



# LIA TODAY

The Official Newsletter of the Laser Institute of America

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

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## In The News...



### Skin Cancers Revealed by Laser Light

A non-invasive laser scan technique, developed by researchers at Duke University, involves scanning the skin with multiple colors of laser light and then using the characteristic absorption of melanin and hemoglobin to assess the distribution of these two chemicals in the suspected area, reported the June 11 issue of *Optics.org*. The distributions of hemoglobin and melanin serve as early warning signs for skin cancer growth and to date, the best clinical method remains simple visual examination to detect the development of melanomas

"Our method involves "shaping" the laser pulses or pulse trains in order to extract the molecules' signatures, and detecting the backscattered light," said team leader Warren S. Warren

Melanomas characteristically have stronger absorption from melanin than from hemoglobin, and in animal studies the Duke team found they could easily pick up the

(Cont. on pg.16,  
see **In The News...**)

## Laser Programs In Academia Today

by Stephen Lumbert

**L**aser technology is ever evolving as we continue into the 21<sup>st</sup> Century. Since lasers entered the mainstream of research and industry during the 1970s, there have been many fine individuals that devoted their entire careers to pursuing improvements in laser technology, application, and an increased awareness of laser safety. In the next several years, many of these pioneers are nearing retirement, and sadly others have left us with only their work and the fond memory of their time with us. Consequently, there is, and will be, an increased need for new people to enter the convergent fields of lasers and optics.

To help bridge this gap, there are a number of laser programs in academia today starting at the community college level progressing to post graduate studies and certifications. At this time, there are two divisions that laser programs tend

to follow in the academic arena. One division has research and development into existing and future technologies as its focal point, and the other division has a strong emphasis on practical training for the laser workplace.

### Future Outlook

As the number of industrial and outpatient laser applications increase, so does the need for qualified personnel to perform their respective tasks. Some of the basic areas of study include fiber optics, laser/material interaction, and laser safety. Using grants from a combination of public and private sources, these programs attempt to push the envelope of current laser techniques and knowledge. Laser technicians, operators, and safety officers are in short supply and academia strives to fulfill that need.

(Cont. on pg. 6, see **Programs**)

## Review Of Laser Processing Systems in China

by Dr. James Chen Yihong

**T**he Chinese laser market has rapidly been developed and the average annual growth has been about 25% from 1999 to 2005, which is much higher than the global annual growth. Table 1 shows the domestic sales from 1999 to 2005. Compared with the global sales of \$3.7 billion in 2004, the Chinese market is still small, but most of its potential market growth will be in the future.

There are more than 400 laser companies in China, but most of them are very small. The main laser companies are Hans Laser, HG Laser, Chutian Laser, Star Laser, Zihengda

Laser, Ante Laser, Light Star Laser, Aohua Laser, Daheng Laser and Unity Prima etc. Only Hans Laser and HG Laser are public companies in the Chinese stock market.

It is reported that there are more than 20,000 employed in the laser field. Of these, those with a technical background are more than 50% and those with senior qualification (associate professor, senior engineer or above) are more than 30%. This means that the laser technology is still new technology in China. There is laser specialty in more and more universities, and thus more and more graduates will join in the laser industry.

(Cont. on pg. 8 see **China**)

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The Official Newsletter of the Laser Institute of America

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**L**aser Institute of America (LIA) is the professional society dedicated to fostering lasers, laser applications and laser safety worldwide. LIA is the secretariat and publisher of the ANSI Z136 series of laser safety standards, and is a leading provider of laser safety education.

LIA offers educational programs, conferences and symposia on the applications of lasers and electro-optics. LIA's annual International Congress on Applications of Lasers & Electro-Optics (ICALEO®) features the world's foremost meeting on laser materials processing. The biennial International Laser Safety Conference (ILSC®) covers all aspects of laser safety practice and hazard control.

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## LIA's Calendar of Events

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### Laser Safety Officer Training

Aug. 6-8, 2007 • Albuquerque, NM  
Dec. 3-5, 2007 • Miami, FL

### Laser Safety in the Lab

Aug. 20-21, 2007 • San Diego, CA

### Medical Laser Safety Officer Training

Sept. 21-22, 2007 • San Francisco, CA  
Nov. 9-10, 2007 • Raleigh, NC

### Laser Safety Officer with Hazard Analysis

Sept. 17-21, 2007 • San Francisco, CA  
Oct. 29-Nov. 2, 2007 • Orlando, FL

### Basics of Laser Safety

Oct. 11-12, 2007 • Memphis, TN

### Advanced Concepts in Laser Safety

Sept. 24-26 • Silver Springs., MD

### Industrial Laser Safety

Aug. 16, 2007 • Sturbridge, MA  
Nov. 8, 2007 • San Diego, CA

### ICALEO® 2007

Oct. 29-Nov. 1 • Orlando, FL

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## Executive Director's Message

### Take Your Fiber, It's Good For You!



LIA Executive Director Peter Baker, right, with LIA Past President Eckhard Beyer of Fraunhofer IWS at Laser. World of Photonics 2007 in Munich, Germany.

This year's Laser. World of Photonics and associated Lasers in Manufacturing conference were, as always, a great opportunity to take the pulse of our industry, make new friends, and catch up with old friends. We report on both events in more detail in this issue on pages 10 and 11, but one thing is clear, fiber lasers were the hot topic this year.

Many companies now have, or have announced they will soon have, fiber lasers in their lineup. LIA Corporate Members Spectra Physics, GSI Group, and TRUMPF have now joined the

fiber club and SPI and industry leader IPG Photonics have expanded their offerings.

These announcements are good for the industry as they not only offer users a choice of suppliers, but validate the advantages and utility of fiber lasers for a growing range of applications.

