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: DENTISTRY AND MEDICAL | VOLUME 16 NUMBER 1 | JAN / FEB 2008

In celebration of LIA's 40th anniversary, LIA TODAY is honoring the advancements in laser applications by featuring 40 articles written by the professionals who have contributed to this beneficial technology over the past four decades.

LASERS IN DENTISTRY: THE PAST, PRESENT AND FUTURE

By Joel White

Laser use in dentistry began with the advent of the first lasers in the 1960s. The initial lasers investigated by dental researchers were continuous wave devices that generated a lot of heat on enamel and dentin. These first lasers were shown to alter the tooth structure and compromise the dental pulp so could not be used on teeth. Lasers, like the ruby laser, also did not have a good way of delivering the laser energy inside the oral cavity. During the 1970s, laser use in dentistry was limited to cutting oral soft tissues, mostly with carbon dioxide lasers and articulated arm or wave guide delivery systems.

In the 1980s, two significant developments occurred in laser development that allowed their increased use in dentistry. Short microcsecond pulsed lasers with fiberoptic delivery were developed. These lasers have high peak power and a low average power, so they can ablate mineralized tissue (enamel and dentin) and cut and coagulate gingival (gums) and oral mucosa (soft tissue above the gums). They also have small fiberoptic delivery with beam sizes in the range of 300 microns to 1 millimeter, so they can remove extremely small amounts of dental disease, as compared to a dental drill and conventional treatments. (*Cont. pg. 6, see* **Dentistry**)

MEET LIA'S 2008 PRESIDENT & BOD

The 2008 president of the LIA certainly has a long commute to attend board meetings. Installed during ICALEO in October, Andreas Ostendorf is the CEO of Laser Zentrum Hannover e.V. (LZH) in Hannover, Germany. LZH is one of Europe's leading research and development institutes in the field of laser technology.

Ostendorf studied electrical engineering at the University of Hannover, Germany. In 1995 he joined LZH as a scientist dealing with micro-machining using UV and ultrafast lasers. In 2000 he finished his Ph.D. thesis on comparing the interaction models of those two laser principles. After holding different offices at the LZH, in 2001 he became its CEO and a member of the board of directors. Additionally, in 2005 he started giving lectures as a member of the faculty of mechanical engineering at the University of Hannover.

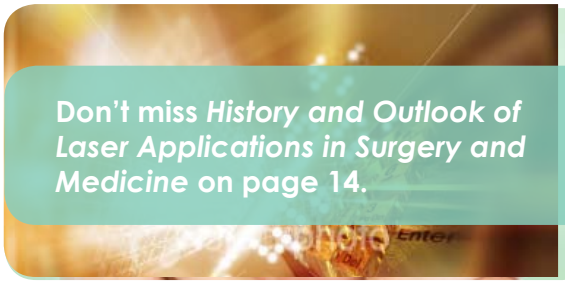
(*Cont. pg. 8-11, see* **President and Board 2008**)

IN THE NEWS

NIST, EC Agency Partnership

Enhancing trade between the United States and the nations of the European Union (EU) while helping ensure the safety and quality of goods sold in both markets is the goal of a collaborative agreement signed on Dec. 17, 2007, between the European Commission (EC) Joint Research Centre (JRC)'s Institute for Reference Materials and Measurements (IRMM) and the National Institute of Standards and Technology (NIST). The pact will advance the development and availability of international measurement standards in the fields of chemistry, life sciences and emerging technologies. NIST and the JRC are currently establishing a work plan that will detail specific projects and activities, including workshops and conferences.

(*Cont. pg. 21, see* **IN THE NEWS**)



Don't miss *History and Outlook of Laser Applications in Surgery and Medicine* on page 14.

Laser Institute of America

40th Anniversary

Laser Applications and Safety

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

IN THIS ISSUE

FEATURES

DEPARTMENTS

ADVERTISERS

LIA TODAY

THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA

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

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

If you are interested in advertising space in this newsletter or a subscription, please contact Jim Naugle at 407.380.1553. or 1.800.34.LASER.

2008 LIA OFFICERS

President - Andreas Ostendorf
Laser Zentrum Hannover e.V.

President-Elect - Rajesh Patel
Newport - Spectra Physics

Past President - William Shiner
IPG Photonics Corporation

Secretary - Klaus Löffler
TRUMPF Laser & Systems GmbH

Treasurer - Stephen Capp
Laserage Technology Corporation

EDITORIAL STAFF

Editor-in-Chief - Peter Baker

Managing Editor - Kris Stell

Copy Editor - Barbara Sams

BUSINESS STAFF

Advertisng Sales - Jim Naugle, Kim Truelove

CALENDAR OF EVENTS

Laser Safety Officer Training
May 5-7, 2008 | Cleveland, OH
July 14-16, 2008 | Nashville, TN
Aug. 11-13, 2008 | Denver, CO
Dec. 8-10, 2008 | Orlando, FL

Laser Safety Officer with Hazard Analysis*
Mar. 10-14, 2008 | Las Vegas, NV
June 9-13, 2008 | Chicago, IL
Sept. 15-19, 2008 | San Francisco, CA
Nov. 3-7, 2008 | Boston, MA

PICALO 2008
April 16-18, 2008 | Beijing, China

Advanced Concepts in Laser Safety
Aug. 11-13, 2008 | Orlando, FL

Medical Laser Safety Officer Training*
Feb. 22-23, 2008 | Las Vegas, NV
May 16-17, 2008 | Chicago, IL
Sept. 19-20, 2008 | Boston, MA
Nov. 14-15, 2008 | Phoenix, AZ

Medical Laser Safety with Hands-On
June 6-8, 2008 | Atlanta, GA

ALAW 2008
May 13-15, 2008 | Plymouth, MI

ICALEO 2008
Oct. 20-23, 2008 | Temecula, CA

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

ABOUT LIA

Laser Institute of America (LIA), founded in 1968, is the international society for Laser Applications and Safety. It is comprised of laser researchers, manufacturers, integrators, and end users working together to increase the use and safe application of laser technologies. LIA individual and corporate members receive significant discounts on all LIA materials, training courses, and conferences.

Laser Institute of America started with the sole intention of turning the potential of a powerful new technology into a viable industry. The LIA was forged from the heart of the profession – a network of developers and engineers – people who were actually using lasers. These were the first "members" of the LIA, the people who decided that sharing new ideas about lasers is just as important as developing them. The belief, as it remains today, is to promote laser applications and their safe use through education, training, and symposia.

If you would like more information about the LIA, call 407.380.1553, 1.800.34.LASER or visit us on the web: www.laserinstitute.org.

