating electricity from photovoltaics and to increase cell efficiencies. All lectures will be held in English. For more information about the SOLASYS and the workshop, visit www.solasys.eu, or e-mail Dr. Schulz-Ruthenberg of Fraunhofer at malte.schulz-ruhtenberg@ilt.fraunhofer.de.

LIA COMES TO THE DC/BALTIMORE METRO AREA

Are you new to laser applications and looking to gain insight that can't be gained in a book or technical manual? Or are you a "laser jock" who can share years of experience using lasers in applications from micro-machining to chemical analysis? In either case, you'll want to join the Laser Institute of America's (LIA) newly forming DC/Baltimore Metro area chapter. The quarterly local meetings will be a unique opportunity to meet and network with end users, manufacturers of lasers and related products, safety officers and researchers. In the DC area, we have special access to government labs and the agencies that influence the future of laser technology.

LIA is the professional society for laser applications and safety. Its 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, training and networking opportunities to laser users from around the globe. To further enhance LIA's mission, it serves as the secretariat and publisher of the American National Standards Institute (ANSI) Z136 series of laser safety standards. These standards constitute the foundation of laser safety programs nationwide.

Sarah Boisvert of Potomac Photonics, Lanham, Md., is the founding chairperson. Boisvert is a fellow and past president of LIA. She is spearheading this exciting initiative. If you'd like more information about joining the local chapter, e-mail her at sboisvert@potomac-laser.com. While there are no chapter dues, membership in the LIA is required. If you are not already a member, visit www.lia.org/membership for details on corporate and individual options.



ICALEO 2011 CALL FOR PAPERS

A call for papers has been announced for the International Congress on Applications of Lasers & Electro-Optics (ICALEO®), which has a 29-year history as the conference where researchers and end-users meet to review the state-of-the-art in laser materials processing, laser microprocessing and nanomanufacturing as well as predict where the future will lead. From its inception, ICALEO has been devoted to the field of laser materials processing at macro, micro and nanoscales and is viewed as the premier source of technical information in the field.

Each year ICALEO features areas of topical interest. This year's featured sessions include diode lasers for processing and pumping, laser process monitoring and control, laser processing of

biological materials, lasers in nanotechnology and environmental technology, laser hybrid processing, laser manufacturing for alternative energy sources and laser business development.

ICALEO 2011 will be held Oct. 23-27 at the Hilton located in Walt Disney World® Resort in Orlando, Fla. The deadline for abstract submittal is April 26. Abstracts are submitted via the ICALEO website at www.icaleo.org.

Additionally, there are various sponsorship and vendor opportunities available to give your company or organization added promotional exposure at ICALEO 2011. For information on these opportunities, contact David Evans at 407-380-1553/1-800-34-LASER or e-mail devans@lia.org.

LIA CHANGES WEBSITE ADDRESS

The Laser Institute of America (LIA) has officially changed its website address from www.laserinstitute.org to the more user-friendly www.lia.org. This change is more consistent with the society's acronym and branded logo – LIA – and should help omit any confusion with other laser educational institutions and facilities that sometimes occurs. Not to mention it's easier to type in.

This change also extends to all of LIA's staff e-mail addresses. For instance, the general helpline is now lia@lia.org.

This change is now in all of LIA's marketing material and we look forward to a continued seamless transition.

Make www.lia.org your homepage!

PUBS DISCOUNTS

LIA is doing its part to bring down medical costs while providing a safe laser environment for your facility. For a limited time only, LIA is offering **30% OFF** the *ANSI Z136.3 Safe Use of Lasers in Health Care Facilities*, as well as **\$100 OFF FOCAL POINTS – Interactive Training for Medical Laser Safety**.

The ANSI Z136.3 is recognized as the definitive document on laser safety in all health care environments. It provides guidance for the safe use of lasers for diagnostic, cosmetic, preventative and therapeutic applications in any location where bodily structure or function is altered or symptoms are relieved. It is a must for hospitals, medical centers, spas and clinics using lasers.

As a key part of your facility's laser safety program, *FOCAL POINTS* offers a user-friendly training program that medical laser safety officers can use to effectively train their staff. Considering the wide variety of laser applications and their increasing role in health care, it is vital that health care professionals understand fundamental information regarding lasers and their safe use, all of which is covered by *FOCAL POINTS*.

Now is the time to invest in the foundation of a successful laser safety program! To order either publication at the discounted price, visit www.lia.org/store. Use discount code: PSC0411. ■



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Laser Applications and Safety

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