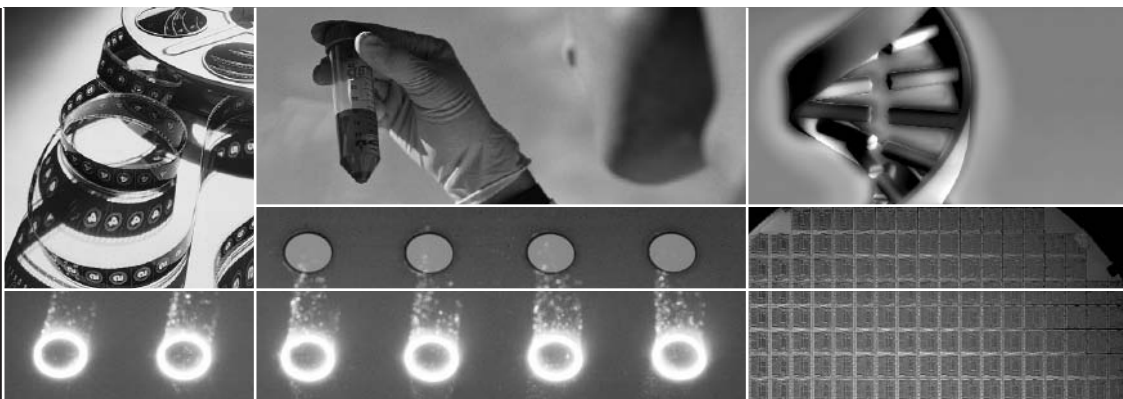
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**Programs, cont. from pg. 1**

However, the need for new blood in the research arm of academia is even more severe.

In the future, we may find ourselves facing a dilemma in which there are not enough talented young minds interested in the field of lasers and photonics. Already according to the National Science Foundation<sup>1</sup>, the number of first-time, full-time graduate science and engineering students has declined one percent between 2003 and 2004. For first-time, full-time foreign graduate students the decline was seven percent. Since 2001, the decline in foreign student enrollment is an amazing 20 percent.

Meeting these challenges requires a renewed emphasis on recruiting new students into the study of lasers and photonics. The following overview sheds light on some available laser programs.

**At the CC Level**

At the community college level there are some very exciting program offerings. At Three Rivers Community

College (TRCC) in Norwich, Connecticut, they offer an associates degree in Laser and Fiber Optic Technology<sup>2</sup> (LFOT). Additionally, TRCC has offered non-credit training for Connecticut's photonics industry since 1995. Expected competencies after successful completion of the LFOT course of study include being able to mount, align and operate lenses, mirrors, reflectors, gratings, filters and polarizing optics; fiber optic handling techniques, including connectorization and mechanical and fusion splicing, and survey of a laser work scene, citing unsafe conditions present.

Additionally, TRCC offers an "advanced topics" course in the fourth semester where students build a model WDM system and work with an EDFA; one year they built a CO<sub>2</sub> laser. Recently they began an interdisciplinary laser-manufacturing program to respond to the need for manufacturing technicians with laser knowledge and experience. Future projects will include machine vision and LabVIEW/remote instrumentation. This is a very positive step towards filling the need for more qualified industrial personnel and medical technicians in the workplace.

**University Programs**

At the university level, LIA's academic corporate members have programs covering a wide range of specialties. Pennsylvania State

offers a mix of laser programs from introductory level courses such as ELOP 201, Industrial Applications of Lasers, to their Applied Research Laboratory Laser Processing Consortium, where they address the challenges of laser welding, cladding, cutting, surface transformation hardening and modifications, creation of near-net-shape components, stripping of coatings, and remediation of hazardous materials. They have also operated a summer intern program for junior students from throughout the U.S. for several years to expose young engineers to laser processing technology, and recently installed a Graduate Certificate Program in Lasers and Materials Processing within the College of Engineering at Pennsylvania State University.

Another example is the University of Texas at San Antonio (UTSA) where they are investigating exciting areas of biophysics such as the optical properties of biological tissues and laser-tissue interaction. Oklahoma State University (OSU) has laser programs reaching not only into areas of veterinary medicine, but also offering a Photonics Advanced Degree Program for studying the technology associated with optical communications, optical computation, holographic storage, ultrafast laser applications, and photonic materials and devices.

**Additional Programs**

Looking forward, the University of Central Florida's College of Optics & Photonics has the Research Experiences for Undergraduates (REU) pro-

grams in optics and lasers that offer student research experiences that cover a range of topics in both science and engineering. REU participants take advantage of specially designed courses of the topic areas for this undergraduate experience including: solid-state laser materials growth and spectroscopy, high energy/short pulse laser development, and laser produced plasmas.

UCF-based REU participants will take specially designed short courses in optics, lasers and interaction of light with matter. Other activities include weekly seminars, industrial visits, a course in ethics in research, and "roundtable" discussions between the REU participants and organizers. Some students will have the possibility of attending a national laser and optics conference.

At the University of Michigan-Ann Arbor's Center for Lasers and Plasmas for Advanced Manufacturing (CPLAM), programs were created to develop a better understanding of the fundamental science behind laser-aided intelligent manufacturing and therefore reducing the lead-time for manufacturer's concept-to-product cycle. A partial list of CPLAM's ongoing programs include: establishing the science base for laser material processing, producing materials with novel properties and developing economical processing methods, and education of university students and industry personnel in the latest technology and basic cross-disciplinary sciences.

University of Michigan-Ann Arbor is also a part of the



**Students at UCF's CREOL get hands on in a femtosecond lab.**

<sup>1</sup>National Science Foundation/Division of Science Resources Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering

<sup>2</sup><http://www.lasertechnology.org/>

<sup>3</sup><http://www.engin.umich.edu/research/lamircuc/GARELAM.html>

<sup>4</sup>[http://www.iop.org/activity/policy/Consultations/Education/file\\_3637.doc](http://www.iop.org/activity/policy/Consultations/Education/file_3637.doc)

new Global Alliance of Research and Education on Laser Aided Advanced Manufacturing<sup>3</sup> (GARELAM). This new confederation intends to grow into a global platform for creating the culture and process of innovative and sustainable collaborative engineering research and education in the 21<sup>st</sup> Century. The tightly coupled research and educational missions of GARELAM center on the hypothesis that the development of innovative and sustainable manufacturing technology in the 21<sup>st</sup> Century will be enhanced through global collaboration between technical and industrial experts of the relevant regions. The definitive attribute of each GARELAM project will be its concept-to-market approach in a global context.

According to Judy

Donnelly of TRCC, "I think we have to start well before high school so that kids take the right courses in high school (math/science) that they need to succeed. But students won't take these 'hard' courses if they don't think there's a good reason to. We have been working with the New England Board of Higher Education's PHOTON projects (PHOTON, PHOTON2 and PHOTON PBL) for over 10 years, trying to get the word out to middle and high school teachers and guidance counselors as well as college faculty – through in person and online teacher professional development. Each of our teachers, in turn, is working locally to raise 'optics awareness.'