WILSON'S COMPLETE
LASER PROTECTION

Wilson offers One-Stop-Shopping for all your laser protection needs.

Of course, the Flagship of the Wilson line is the **Laz-R-Barrier**(r) — superior to all other laser curtains.

That's because **Laz-R-Barrier**(r) protection curtains contain reflective laser radiation and broadband optical radiation from laser plumes. These curtains protect against accidental and chronic eye and skin irritation that can result from exposure to reflective laser beams.

Laz-R-Barrier is flexible, drapable and can be fabricated in most curtain sizes and shapes. When supported on Wilson's easy rolling track framework, the curtains are compatible with interlocking circuits

Wilson also offers a variety of **Laser Eyewear**, designed for added protection for both operators and those nearby. This fine quality Eyewear prevents eye injury from errant laser beams.

No matter what your needs may be, Wilson has the product line to fulfill your Industrial and Medical laser safety requirements.

Whether it's Optical Table Barriers, Roller Shades, Window Shades, Beam Stops, Signs, Illuminated Signs or Door Stops,

***Wilson** has it all.*

WILSON QUALITY SAFETY PRODUCTS

123 Explorer Street, Pomona, CA 91768

Tel: 909/468-3636 Toll Free: 800/423-4277 Fax: 909/468-3640

www.wilsonindustries.com • E-mail: info@wilsonindustries.com

Laser Smart Products™

from the laser people you depend on

Laser Smart™ Knowledge is your best protection -

Inquire about our laser auditing and laser consulting services presented by experienced laser experts

Laser Safety Eyewear

VIEW-IT™ IR & UV Detectors

EVER-GUARD® High Power Barriers & Curtains

Laser Diode Modules

ENTRY-GUARD™ Safety Interlock Systems

TRAP-IT™ Beam Dumps

Enclosure Systems

Pump Chambers

ZAP-IT® Alignment Paper

SERVICE-RIGHT™ Portable Barrier Systems

KENTEK®

"Laser People Helping Laser People"™

800 432 2323
+1 603 435 5580
www.kentek.com

Laser Safety Solutions • Laser Accessories • Laser Replacement Parts

PRESIDENT'S MESSAGE

It is of course a great honor to guide LIA into its 40th year. I have great respect for those people who founded the society four decades ago. At that time – just after the invention of the laser – Schawlow, Maiman, Schwartz and others had the vision to establish a community in order to foster laser applications. No one could really imagine what a success story the laser would become.

My vision 40 years later is that LIA will become the international platform where laser scientists discuss their ideas, create new visions, initiate cooperation projects, and where people can always get an answer for a specific laser question. Of similar importance is that the society act as a huge and open family. Anyone who is interested in laser applications and laser safety is very welcome to join this family and to find new friends from all regions of the world.

To turn this vision into reality, my prime objective will be to further work on international integration. The collaborations with other societies in different countries have to be further developed. PICALO congresses in Australia and China are just the first concrete steps. More have to follow, e.g. as national chapters or even congresses. Also, we plan to make LIA more attractive to corporate members. Last year's President Bill Shiner made very successful work in this direction. One new measure will be the organization of joint stands on international exhibitions. This will allow the small- and medium-sized companies as members of LIA to present their products abroad at affordable costs. LASYS in Stuttgart, Germany and LASER – World of Photonics China, Shanghai, will be the first events.

In view of all these opportunities and challenges, I look forward to working with Peter Baker and the LIA staff, with my colleagues on the LIA board, and with all of you readers of LIA TODAY.

Andreas Ostendorf
President
Laser Institute of America

EXECUTIVE DIRECTOR'S MESSAGE

Year in Review 2007 | Last year was another good one for our society. We have developed excellent teamwork between our officers, board members, conference chairs, members and staff. Together we continue to invest in continuous improvement of our existing products and services and the development of new ones.

LIA Executive Director Peter Baker, right, handing outgoing LIA President Bill Lawson a service plaque.

March | For the first time at ILSC® we introduced the Practical Applications Seminars for practicing LSOs and MLSOs. These were very well received and were a contributing factor to our record attendance and revenue.

We produced our first *Laser Application Resource Guide* which helps educate laser users and connect them with the products and services of our corporate members.

April | We exhibited at LASER. World of Photonics China/Shanghai and co-sponsored the International Conference on Laser Processes and Components together with our friends at the Laser Processing Committee of the China Optical Society and Laser Zentrum Hannover.

Also in April we held the Automotive Laser Applications Workshop. It was the 16th ALAW but the first time that we held it in cooperation with our partners the Fabricators and Manufacturers Association.

May | We published the sixth revision of theANSI Z136.1 *American National Standard for Safe Use of Lasers* which is the foundation document for a laser safety program in the U.S.

October | The 26th ICALEO® was, once again, the biggest and best ever. We introduced our first ever conference on nanomanufacturing.

As you can see, team LIA invested consistently and accomplished a lot during 2007. We benefited greatly from the leadership and enthusiasm of our 2007 President Bill Shiner. Thanks Bill!

We now welcome our 2008 President Andreas Ostendorf and look forward to another good year under his leadership. Andreas has already made major contributions to our society, serving as ICALEO® chair twice and creating the opportunity for LIA to participate with LPC-COS and LZH in the LASER. World of Photonics exhibit at ICLPC in Shanghai. Welcome Andreas!

TODAY's New Look | On a final note, we hope you like the new look of the LIA TODAY, your member benefit newsletter. We still offer the same great editorial content, we've just packaged it in a sleeker, full color format that we feel is more in line with our status as the international society dedicated to fostering lasers, laser applications and laser safety worldwide for the last 40 years.

Peter Baker
Executive Director
Laser Institute of America

Over the last 20 years, there has been a continued growth in the uses of lasers in dentistry. Today, there are over 25 specific indications for use for lasers in dentistry. These cleared indications for use, by the U.S. Food and Drug Administration, include lasers for use in diagnosis and for soft and hard tissue surgery:

Diagnostic Uses of Lasers:
- Aid in diagnosis of dental caries
- Aid in detection and localization of dental calculus
- Aid in the detection and visualization of normal, abnormal and cancerous oral soft tissues

Soft Tissue Dental Applications:
- Intraoral soft tissue surgery
- Aphthous ulcer treatment
- Sulcular (periodontal pocket) debridement
- Treatment of herpetic lesions
- Removal of coronal pulp, adjunct to root canal procedures
- Pulpotomy as adjunct to root canal treatment
- Coagulation of extraction sites
- Cementum mediated periodontal ligament new attachment to the root surface in the absence of long junctional epithelium

Hard Tissue Dental Applications:
- Curing of composite
- Tooth whitening
- Caries removal, cavity preparation, enamel roughening
- Illumination for endodontic orifice location
- Illumination for caries detection
- Soften gutta percha
- Osteotomy, osseous crown lengthening, osteoplasty
- Selective removal of enamel (first degree) caries
- Removal of filling materials as adjunctive treatment during root canal treatment
- Blood flow measurements
- Tooth preparation to obtain access to root canal, pulp extirpation, root canal debridement and cleaning, root canal preparation including enlargement
- Cutting, shaving, contouring and resection of oral osseous tissues (bone)
- Apicoectomy (removal of the apex of the root) surgery

It is estimated that 10 to 20% of dentists in the U.S., Japan and Europe have and utilize dental lasers. The most frequent use of lasers in dentistry is for treating dental cavities and periodontal disease, the two most prevalent diseases of the oral cavity. Dentists and dental hygienists who have appropriate training and experience in dental laser use and in accordance with their specific county and state licensure scope of practice, perform the dental laser procedures.