"SPIE and OSA have created lots of free resources for teachers – DVDs, posters,

booklets – and these have been very helpful as well. The Hands-on-Optics project has also produced excellent curriculum on the middle school level and in eastern Connecticut, we are working with H-O-O to do professional development in optics/vision with middle school teachers. In our program, we take several company tours each year, but it's really younger kids who need to see what's available to them with the right education."

Rich Martukanitz of Pennsylvania State University adds, "In many instances, laser education within the U.S. is falling between the cracks. This is due to several factors: the de-emphasis of manufacturing in general, the cross-disciplinary nature of laser technologies, and the lack of formal educational programs in laser technology within the

U.S."

All of these programs, along with many others, are an exciting glimpse into what is happening now and what the future may hold. Industry help has been beneficial and its continued support is critical to all of these efforts as well. However, more must be done in the area of enticing future students to follow in the footsteps of those laser pioneers and continue on the path of the current generation of laser professionals. The shortage of teachers with a physics background is a pressing issue<sup>4</sup> and we rely on them to spark interest in our field. In the words of Dante Alighieri, "A mighty flame followeth a tiny spark." \*

*Stephen Lumbert is a freelance technical writer for LIA TODAY.*

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## China, cont. from pg. 1

**Laser Usage**

The lasers are mainly used in laser marking, cutting, welding and heat treatment/hardening as shown in Fig. 1. Laser heat treatment is more used in China compared with the global market since China-made high-power transverse-flow CO<sub>2</sub> lasers are good enough for industrial applications. In all applications, CO<sub>2</sub> lasers are first in the market and YAG lasers are second. However, high-power laser welders and cutters, micro-machining systems, and advanced laser systems are mainly imported.

Laser marking is an advanced technology in marking application. The most used lasers are CO<sub>2</sub> lasers, lamp-pumped YAG lasers, diode-pumped YAG lasers, and fiber

lasers. At the moment, the key components such as acousto-optic Q-switches, ceramic reflectors, UV lasers, diode modules, fiber-coupled CO<sub>2</sub> and UV optics, and advanced lasers such as fiber lasers, RF-excited CO<sub>2</sub> lasers, and diode-pumped solid-state lasers, are mainly imported. The annual market is about 5,000 sets and \$65-\$104 million. Of industrial laser applications, laser marking is most developed and most widely used in China.

In laser welding, high-power CO<sub>2</sub> lasers, high-power diode lasers, and pulsed Nd:YAG lasers are used. The main application areas are welding of batteries of mobile phones, diamond saw, and

**Table 1. Sales in China from 1999 to 2005**

Year	1999	2000	2001	2002	2003	2004	2005
Sales (million US\$)	183	248	421	371	479	562	621
Annual growth (%)		35.5	69.9	-11.7	29.0	17.3	10.4

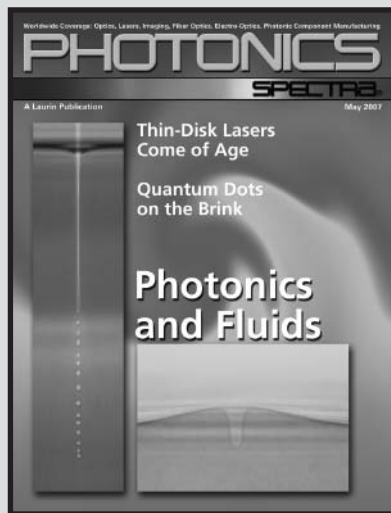
stainless steel plates. The annual market is more than 1,000 sets and \$26-\$40 million. High-power diode lasers are imported.

High-power laser cutting is mature technology in China and high-power CO<sub>2</sub> lasers and Nd:YAG lasers are used in laser cutting. The annual market is 300-400 sets and \$130-\$200million. Low-power CO<sub>2</sub> laser engravers and cutters are mainly made by Chinese companies, but they are very cheap. The annual market is 12,000 sets and \$65-\$91mil-

lion. It is pointed out that more and more these lasers systems are sold into the global market. Last year, a joint venture was set up in China to produce 4000W CO<sub>2</sub> lasers.

There are many other laser machining systems such as laser heat treatment, drilling, sub-surface engraving, and specific application-used systems such as button marking, piston ring marking, IC marking, cloth cutting, PCB drilling, but their market share is not high. Some advanced systems are used in universi-

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ties and research institutes, but they are mostly imported.

### Ongoing Issues

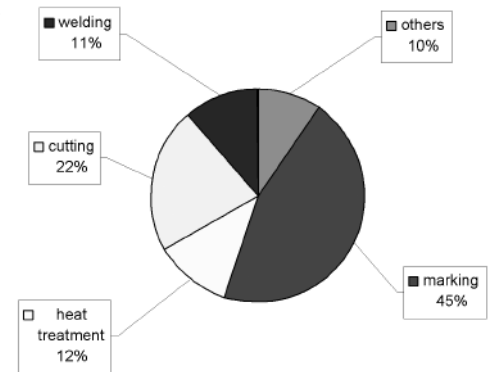
There are some problems in the laser field or market, and they are 1) Competition of some products such as laser markers and CO<sub>2</sub> laser engravers is too heavy and their prices are not reasonable. The profit of these products is very limited; 2) Investment in laser field is very small and technology development is too slow, especially in the field of new technology and new systems; 3) Key components rely on import and the laser production chain was not set up. There are too many companies

that make same or similar products, but not many companies develop their own technologies or new products; and 4) Piracy is serious. Once a new machine comes out, there are many copies immediately.

### Future Outlook

Photonics is a rapid growth technology and laser technology is a key technology of photonics. The Chinese government puts much money and effort to develop laser technology and its applications. The trend and hot development areas are all-solid-state lasers, diode lasers, fiber lasers, and UV lasers. More and more new processing sys-

tems or specific-application systems are being developed. The combination of small companies to form bigger companies is more popular. More foreign laser companies are interested in setting up joint ventures or sole subsidiary companies in China to go into the Chinese market. \*



**Fig. 1 Applications of laser systems in China.**

*Dr. James Chen Yihong (james@AnteLaser.com) is the general manager of Guangzhou Ante Laser Co. Ltd. and chairman of the Wuhan Laser Manufacturing*

*Society.*

*These statistics are based on the data from the Laser Branch, China Optics and Photonics Manufacturing Society.*

## BECOME A CERTIFIED LSO TODAY!

### Why Become Certified?

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# Lasers Shine At Munich Show

by Bill Lawson

I have been going to the Munich laser show (Laser. World of Photonics) since 1985 when Germany's substantial investment in laser development was starting to result in strong German growth as a laser manufacturer. Although lasers today are manufactured and used worldwide in industry, the Munich show continues to be the best show internationally for material processing lasers. All the large laser manufacturers are in attendance, as are most of the small ones. In this one place you can see what is new worldwide in laser sources, learn the latest infor-



**Bill Lawson has traveled from Wisconsin repeatedly to attend the conference in Munich.**

mation on laser material processing that people are willing to share, and talk in person with more than salespeople at most of the companies.