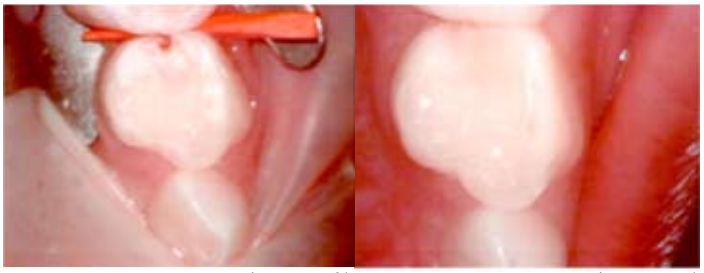
Organized dentistry, including the American Dental Association and the Academy of Laser Dentistry, participate in American National Standards Institute standards for lasers in dentistry. In addition, education, training and credentialing is available through the Academy of Laser Dentistry and others.

MOST POPULAR USES

Dentists often perform cosmetic gingival contouring and tissue retraction using lasers. Most often, these laser procedures are also done in conjunction with a filling or crown restoration (White, JM et al. 1991) (**figure 1 and 2**). Dentists also perform

(Figure 1) *(Figure 2)*

Figure 1 & 2: Small gingival growth prior to excision with dental laser and after treatment with a pulsed Nd:YAG laser.



(Figure 3) *(Figure 4)*

Figure 3 & 4: Lasers can remove the most superficial decay with precise ablation.

excisional and incisonal surgery, like fibroma (fibrous growth) removal and frenuectomy (cutting of soft tissue tags).

The most common soft tissue lasers are diode, Nd:YAG, ErCR:YSGG and Er:YAG lasers. Typical laser parameters are usually 1-3 W and 20-50 pulses per second for 20 seconds to one minute. It is estimated that the most frequent use of lasers is by dental hygienists and dentists who use lasers for removing the diseased epithelium within the periodontal pocket, sulcular debridement of the periodontal pocket and periodontal ligament new attachment in the treatment of periodontal disease, using diode and Nd:YAG lasers. Lasers are also used for non-contact procedures in the treatment of cancer sores.

Dentists use lasers for the ablation of enamel, dentin and even bone, making very precise preparations for restorations. Lasers remove the most superficial tooth decay in the enamel and dentin, with precise ablation, saving tooth structure (Den Besten, PK and White, JM 2001) (**figure 3 and 4**). The dental decay is removed and the cavity is prepared for a restoration. The family of erbium lasers with microsecond pulse duration and small contact tips are most used for hard tissue treatment in dentistry. These ErCr:YSGG and Er:YAG devices have microsecond pulse durations with air/water spray.

USES INCREASE

Diagnostic dental lasers use fluorescence as an aid in the diagnosis of dental disease. Laser fluorescence devices now are able to detect the bacteria within the pits and fissures of teeth. Using laser fluorescence, dentistry is able to see decay and to monitor the progression of demineralization of the tooth. This same concept is used for the detection of dental calculus, the hard

deposits on the teeth, and a major cause of periodontal disease. Lasers are now just being used for the diagnosis of oral cancer, a devastating oral disease with a high mortality rate. Normal healthy tissue can be visualized and compared with cancerous tissue with a change in fluorescence.

Overall, dental lasers are used most in providing minimally invasive dental treatment. Lasers are precise and patients are enthusiastic and accepting of dental laser treatment. Patient's perceptions of laser treatment are much higher than with the noise, vibration and pain of the dental drill. Dentists enjoy providing dental care that is well tolerated by patients. Practitioners incorporate lasers in their practices to provide high quality, minimally invasive care for their patients. Most dentists use lasers because of their clinical benefits, to expand their services, attract new patients and increase productivity.

Laser development and dental research continue to find ways to improve oral health. Research is showing promise in laser hardening of enamel and diagnosis using optical coherence tomography. As lasers develop, so do their applications in dentistry. It might be that there will be 50 uses of lasers in dentistry in our future.

Joel M. White, DDS, MS, is a professor at the School of Dentistry, University of California, San Francisco. An LIA member since 1999, White is also chair of the Z136 Standards Subcommittee 3 (SSC-3) – Safe Use of Lasers in Health Care Facilities and a member of ASC Z136.

Use of pulsed Nd:YAG laser for intraoral soft tissue surgery. White, JM; Goodis, H; Rose, CL. Lasers Surg Med 11:455-461, 1991.

PK DenBesten, JM White, JEP Pelino, G Furnish, A Silveira, FM Parkins, "The Safety and Effectiveness of an Er:YAG Laser for Caries Removal and Cavity Preparation in Children," Med. Laser Appl. 16: 215-222 (2001)

ASC Z136 UPDATE

Over the course of the past year, ASC Z136 has welcomed new members from industry, government (DoD and national labs), and academia. The three new standards subcommittees, established for the development of standards specific to the safe use of lasers in R&D labs and manufacturing (entertainment, displays and exhibitions), have solicited members from within the laser safety community.

You, too, can participate in the development of the Z136 series of laser safety standards. To join ASC Z136 or any of its subcommittees, go to www.z136.org and apply for membership, or contact Barbara Sams at the LIA, 407-380-1553, bsams@laserinstitute.org.

The Academy of Laser Dentistry Presents

ALD
Academy of Laser Dentistry

(954) 346-3776
Toll Free 877-LASERS6

ALD 2008

Become Certified by ALD!

Sailing Ahead

San Diego, California
April 9-12, 2008
ALD's 15th Annual Conference & Expo
LOEWS Coronado Bay Resort

Lasers in Clinical Practice – Point & Counterpoint
- Diagnostics
- Caries management
- Endodontics
- Periodontics
- Prosthodontics / Implantology

Invited National and International Speakers
Dr. Eugene Seidner Award Competition

Register Today at www.laserdentistry.org

START WITH CONFERENCES

The LZH has actively supported ICALEO® and ILSC® for many years. In fact, Ostendorf was a chair of ICALEO 2002, 2003, and 2004 responsible for the microfabrication conference. In 2005 and 2006 he was the general chair of the overall conference.

"Almost from the beginning when I started at Laser Z,entrum Hannover in 1995, I became aware of LIA as a unique source of scientific and technical information. Two years later when I attended ICALEO for the first time, I experienced all the networking opportunities and enjoyed meeting and listening to the gurus of laser applications. Shortly afterwards, I sought to actively support the network by becoming more involved with ICALEO," explained Ostendorf.

This early involvement has lead to Ostendorf's very strong ideas on how to keep ICALEO on top.

"ICALEO has developed over the last decade as the most important congress in laser material processing. However, it is always dangerous to stay passive and to just observe where it goes by its own dynamics. In order to keep ICALEO at the cutting edge, new topics have to be identified that are only weak on the horizon today. For this purpose we have installed a strategic working group on the board with the first result being the establishment of a new conference within ICALEO on nanomanufacturing. Based on its successful launch in 2007, we are convinced that this conference will further grow within ICALEO, providing also a new face to the congress," he said.

INTERNATIONAL RELATIONS

As a scientist, Ostendorf has been involved in many national and international research programs and German collaborative research centers. In his current position, he has intensified international cooperation between the LZH and especially American, Chinese and Russian scientific institutes. Ostendorf is also a member of the WLT German Scientific Laser Society, which cooperates internationally with LIA.

"Building international bridges and setting up networks is one of the most important action items in highly complex fields like laser technology. No person or organization can manage the overall complexity of the scientific progress alone. It's more important to know people who could give a specific answer to a detailed question. New developments are mostly a result of intensive networking activities. LIA can offer a perfect network of contacts and information on laser technology with a high value in almost any region of the world. However, in countries like China, Korea, or Russia with their huge potential, LIA has to further increase awareness. PICALO 2008 in Beijing will be an important milestone regarding international visibility," he said.

THE YEAR AHEAD

Ostendorf has plans during his term to further intensify LIA's strategy to be the best platform where laser experts can meet, exchange information, learn, and interact.

"LIA lives from interaction and communication. This is how new ideas are generated and that makes it attractive for new members. The most effective way to strengthen the society is then to increase meeting opportunities. The new conferences, PICALO and ALAW, are the beginning. Also the regional chapters offer an important added value. With its long-term experience, LIA can be the international roof organization in the field of laser applications and safety. In this context it should be mentioned that LIA has to intensify the cooperation base with the important national societies, like we have the WLT in Germany, AILU in UK, LAS in Russia, LPC-COS in China or JLPS in Japan," he explained.

So from the sounds of it, Ostendorf will be logging many skymiles this year. And he looks forward to another aspect offered by LIA involvement.

"LIA and the networking opportunities it brings has created many personal friendships that are just as valuable as technical contacts," he said.

Andreas Ostendorf, right, accepting his ICALEO chairman plaque from then president Joe O'Brien.

MEET THE 2008 OFFICERS & BOARD

President Elect Rajesh (Raj) Patel has accumulated 20 years of experience in the laser material processing field. He is currently a manager at Spectra Physics, a division of Newport Corporation, and is responsible for managing laser processing applications lab and new laser product development project. Prior to working at Spectra Physics, he had his own consulting company and has also worked at IBM, Aradigm, and IMRA America in the past. He received his Ph.D. degree in mechanical engineering from the University of Illinois at Urbana-Champaign in 1989. He is an author of 22 U.S. patents related to laser processing, optics, and the mask technology field and has published and presented more than 40 technical papers. He is a member of LIA and SPIE, has served on LIA's executive committee for the last three years, co-chaired LIA's ICALEO 1997, 1998, 1999, and 2002 conference, and was conference chair of ICALEO 2004.

Secretary Klaus Löffler graduated from the University of Stuttgart with a master's in mechanical engineering. He worked at TRUMPF Laser Technik in Ditzingen, Germany as CO2 development engineer until moving to TRUMPF Inc. in Farmington, Conn., where he worked as technical coordinator between TRUMPF in Germany and TRUMPF Inc. He then started the TRUMPF Laser

Technology Center in Plymouth, Mich. Starting 2006 he took over international sales at TRUMPF Laser and Systems. Also, in 2004 he founded the Automotive Laser Conference in Wolfsburg, Germany, which together with ALAW and JALAW, builds a global conference partnership.

Treasurer Stephen Capp is currently the LIA treasurer and is CEO of Laserage Technology Corporation, an international supplier of laser-processed materials, where he has held that position since 1994. He previously held positions as plant manager and vice president of operations. He graduated from Milwaukee School of Engineering in 1978 with degrees in electrical power engineering technology and industrial management. He has been a member of the LIA since 1992. He also is involved with the executive council of the International Microelectronics and Packaging Society.

BOARD

Dave Clark, director of marketing at Newport, Inc., is responsible for strategic marketing and business development for the industrial market segment at Newport and Spectra-Physics. He joined Newport last year and has 18 years sales, marketing and engineering experience in the photonics and laser industry. Clark holds a BS in applied physics from Coventry University.

Paul Crosby is vice president of business development at Coherent, which he joined in 1980, and where he has held a number of senior positions, including director of sales and marketing. He has had responsibility for a number of entrepreneurial activities including Coherent's re-entry into carbon dioxide laser technology and the development of a number of commercial markets. Crosby received his Ph.D. and MS from the University of Southampton.

Klaus Kleine is responsible for the U.S. operations of Laserline Inc. as a general manager. Laserline specializes in the development and production of high-power diode lasers for industrial and scientific applications. He is also a member of the staff at the University of Liverpool where he conducts research work related to welding and cutting applications. Prior to his assignment with Laserline, Kleine worked at Guidant, Tsunami Optics, Light Solutions Inc., DuPont and the Fraunhofer Institute for Laser Technology. Kleine holds a MS (Dipl. Ing.) from Aachen University of Applied Science in Germany.

BLS®
Board of Laser Safety

CERTIFICATION
for Laser Safety Officers

- Get connected with other laser safety professionals
- Gain a competitive edge
- Stay current on changes in the industry
- Achieve recognition

CLSO®
Certified Laser Safety Officer
Intended for professionals who are working with lasers in a scientific, manufacturing, or industrial environment.

CMLSO
Certified Medical Laser Safety Officer™
Intended for professionals who are working with lasers in any medical environment.

For more information or to obtain a complete information packet.