Munich is also a great location for the show, which was held June 18-22, 2007: good Bavarian food such as Schwein Haxen, and my roller blades/in-line skates always go with me to Germany as they have more paved paths than anywhere else I have been in the world. This time I

skated/bladed with the over 10,000 other skaters on the 13km southern route. Great fun to have the police giving skaters preference on the streets for an hour!

This report contains my impressions because, with its size and many highlights, I found it hard to see the show completely in its four days. There were 1,008 exhibitors and more than 25,000 attendees.

## Fiber Laser Leads

This was the year of the fiber laser. I heard that there were at least 23 companies showing fiber laser products.

IPG, as usual, had a great showing of all its fiber laser products. Rofin exhibited a 1000-Watt fundamental mode laser and Lumonics had its own 300-Watt fiber laser. Even Trumpf, the disc laser leader, showed a 300-Watt fiber laser. Rumors are that it might be capable of much higher powers. SPI showed its new products, but still no kW fiber laser. There were several manufacturers showing femto-second fiber lasers. Crystal Fibre, a manufacturer of photonic crystal fibers, talked about some developments of multi-kW fundamental mode lasers using their fibers.

The disc laser, however, was not to be eclipsed by the fiber laser. Trumpf showed an 8kW disc laser with 8mm mr beam parameter product (BPP) and is talking about getting up to 32kW from that laser design in the future. They also showed a 1kW disc

using a plug-and-play 50 micron fiber with a BPP of 2. Trumpf also announced, as I understand, a kW disc laser with a 100 micron fiber and a BPP of 4. Rofin showed a Q-switched disc laser for hole drilling and silicon cutting.

Even though it was the year of the fiber laser, there were things happening in other types of lasers. As is always the case,

technologies seem to respond to competition and CO<sub>2</sub> is not to be left behind. PRC showed a larger CO<sub>2</sub> laser. Rofin showed its new 600-Watt CO<sub>2</sub> sealed slab and the largest Rofin diffusion cooled slab now is rated at 5,000 Watts. Trumpf showed a much smaller 1,000 Watt version of its diffusion-cooled KOAX laser. Trumpf fast flow lasers are also chasing the diffusion-cooled lasers for reduced gas usage. The company stated its Truflow laser in some models will run for 1,000 hours on one bottle of mixed gas. Not to be left out, the small CO<sub>2</sub> companies like Synrad and Universal were also showing improved products.

## Impressive Improvements

Even though the fiber and disc seem to be the next generation of solid-state laser for many applications, there are improvements in conventional solid-state lasers. Lasag showed a new slab laser that looked very interesting. The pico-second and femto-second lasers were in great evidence with powers exceeding 20

Watts. There were spectacular samples of what could be done with very short pulses and doubled, tripled and even quadrupled wavelengths.

Direct diode lasers are developing and, while not yet directly threatening fiber or disc lasers, they keep improving the power versus beam

**“ In this one place you can see what is new worldwide in laser sources...”**

quality factor. As an example, Laserline showed 1,000 Watts from a 200 micron .22 NA delivery fiber and 4,000 Watts from a 400 micron .22 NA fiber. Direct diode lasers are already the laser of choice for cladding and heat-treating and are starting to nibble at welding applications.

The Munich laser show again demonstrated why it is the best place for a laser processing engineer to get an overview of what is available now, and what is coming in the future for improving laser-based processing performance. I expect the 2009 show to again be the best place to see developments in the industrial laser world, to enjoy good food and conversation, and of course, Munich Blade Night. Hope to see you there on your blades!! \*

*Bill Lawson is president of NewTech Development, LLC (www.newtechdev.com) in Somerset, Wisconsin, with focus on emerging technology, market development and industrial laser process development. Lawson has served the LIA as a director, treasurer in 1999, and president in 2003.*

# Laser Conference Offers It All

by Milan Brandt

**L**asers in Manufacturing (LIM 07) was held in Munich, Germany from June 18-22 as part of the Laser 2007. World of Photonics Congress and trade show. LIA was a cooperating society. The World of Photonics Congress is the largest European congress covering all aspects of photonics. Including the trade show, which showcased the latest developments in lasers, systems, processes, optics and associated equipment and components, it is estimated that some 3,000 attendees from all over the world visited the various trade halls, attended lectures and workshops, and engaged in intense discussions on the scientific impact and industrial applications of various technologies.

Judging by the response from the delegates and vendors, the event was a great success. It proved an excellent source of information on the latest in technology and networking opportunities.

## A Well-Rounded Conference

LIM 07 was a five-day international conference covering all aspects of laser technology and application, focusing in particular on the growth and applications of industrial lasers in Europe. The conference general chair, Professor Frank Vollersten from BIAS in Bremen, Germany, attracted many local, regional and international researchers to present and share their latest developments in macro and micro machining with lasers. Some 180 papers were delivered in 14 sessions over the five days.

In his opening remarks, Vollersten welcomed the delegates and said that one of the aims of LIM 07 was to continue to build on the previous LIM conferences in providing a European forum for researchers and industry to present their latest ideas and discuss their results, and this goal was achieved.

The conference opened with a review by K. Mikame on the laser applications in Toyota Motor Corporation, in

particular in laser welding. He concluded that lasers have made a significant impact in Toyota in allowing new part design and manufacturing to take place, which improved productivity and reduced production costs. Another plenary speaker was C. Addington from HP, who discussed the impact lasers have made at HP, in particular in the manufacture of inkjet printers. He showed the various designs and laser manufacturing solutions. The plenary session concluded with Reinhart Poprawe from the Fraunhofer Institute for Laser Technology in Aachen, Germany, with a talk on the society and the drivers for change, and he linked these to the future of laser materials processing.

## Laser Welding Dominates

Although I attended the papers in the macro sessions, both the macro and micro sessions covered all aspects of laser cutting, in particular using high brightness lasers, welding, monitor and control, systems, surfacing and free-form manufacture. It was clear from the papers that the dominant laser of interest is the fiber laser and that in Europe, laser welding is the dominant application. Some 40 papers out of 80 in the macro sessions discussed some aspect of laser welding.