Visit: www.lasersafety.org
Call: 1.800.34.LASER

William Lawson, P.E., founded New Tech Development, LLC, Somerset, Wis., to focus on helping emerging market high technology companies develop and implement strategies for growth. Prior to this he was chief technology officer for Preco Laser Systems, and before 2002 he was the majority owner of Laser Machining, Inc., (LMI), which he started in 1978 with one 50W CO2 laser. When it was sold, LMI had grown to having over 35 industrial lasers in its plant and 225 employees. He holds a bachelor's degree in mechanical engineering from the University of Wisconsin-Madison. He has served the LIA as a director, was treasurer in 1999, president-elect in 2002, and LIA president in 2003.

Yongfeng Lu, Ph.D. is currently the Lott Chair Professor of Electrical Engineering at the University of Nebraska at Lincoln (UNL). He received his bachelor degree from Tsinghua University, China, and master and Ph.D. degrees from Osaka University, Japan. Before joining UNL in 2002, he was a faculty member at the National University of Singapore. Lu has received more than $5 million research funding since 2003. More than 190 peer-reviewed journal articles and a number of patents have arisen from his research work. Lu has three new technologies licensed to industry. He has received a number of awards, given a large number of plenary, invited talks, and lectures in international conferences, academic and industrial organizations.

John Marshall is the Frost professor of ophthalmology and chairman of the academic department of ophthalmology at the Rayne Institute, St. Thomas' Hospital. His research over the past 40 years has ranged over a number of ocular problems, but has concentrated on the inter-relationships between light and ageing, the mechanisms underlying age-related, diabetic and inherited retinal disease, and the development of lasers for use in ophthalmic diagnosis and surgery. This work has resulted in almost 400 research papers and numerous book chapters and books, and he has been awarded several medals and honors.

Nathaniel R. Quick is a fellow of LIA and former LIA treasurer. He is the president and chief technical officer of AppliCote Associates, LLC, Sanford, Fla., a technology development company. He holds a Ph.D. from Cornell University in materials science and engineering. He established AppliCote Associates to develop laser-based technologies that enable the next generation of semiconductor devices. Quick is a UCF Florida Photonics Center of Excellence advisory board member, a fellow of the African Scientific Institute, a past guest researcher at NIST and past member of the Army Science Board. He currently holds 38 U.S. patents and has over 60 publications.

John R. Tyrer was awarded his Ph.D. for his work on the application of pulsed lasers to speckle and holographic interferometers. After leaving the automobile industry as an experimental test engineer/designer, he was appointed as lecturer to the department of mechanical engineering at Loughborough University, and in 1988 was appointed a senior lecturer with research interests. Tyrer has published over 90 journal papers and currently has eight patents and two pending. He was conference chair for ILSC 2007. In 1996, Tyrer established a university spin-out company, Laser Optical Engineering, to take licensed products to the marketplace.

Frank Vollertsen, Prof. Dr.-Ing., is CEO of BIAS GmbH and professor at the University Bremen (Germany), faculty for production engineering, responsible for welding and related matter. He studied materials science in Erlangen, did his Ph.D. and habilitation in production engineering and in 1998 became a full professor at the faculty of mechanical engineering of the University Paderborn. In 2003, he moved to Bremen, where he works on a variety of laser processes. He did the first welding trials of high laser power worldwide, and is a well-known expert in laser forming. His work, which is published in more that 100 journals and more that 150 conference papers, has received several awards.

Richard Walker is the president and CEO of Northrop Grumman, Cutting Edge Optronics (CEO), Inc., St. Charles, Mo., a post he has held for the past seven years. He was president of CEO's industrial laser division prior to the acquisition by TRW in 2000. Walker was educated in England and awarded an MSc Hons. degree in physics from the University of London. Walker has been active in the industrial and commercial laser field for almost 30 years, holding technical and managerial positions in both Europe, and for the past 25 years, the U.S. He has authored several papers and has been awarded patents for laser and beam delivery designs as well as material processing applications.

Dean Wilson is president of Wilson Industries. He joined Wilson in 1975 and has managed the sales, marketing, research and development, manufacturing and general operations at various times throughout his tenure. Wilson Industries manufactures industrial safety products specializing in laser barriers, laser eyewear, welding curtains, and more. Wilson has actively participated in the development or invention of several products such as transparent welding curtains, high temperature fabrics for welding protection and thermal insulation, and high amperage class 4 laser barriers. He has a BS degree in biology from San Diego State University.

2006-2008 LIA BOARD OF DIRECTORS

Anthony Arquisch	LASAG Industrial Lasers
Milan Brandt	Swinburne University of Technology – IRIS
Ben Edwards	Duke University Medical Center
Michael Green	Association of Industrial Laser Users
Bo Gu	GSI Group, Inc.
Aravinda Kar	College of Optics and Photonics at the University of Central Florida
William O'Neill	University of Cambridge
Wayne Penn	Alabama Laser Systems
Ronald Schaeffer	PhotoMachining, Inc.
Sheldon Zimmerman	Naval Surface Warfare Center

2007-2009

Magdi Azer	GE Global Research
Neil Ball	Directed Light Inc.
Eckhard Beyer	Fraunhofer IWS
Paul Denney	Connecticut Center for Advanced Technology
Hau Chung Man	Hong Kong Polytechnic University
Etsuji Ohmura	Department of Manufacturing Science at Osaka University
Silke Pflüger	SPI Lasers
Reinhart Poprawe	Fraunhofer ILT
Y. Lawrence Yao	Columbia University

JLA UPDATE

The *Journal of Laser Applications*® offers the latest refereed papers by leading researchers in the laser community. The November 2007 issue includes papers from materials processing and sensing. Look for the online version at 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.

PICALO PREVIEW

3rd Pacific International Conference on Applications of Lasers and Optics
PICALO
April 16-18, 2008 • Capital Hotel • Beijing, China

The 3rd 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. The PICALO general conference chair is Minlin Zhong of Tsinghua University, Beijing, People's Republic of China.

WHO SHOULD ATTEND PICALO

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

"The attendees will be able to enjoy their time in the Olympic atmosphere in the historic city of Beijing, visit the Great Wall, and sample the delicious Chinese food," stated Zhong.

TWO GREAT CONFERENCES

PICALO 2008 will feature a laser materials processing conference that will feature the latest developments across the world in laser cutting/machining, surface modification, welding, additive manufacturing, lasers and systems, modeling and simulation, drilling and forming, and industrial applications.

PICALO will also feature a micro, nano and ultrafast fabrication conference, which will focus on new laser technologies in these areas. Attendees will find innovative ideas and solutions for micro/nano/ultrafast fabrication in opto- and microelectronics, electronics, microsystems, material processing and biomedical industries. Special sessions are dedicated to fundamental science in laser-material interactions, near-field phenomena for nanoprocessing, laser microfabrication and micromachining, laser-assisted device fabrication, laser direct writing, and more.

"About 240 abstracts have been submitted to PICALO 2008, which is almost double the previous PICALO. About half of the abstracts submitted are from outside China. And the abstracts from China were submitted from 36 different universities and institutes," said Zhong.

"PICALO will present the latest research and developments almost worldwide in laser material processing and laser micro-processing. The plenary session will highlight extreme photonic/laser processing, characterizing new technology in extreme high power intensity, extreme short pulse duration and extreme new material and phenomena. For example, the report on 'Ultra-intense laser-matter interactions with a 150 terawatt power laser' will present 150 terawatt power laser-mater relativistic interaction, generation of bright pulses of energetic (keV — MeV) x-rays and charged-particle beams, and unique applications in the physical sciences, biomedicine, defense and homeland security. The report titled 'Photonic Meta Materials, Nano-scale Plasmonics and Super Lens' may inspire profound impact in a wide range of applications such as nano-scale imaging, nanolithography, and integrated nano photonics. These two reports show new technologies compared to normal laser processing."

INTERNATIONAL ENTERPRISE SUMMIT

New for 2008 is the PICALO International Enterprise Summit titled "Globalization: Opportunities & Challenges for Laser Companies in China & the World," which will discuss the impact of globalization on the laser industry. Executives from the Chinese laser industry and from leading world-class laser and optics companies will come together to discuss the impact of globalization on the laser industry – opportunities and challenges for laser business in China and the world for the next decade and beyond.

This PICALO 2008 summit will provide insight from industry experts, legal experts, and decision makers on how to do or expand business in China and on how the laser industry benefits from globalization. The forum allows face-to-face interaction – a great prospect for networking and relationship building.

CONFERENCE TOURS

Just prior to PICALO on Monday, Apr. 14, attendees have the opportunity to visit historic Wuhan and tour prominent laser companies in a special pre-conference tour. Wuhan, capital of the Hubei province, is known as China's Optical Valley. It is the largest base for the optical electronics and photoelectronics industries in China. Participants will tour three companies and interact with executives from each. After a driving tour of Wuhan to see this historic part of the country, including Huanghe Pagoda and East Lake, the day concludes with a closing dinner banquet that will include representatives from the featured companies

as well as other area Wuhan laser companies. The tour costs an additional $150 per participant.

Just after PICALO on Saturday, Apr. 19, is the optional post conference tour that visits the MutianYu section of the Great Wall of China, Ming Tombs, and the famous Cloisonné Factory. The Great Wall, the only man made wonder of the ancient world that can be seen from the moon, is a magnificent monument to China's long and rich history. After taking in the Great Wall, take a tour of the vast mausoleums of 13 emperors of the Ming Dynasty at the Ming Tombs that lie northwest of Beijing. The day ends with a visit to a cloisonné factory. Cloisonné is a unique combination of copper and porcelain working skills, traditional painting, sculpting, and etching skills.

VENDOR PROGRAM

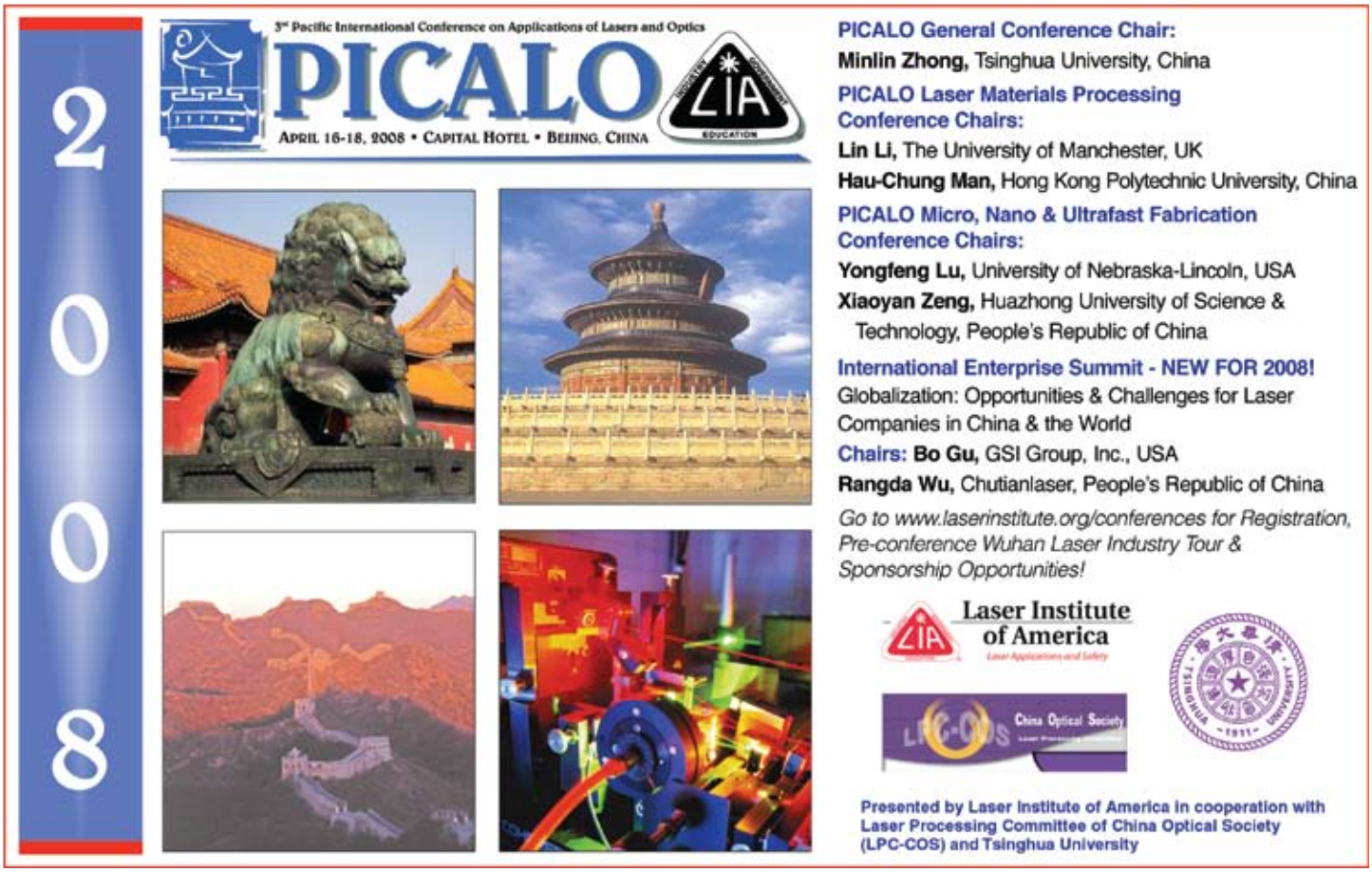
The Laser Industry Vendor Program, which will be held on Thursday, Apr. 17, gives vendors and conference attendees the opportunity to discuss equipment and applications in a relaxed setting. After completion of the day's technical sessions, attendees get to come share refreshments and product ideas with their colleagues and suppliers at this great event.