It is perhaps worth noting the presentation on disc lasers by Peter Leibinger from Trumpf, who not only presented without slides, but gave a balanced view on the progress and applications of disc and fiber lasers from Trumpf's



**A first-time attendee, Milan Brandt traveled from Australia to attend the conference.**

perspective. It is worth noting that CO<sub>2</sub> lasers will play a major role in Trumpf's laser armory for some years to come.

While the conference was a success in general, the only minor negative comment is that, in my view, there should have been less of an overlap between the conference and trade fare. I missed a number of interesting talks due to networking and discussions with suppliers.

Overall, however, I enjoyed the whole event and would recommend it to anyone involved in photonics as a must-see event at least once. ✱

*Milan Brandt is a professor in laser engineering with the Industrial Research Institute Swinburne, Swinburne University of Technology, in Melbourne, Australia. The institute is a leading provider of industrial research solutions to local industry in the areas of bio-engineering, microwave applications, non-contact inspection, micro and macro machining with lasers. He is a member of LIA's board of directors and twice chair of PICALO.*



**LIA Corporate Member Trumpf displayed several new products at the show.**

# ICALEO 2007 To Be An Excellent Conference

The International Congress on Applications of Lasers & Electro-Optics (ICALEO®) has a 25-year history as the conference where researchers and end-users meet to review the state-of-the-art in laser materials processing and predict where the future will lead. From its inception, ICALEO has been devoted to the field of laser materials processing and is viewed as the premier source of technical information in the field.

The 26<sup>th</sup> ICALEO will be held Oct. 29-Nov. 1, 2007 at the Hilton in the Walt Disney World Resort in Orlando, Fla. ICALEO® 2007 will include two conferences, the Laser Materials Processing Conference and the Laser Microprocessing Conference, as well as a Poster Presentation Gallery, the Laser Solutions Short Courses, and a Business Development Session. Furthermore, an exciting new conference has been added for

2007 devoted strictly to nanomanufacturing.

Anyone interested in laser 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

include Dr. Ferenc Krausz, professor of physics at LMU Muenchen of MPQ in Garching, Germany and Dr. Colin Seaton, director of new business development in the display sector of Coherent, Inc, USA. Lastly, Professor Reinhart Poprawe of Fraunhofer ILT, Aachen,

assisted laser microprocessing. Additional topics include ultrafast laser processing, nanosecond pulse microdrilling, fiber laser applications, surface modification, micro-welding/structuring/forming/packaging, device manufacturing, deposition and process monitoring, biomed-



won't want to miss this conference. According to ICALEO 2007 General Chair Professor Yongfeng Lu of the University of Nebraska-Lincoln, the ICALEO program committee has put together a very interesting program with a high number of contributions from research and engineering groups covering all parts of the world in areas of traditional and emerging laser applications.

## Plenary and Technical Sessions

The plenary session, "New Frontiers of Lasers & Photonics," will consist of eminent leaders in science, business and government giving talks on different aspects of new frontiers of lasers and photonics says Lu. Presenters

Germany will discuss photonics in the 21<sup>st</sup> Century.

The Laser Materials Processing Conference will cover a wide range of topics on macroscopic processes, applications, and related laser equipment and systems. This year will have a session on high brightness lasers and a special session on recent developments in diode technology. In addition to new laser technologies, approaches to manufacturing needs are also a major topic. Also with more emphasis in manufacturing to use processes that are "under control and understood", there will be a session on "Modeling & Simulation" to help understand laser processing and a session on "Monitoring & Control" to insure quality.

The Laser Microprocessing Conference addresses special interests in processes and systems for microscopic applications, including high-light sessions such as hybrid processing, and chemically

ical applications, and light sources for microprocessing. A highlighted session on hybrid and other novel processing techniques will be presented.

Lasers are also being called upon to make an impact on the earth's environment. The Laser Materials Processing and Laser Microprocessing Conferences are jointly sponsoring a session on how lasers are being used for "Green" applications that will have a positive impact on the earth and global warming.

New this year, ICALEO has established a separate Nanomanufacturing Conference to highlight laser technology for the emerging field of nanoprocessing and nanomanufacturing. This conference has been initiated to address the producibility, predictability and productivity aspects of optical and laser-related nanotechnologies for nanomanufacturing and their scale-up for mass production. This conference will highlight

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research in emerging nanomanufacturing technologies in laser nanopatterning, holographic lithography, nanoparticle generation, pulsed laser deposition and sintering, micro/nano-machining, multi-photon polymerization, laser-assisted characterization and scanning probe lithography/microscopy for a variety of applications including nanocomposites, flexible electronics, photovoltaics, biosensors, etc.

### Additional Events

In addition to the technical conferences on laser materials processing, laser microprocessing, and nanomanufacturing, ICALEO 2007 has organized a Laser Business Insight – Panel Discussion that should be of particular interest for

participants who would like to gain more information and experience in laser business. Valuable experience will be presented, and there will be plenty of time to interact with colleagues and experts.

Moreover, the Laser Solutions Short Courses are ideal for those who want to receive a complete overview on the state-of-the-art in laser processing. A series of five short courses taught by industrial photonics experts will address fundamentals related to lasers, optics, material processing, and applications and are designed to complement the other ICALEO activities.

The ICALEO 2007 Vendor Tabletop Display & Reception will be an important networking opportunity to discuss individual ideas with industry

representatives. Additional social events include the President's Reception, the LIA Annual Meeting & Awards Luncheon, and the Meet & Greet Fiesta.

"With all these opportunities, the 26<sup>th</sup> ICALEO will be the pacesetter in the field of laser applications. I would be pleased to be able to meet all of you in Orlando!" said Lu.

The ICALEO advance program, which provides details for all the technical sessions, poster presentations,

### Early Bird Registration Special

LIA is offering a special promotion for ICALEO registrations. If you register online by the early bird deadline of Sept. 13, you will receive \$50 off a full conference registration. After Sept. 13, the higher rates apply. Discount does not apply to one- or two-day registrations.

This online registration special applies to any type of attendee – member, non-member, cooperative society, retired, and student.