Registration for PICALO is simple – you can register online or download a PDF registration form from www.laserinstitute.org/conferences/picalo. For more information on PICALO 2008, visit www.laserinstitute.org/conferences/picalo or call 800-34-LASER, or e-mail picalo@laserinstitute.org. ■

PICALO PARTNERS

Many thanks to the cooperating societies for PICALO 2008:

- **Association of Laser Users**
- **Beijing Optical Society**
- **Chinese Society of Non-Traditional Machining**
- **Chinese Welding Society**
- **European Laser Institute**
- **European Optical Society**
- **Japan Laser Processing Society**
- **Chinese Journal of Lasers**



LASER APPLICATIONS IN SURGERY AND MEDICINE — TOWARD KINDER, GENTLER LASER MEDICINE AND SURGERY

By David H. Sliney

Laser applications in medicine and surgery have become "kinder and gentler" in the past decade. That is, power levels have decreased, tissue destruction is less, and more subtle biological responses have been sought. Biomedical laser applications have come a long way in recent decades.

BACKGROUND

Laser surgery was thought of almost immediately after the demonstration of the first lasers in 1960. The experimental use of lasers in surgery and medicine began only shortly after the development of the first working laser system. However, the development of practical, effective, and safe surgical lasers has been lengthy with many obstacles and delays. A number or surgeons, engineers and life scientists conducted a range of research studies between 1961 and 1965 and the first applications of lasers in ophthalmology appeared between 1965 and 1970. Leon Goldman and others pioneered laser applications in dermatology. However, for nearly two decades the ophthalmic use was the only widespread use of lasers in surgery despite the early attempts to apply ruby, argon, Nd:YAG and CO_2 lasers in other fields of surgery. Clinical use of the CO_2 laser steadily grew during the 1980s, followed by the use of Nd:YAG lasers, which were introduced largely to permit the delivery of laser energy endoscopically through fibers—which was not possible at the 10.6-µm wavelength. The use of lasers in general surgery came long after the standard use in ophthalmology of the argon laser for treating diabetic retinopathy and other retinal vascular disease and glaucoma during the 1970s.[1-4] The Nd:YAG laser photodisruptor used for anterior-segment surgery of the eye was developed in the late 1970s.[5] Finally, by the end of the 1980s the laser was used for a wide variety of surgical operations.[4] An examination of why so many medical laser applications appeared earlier for eye surgery is instructive.

Most biological tissues are highly scattering, as can so readily be shown by placing a small flashlight or red laser pointer on a finger. The red light glow is readily seen to cover a far larger volume than the initial light beam. The light cannot be focused inside the skin. It is also exceedingly difficult to produce a convincing depiction of the translucence of human skin with pastels, watercolors or even some oil paints. Color alone is not sufficient; the difficulty comes from the multiple scattering deep with the skin, which gives the glow to the light emerging (remitted) from the skin. Renaissance painters discovered the value of many layers of oil paints in order to achieve this multiple scattering. Thus, the diffuse, multiple scattering limits the use of a focused surgical laser beam except for surface treatments outside the eye. Since the eye has the only non-scattering tissue in the body, a beam can be focused for surgical work inside the eye. This is relatively non-invasive, since bacteria cannot ride into the eye on a light beam! Of course I should add that the development of photodynamic therapy with photosensitive dyes actually makes use of multiple scattering to distribute the laser exposure dose. Low-level laser therapy (LLLT), or laser "photobiomodulation," which employs low-power, non-thermal laser interactions also rely on this type of scattering.[6]

EVOLUTION OF APPLICATIONS

Laser surgery was thought of almost immediately after the demonstration of the first lasers in 1960.

In this decade there have been a number of innovations in the direction of lowering the power and energy delivered to human tissue—with the result of producing more subtle effects at the cellular level or by stimulating an effect without the "brutal" coagulation or vaporization of tissue.[7-13] And, electrosurgery began to replace laser surgery in the 1990s for some procedures involving cutting, cauterizing and coagulating tissue in endoscopic applications—attributed to the reduced cost of equipment and perhaps also because it avoided all of the laser safety issues that were seen by some as increasing costs. Of course the laser continues to be used in endoscopic surgery for cases that demand more precise surgery and in other areas where electrosurgery is not useful. The greatest evolution of laser applications in medicine and surgery has been in diagnostic applications and the use of optical techniques to guide or even automate laser surgery as we shall discuss.

RECENT, MORE ADVANCED LASER APPLICATIONS

Twenty to 30 years ago, almost all papers presented at medical laser meetings emphasizing biomedical engineering and biophysics, e.g., at the Gordon Conference on Lasers in Medicine and Surgery, involved laser tissue interactions that were thermal or thermomechanical in nature, such as laser photocoagulation and photovaporization. Today, these meetings are almost totally devoted to diagnostic applications. Surgical lasers had always been Class 4 products by the laser safety standards; whereas diagnostic instruments were generally Class 1.

LASER DIAGNOSTIC INSTRUMENTATION

Laser-based diagnostic instruments have really come into their own in this decade. Of course there have long been some specialized instruments, such as the scanning laser ophthalmoscope, but other applications have been slow to find their way into the clinical setting. [14-15]

Lasers to stimulate fluorescence (including multi-photon fluorescence) in either endogenous (natural) or exogenous (medically administered) fluorophores (molecules that fluoresce) by laser energy has long been studied, but only recently realized in useful applications in several areas. Fluorescence diagnostics with laser endoscopic probes are in use, fluorescence imaging of natural fluorophores in the retina (e.g., lipofuscin) by a 488-nm argon wavelength laser to detect early changes in age-related macular degeneration is exciting interest in ophthalmology. Optical coherence tomography (OCT), which generally uses a super-luminescent diode rather than a laser, has found its way into many clinics—particularly in ophthalmology during this decade. Indeed, OCT in retinal diagnosis has almost become an indispensable tool in clinical practice for the diagnosis and management of diseases involving the macula and optic nerve head. More recently, OCT of anterior segment is in common practice. Newer OCT instruments employing advanced imaging techniques now provide real-time cross-sectional tomographic images of the ocular microstructure in living tissue with unprecedented high-resolution. In essence, OCT provides the ophthalmologist a rapid look at the microscopic level in living tissue to permit in effect a "non-excision optical biopsy" — heretofore impossible. Similar approaches with OCT are appearing in dermatology. Most recently, OCT has been combined with multi-spectral imaging (MSI) and fluorescence imaging using the 488-nm argon laser beam and various scanning techniques to reveal spectacular retinal images. Flying-spot scanning, which has been applied in a confocal scanning laser ophthalmoscope, has more recently been applied to OCT imaging to create an OCT/Ophthalmoscope instrument—and with imaging capability at two different depth resolutions—allowed the development of dual en-face OCT-confocal imaging in the eye.[15] Commercial systems can display two images of ocular tissue, from OCT and from confocal microscopy.