The only way to get the \$50 off is via the online registration – the discount won't be given to any faxed registrations.

vendor exhibits and short courses offered during ICALEO, is available on [www.icaleo.org](http://www.icaleo.org). Also visit this site to register, or contact the LIA conference department at [conferences@laserinstitute.org](mailto:conferences@laserinstitute.org) /800.34.LASER. \*

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#### Congress General Chair:

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Lincoln, NE, USA

#### Laser Materials Processing Chair:

Paul Denney, Connecticut Center for Advanced  
Technology, Inc., East Hartford, CT, USA

#### Laser Microprocessing Chair:

Xinbing Liu, Panasonic Boston Laboratory,  
Cambridge, MA, USA

#### New for 2007!

#### Nanomanufacturing Conference Chair:

Haris Dumanidis, National Science  
Foundation, Arlington, VA, USA

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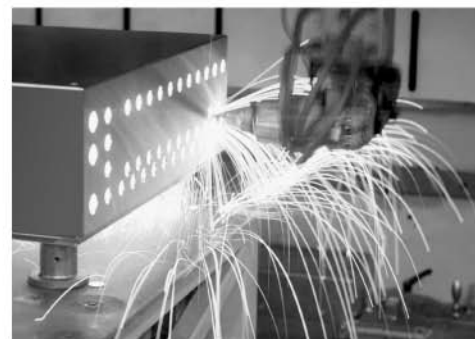


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## Fraunhofer Institute

**L**IA Corporate Member Fraunhofer Institute for Material and Beam Technology IWS is located in Dresden, Germany. Fraunhofer offers application-oriented research and development in the area of laser and surface technology. The distinct feature of the institute is the combination of outstanding experience in laser and coating technologies as well as fundamental material science expertise which leads to optimized manufacturing processes. The close collaboration with system suppliers and equipment manufacturers enables Fraunhofer to offer its customers one-stop solutions based on novel concepts.

Fraunhofer has been an LIA member since 1997, and Fraunhofer's Executive Director Prof. Eckhard Beyer has been a member of LIA's board of directors since 1994 and actually served as LIA's president in 2002.

### Institute Organization

The parent organization of the institute is the Fraunhofer-Gesellschaft, which was founded in 1949. At present, the Fraunhofer-Gesellschaft runs about 80 research units, including 58 Fraunhofer Institutes at over 40 different locations in Germany. A staff of approximately 12,500, predominantly qualified scientists and engineers, works with an annual research budget of around €1 billion. Roughly two-thirds of this budget is generated through contract research on behalf of industry and publicly funded research projects.

The Fraunhofer IWS was founded in 1994. Today, processing technology areas and lab space of about 6200 m<sup>2</sup> as well as the latest equipment can

be used for the development of system components and technologies as well as for material and assembly characterization. In 2006, 100 scientists and technical employees handled approximately 260 projects with a volume of €14.2 million.

The Fraunhofer IWS is subdivided into five departments: joining and surface treatment, ablation and cutting, thermal coatings, PVD and nanotechnology, and CVD thin film technology.

The institute's technical focal points are: laser beam joining, cutting and ablation processes; thermal coating and surface treatment, and thin film technologies like PVD and CVD.

### Fraunhofer's Research

Asked what areas Fraunhofer's research is most focused in, Prof. Beyer said, "In the field of laser materials processing, the most important competencies are the development of production processes based on the newest laser generation as well as the concept and testing of system components suitable for series production.

"Nanotechnology will be among the key technologies of the 21<sup>st</sup> Century and a future research area of the institute. Ultra thin films and particles are among the main elements of our activities with widely varying applications in micro-electronics, optics, medical equipment, and wear protection."

Fraunhofer IWS

has had to respond to industry needs as well, explains Beyer. "The automotive industry represents the most important sec-



**A laser welding process of a gear part is just one of Fraunhofer's many capabilities and research areas.**

tor for laser technology and has shown the largest growth in the last five years and considerably influenced the development of laser technology. Today, there are new lasers on the market, e.g. high power diode lasers, fiber as well as disk lasers, which can be described as the new laser generation.

"Of course, laser technologies are applied in other segments of industry too, e.g. in microprocessing (marking) as well as in medical engineering," he said.

For more information, visit [www.iws.fraunhofer.de](http://www.iws.fraunhofer.de). \*

### Workshop On Fiber Lasers

The Fraunhofer Institute for Material and Beam Technology will be hosting its 3rd International Workshop on Fiber Lasers Nov. 14-15, 2007 at the International Congress Center in Dresden, Germany. Scientists and engineers will present their latest developments on fiber lasers and demonstrate the innovative potential for industrial applications. Topics areas will include beam quality, flexibility, cost effectiveness and efficiency. For more information, visit [www.iws.fraunhofer.de](http://www.iws.fraunhofer.de) or e-mail [info@iws.fraunhofer.de](mailto:info@iws.fraunhofer.de).

# Laser Inventor Passes

## Theodore Maiman, 1927-2007

This year saw the 47<sup>th</sup> anniversary of the invention of the first working laser. That laser's inventor, Theodore Maiman, passed away on May 5 in Vancouver at the age of 79. Also called "the father of the electro-optics industry," Maiman was a founding director of LIA.

Maiman was born in Los Angeles in 1927 and attended the University of Colorado where he received a B.S. in engineering physics. He then went on to Stanford University where he received an M.S. in electrical engineering and in 1955 a Ph.D. in physics. At Stanford, Maiman studied under Willis Lamb, who received the Nobel Prize in physics in 1955.

According to the May 15, 2007 *Optoelectronics Report*, while working at Hughes Aircraft Company in Malibu, Calif. in 1960, Maiman was assigned the job of building a more practical version of the maser using microwave emission from chromium atoms in synthetic ruby crystals. Maiman's laser, based on a synthetic ruby crystal grown by Dr. Ralph L. Hutchesson, was first operated on May 16, 1960.

However, after a protracted legal battle, some key laser patents were awarded to Gordon Gould in 1977, who is credited as the first person to use the word laser. According to the IEEE, Maiman's invention was influenced by an article by Arthur L. Schawlow and Charles H. Townes

(founders of the maser), "Infrared and Optical Masers," which appeared in *The Physics Review* in 1958. In their article, the two scholars laid out a theoretical basis for the laser construction and outlined some of its problematic aspects. Gould was a doctoral student at Columbia University under Townes during this time. Eventually, Maiman became the winner of the race to create the laser, which began in 1959.

After leaving Hughes, Maiman joined Quantatron where he was in charge of the laser activities. In 1962, Maiman became president of the newly formed Korad Corporation, a wholly owned subsidiary of Union Carbide. Union Carbide bought the

laser assets owned by Quantatron. Korad was devoted to the research, development, and manufacture of lasers. He formed Maiman Associates in 1968 after selling Korad to Union Carbide Corporation.

Due to his work on the laser, Maiman was twice nominated for a Nobel Prize and was given membership in both the National Academies of Science and Engineering. He received the Oliver E. Buckley Prize in 1966, was the recipient of the 1983/84 Wolf Prize in Physics, and was inducted into the National Inventors Hall of Fame that same year. Three years later, Maiman became laureate of the prestigious Japan Prize, the Asian equivalent of the Nobel Prize. \*

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## In The News, cont. from pg. 1

signatures of both. Discriminating between them was achieved by scanning with multiple colors of light, either at the same time or in sequential scans depending on the sensitivity.

The new non-invasive laser method could enable doctors to see as much as a millimeter below the surface of the skin, which should be enough for a diagnosis. The laser powers involved are considerably less than a laser pointer, and limiting the pulses to femtosecond bursts ensures that the skin does not overheat while illuminated. A compact laser system based on the technique could be available to dermatologists within three years.

## Two Micron Diode Aims for Soft Tissue Surgery

A  $2\mu\text{m}$  laser diode bar based on gallium antimonide (GaSb) is ideal for use in soft tissue surgery, say researchers from Fraunhofer Institute for Laser Technology, reported the May 24 issue of *Optics.org*. For surgical applications, the advantage of using  $2\mu\text{m}$  is that the light is absorbed easily but does not penetrate far. This means that it is easier to control surgical incisions.

"We obtained a maximum output power of 18-20W at an operating current of 70A and a wavelength of  $1.92\mu\text{m}$  for a bar containing 20 emitters," Konstantin Boucke, head of the laser components department at Fraunhofer ILT, said. "Compared with results obtained by other groups and other material systems, this to our knowledge is an improvement of more than a factor of two."

The individual laser chips were fabricated using MBE at IAF's semiconductor processing equipment. The high-power modules also feature red or green "pilot" lasers to act as a guide for the infrared emission. Each 10mm wide laser bar contains 20 emitters with an emitter width of  $150\mu\text{m}$  and a pitch of  $500\mu\text{m}$ . The laser bars were mounted on water-cooled micro-channel heatsinks with a cooling water temperature of  $20^\circ\text{C}$ .

The next steps are to evaluate the long-term stability and reliability of the laser bars under operating conditions. "We intend to optimize the manufacturing process of the GaSb laser diodes and to further optimize the fiber coupling in the diode laser module," said Boucke. \*

## Journal of Laser Applications® Update

The *Journal of Laser Applications*® offers the latest refereed papers by leading researchers in the laser community. The August 2007 issue includes papers from materials processing, biomedical, and safety. Look for the online version at [www.laserinstitute.org/publications/jla/](http://www.laserinstitute.org/publications/jla/). To view the journal online, please make sure your membership is current. Starting with the August 2007 issue, online figures will be in color. In addition, articles will now be posted online as the production cycle is completed ensuring timely publication. These articles will be fully citable.

The JLA is published four times a year by the Laser Institute of America 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.

Sign up at <http://scitation.aip.org/jla/alert.jsp> to receive your JLA table of content e-mail alerts.



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### Corporate Members

- Allegheny General Hospital – Clinical Eng. Dept., Pittsburgh, PA
- Del Mar Photonics, Inc., San Diego, CA
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For a complete list of corporate members, visit our corporate directory at [www.laserinstitute.org](http://www.laserinstitute.org).

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## Members In Motion

### Expanded Services Offered

PhotoMachining, Inc., Pelham, NH, manufacturer of custom ultraviolet (UV) laser micromachining tools, has expanded its facility from 7,000 to 11,000 square feet and has added five more employees bringing its employee total to 20. The expansion and headcount increase will allow it to keep up with demand for its UV laser systems and to improve its job-shop services that are performed in its Class 10,000 contract-manufacturing facility. Also, a 300-square-foot 'show room' has been added to showcase products, particularly refurbished microscopes and optics assemblies. For

more information visit [www.photomachining.com](http://www.photomachining.com).

### Shipping In 24 Hours

Coherent, Inc., Santa Clara, Calif., has become the first manufacturer of laser measurement and control instrumentation to offer product shipment within 24 hours of receipt of order. With its new "C24" program, Coherent will now maintain inventory of the 25 most popular products for immediate delivery. These include several laser power and energy meters and commonly used sensors for these instruments, as well as the LaserCam-HR beam profiler and some common accessories. This program currently applies to North America, and

will be extended to Europe and Asia in the very near future. For more information visit [www.coherent.com](http://www.coherent.com).

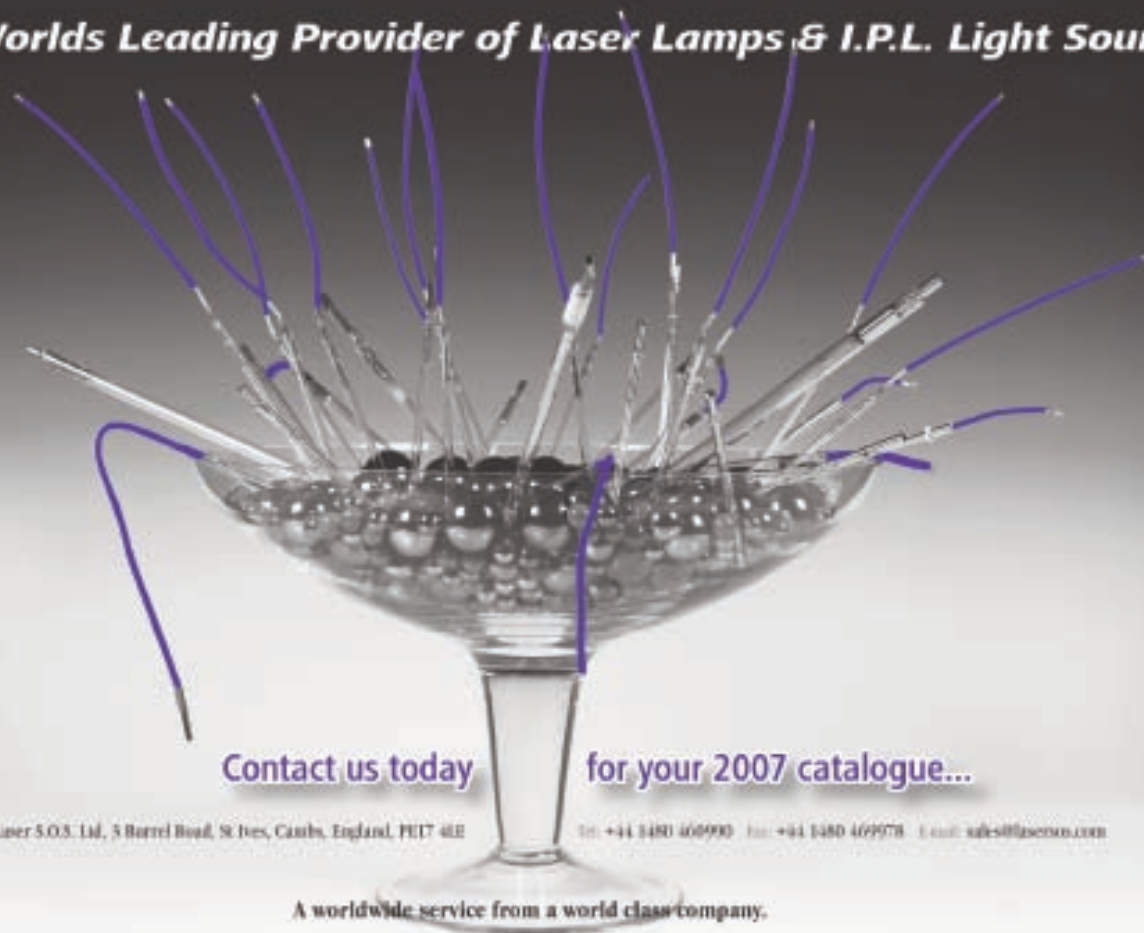
### Crafford-LaserStar Has New Florida Location

Crafford-LaserStar Technologies Corporation, a supplier of laser welding and laser marking/engraving machines, has relocated its Florida office to 8615 Commodity Circle, Orlando, Fla. The new Florida LaserStar center is a state-of-the-art facility that will provide a significantly larger sales, service, education and training center to better accommodate customers. For more information visit [www.laserstar.net](http://www.laserstar.net).

### Partnership To Develop Dicing Tool

Synova, Lausanne, Switzerland, has entered into a partnership with Munich-based Disco Hi-Tec Europe GmbH, a provider of semiconductor wafer dicing, grinding and polishing machines. Under terms of the alliance, the two companies will work jointly to combine Synova's patented Laser MicroJet® technology with Disco's latest-generation blade-saw dicing systems to develop a hybrid dicing tool for advanced dicing applications. Company officials report that the first tools are slated for introduction in late 2007. For more information visit [www.synova.ch](http://www.synova.ch). \*

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# LIA Announces

## PICALO in 2008

The 3<sup>rd</sup> Pacific International Conference on Applications of Lasers and Optics (PICALO) will be held April 16-18, 2008 in Beijing, China. Presented by LIA in cooperation with Laser Processing Committee of China Optical Society and Tsinghua University, PICALO will focus on the growth and application of lasers and optics in the Pacific region. Topics such as aerospace, cutting and drilling, welding, manufacturing, research, software, and hybrid processes will be covered. New for 2008 is the PICALO International Enterprise Summit, discussing the impact of globalization on the laser industry; highlighting opportunities and challenges for laser companies in China and the world for the next decade and beyond. For more information on PICALO 2008, including sponsor and vendor display opportunities, visit [www.laserinstitute.org/conferences](http://www.laserinstitute.org/conferences) or contact Beth Cohen at 800-34-LASER or e-mail [bcohen@laserinstitute.org](mailto:bcohen@laserinstitute.org).

## Revised Laser Safety Guide

LIA has just released the revised *Laser Safety Guide* (LIA Pub. #103). As a result of advances in laser devices and applications, this 11<sup>th</sup> edition of the *Laser Safety Guide* has been completely updated to incorporate the major changes from the recently revised *ANSI Z136.1 (2007) Safe Use of Lasers* standard. The guide is a handbook for all laser personnel. It outlines potential hazards for all types of lasers and provides easy to understand guidelines for controlling laser hazards. The guide provides the reader with the essentials needed for a general comprehension of laser safety concepts. Designed to introduce employees and customers to lasers and laser safety, it details each laser classification and the corresponding control measures used to protect laser users. The *Laser Safety Guide* is available from LIA for \$25 (\$20 for LIA members). For more information, visit [www.laserinstitute.org](http://www.laserinstitute.org) or contact LIA's publications department at 1.800.34LASER or [pubs@laserinstitute.org](mailto:pubs@laserinstitute.org).

## LARG Returning in Fall

In April 2007, LIA released the new

*Laser Application Resource Guide* (LARG). This guide was developed to help our corporate members reach laser end-users only accessible through LIA. This guide not only correlates all participating LIA corporate members by areas of interest, but also provides each company with a full-page capability statement highlighting a more comprehensive listing of their services. Each issue will be distributed to over 10,000 laser professionals (including direct mail and website). All attendees of LIA conferences and trade shows, members, subscribers of



LIA newsletters/journal and more will receive this complimentary guide. The LARG will be published annually in the fall and is available for all corporate members of LIA. The areas of interest are: Laser manufacturers, R&D, safety, beam delivery, job shops,

system integrators, OEMs and ancillary equipment. To be included in the fall 2007 issue, contact Jim Naugle ([jnaugle@laserinstitute.org](mailto:jnaugle@laserinstitute.org)) or Kim Truelove ([ktruelove@laserinstitute.org](mailto:ktruelove@laserinstitute.org)) or call 407-380-1553.

## Bulletin Board for Laser Safety

Recognizing the unfulfilled need for a place to share information, concerns, and new ideas relating to laser safety, the Board of Laser Safety (BLS), an affiliate of LIA, has created a new online forum – the Laser Safety Bulletin Board. The purpose of this bulletin board is to provide an online resource for improvement in the practice of laser safety. To use this new tool, go to [www.lasersafety.org/forum](http://www.lasersafety.org/forum). Registration is simple and takes only a few moments. Users can tailor their experience by setting preferences for time zone, privacy, and formatting. There is even an option for e-mail updates on postings. As a global channel for sharing information, the Laser Safety Bulletin Board should prove to be an excellent new instrument for promoting and improving laser safety. For more information, please contact BLS's Rich Greene at [bls@lasersafety.org](mailto:bls@lasersafety.org). \*

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