Most skin resurfacing lasers used in dermatology have become less traumatic to the skin and non-ablative in the last decade.

For the same reason that tissue scattering prevents focusing a surgical laser beam in tissues other than in the eye, diagnostic imaging in the skin and other tissues has been a great challenge. With laser confocal imaging and OCT, the specialties outside of ophthalmology are beginning to enjoy diagnostic tools not heretofore possible.[14] Only confocal scanning laser microscopy permits imaging of the epidermis and papillary dermis with a resolution nearly approaching that of microscopic examination of excised tissue (histology). Laser based examination of pre-cancerous moles and skin tumors may permit the dermatologist to avoid conventional biopsies in many instances.

GROWTH OF REFRACTIVE SURGERY

Pioneered by researchers in ophthalmology, such as Prof. Stephen Trokel of Columbia (who incidentally served as Chair of an LIA/ANSI subcommittee on safe use of medical lasers for nearly a decade), and (LIA Board-member) Prof. John Marshall in London, ArF (193-nm) excimer-based refractive surgery gradually evolved during the 1980s, with the first laser refractive surgery on a patient's eyes near the end of the decade.[16-18] The 1990s were spent perfecting the laser delivery systems and the ablation algorithms used for this type of procedure, where tissue sections of the order of 50 µm were ablated in steps of 0.3-µm per pulse—quite a different level of tissue ablation compared to CO_2 laser tissue ablation in general surgery of the 1980s. The first excimer lasers for ophthalmic refractive surgery were approved by FDA only in 1996. In this decade, the ArF excimer laser has been augmented by ps- and fs-laser intra-stromal neodymium lasers which perform the surgical incision to cut the flap required in LASIK. Today, tiny, scanning focal beams of fs laser pulses vaporize a tissue layers inside the cornea (intra-stromal ablation) to incise a flap ("intrastromal lamellar keratoplasty") for LASIK, leaving the outermost and innermost layers of the cornea unscathed.[19]

GENTLER TREATMENT OF THE RETINA

Laser treatment of retinal diseases—particularly in the central retina (the macula)—now emphasize lower exposure levels with micropulses to produce sub-threshold lesions in the retinal pigment epithelium (RPE) that are not immediately visible to the ophthalmologist.[7,9] Using shorter pulse durations, selective retinal therapy has similar aims to target only the pigment granules in the RPE.[8] These approaches improve outcome of the therapy, but diagnostic guidance techniques are then needed to help guide the ophthalmologist in delivering the multitude of exposures in the eye. The aim is to stimulate biological repair at the cellular level rather than destroy tissue.

CONCLUSIONS

Laser applications in surgery and medicine continue to evolve, with a general trend to minimize biological disruption to minimize side-effects and optimize resulting therapy. In other laser surgical applications, improvements continue. For example, recent developments in urological applications of lasers show improvements in types of lasers, the wavelength choice of wavelength, optical fiber delivery systems, precision of laser application and yet an actual cost reduction of equipment.[10] Most skin resurfacing lasers used in dermatology have become less traumatic to the skin and non-ablative in the last decade.[20-21] A particularly important development was the introduction of fractional therapy, where an array of punctuate lesions are created, which stimulate tissue repair and regrowth.[13]

A kinder-gentler form of laser therapy that has existed for decades—referred to by a host of names from "soft-laser" to "low-level laser therapy (LLLT), or laser "photobiomodulation,"

remains on the edge of accepted medical practice, with many still skeptical scientists questioning whether effects are placebo. In any case, if it causes real benefit, it surely involves non-thermal, photochemical laser-tissue interactions at the cellular level.[6,12]

David H. Sliney, Ph.D., is recently retired as program manager for the U.S. Army Center for Health Promotion and Preventive Medicine Laser/Optical Radiation Program and is the senior editor for biomedical applications and safety for the JLA®. He is currently an active consultant for LIA.

REFERENCES

1. Goldman, L (Ed.), *The Biomedical Laser: Technology and Clinical Applications*, Springer Verlag, New York, Inc. (1981).

2. Atsumi, K., (Ed.) *New Frontiers in Laser Medicine and Surgery* Excerpta Media, Amsterdam (1983).

3. Joffe S.N., (Ed.), *Lasers in General Surgery*, Baltimore, Williams & Wilkens (1989).

4. Sliney DH, Wolbarsht ML Future applications of lasers in surgery and medicine: a review. *J R Soc Med*.;82(5):293-6, (1989).

5. Trokel, S.L. (Ed.) *YAG Laser Ophthalmic Microsurgery*, Appleton Century Crofts, Norwalk (1983).

6. Sliney, D. Low level laser therapy wound treatment update, *J. Laser Appl.* 11(5):221-224 (1999).

7. Desmettre TJ, Mordon SR, Buzawa D, and Mainster MA. Micropulse and continuous-wave diode retinal photocoagulation: visible and subvisible lesion parameters, *Br J Ophthalmol*. 90:709-712 (2006).

8. Brinkmann R, Roider J, Birngruber R. Selective retina therapy (SRT): a review on methods, techniques, preclinical and first clinical results. *Bull Soc Belge Ophtalmol*. (302):51-69 (2006).

9. Luttrull J K, Musch D C, Mainster M A. Subthreshold diode micropulse photocoagulation for the treatment of clinically significant diabetic macular oedema. *Brit J Ophthalmol*. 89:74-80 (2005).

10. Pierre SA, Albala DM. The future of lasers in urology. *World J Urol*. 25(3):275-83 (2007).

11. Houk L.D., and Humphreys T. Masers to magic bullets: an updated history of lasers in dermatology. *Clin Dermatol*. 25(5):434-42, (2007).

12. Naeser MA. Photobiomodulation of pain in carpal tunnel syndrome: review of seven laser therapy studies. *Photomed Laser Surg*. 24(2):101-10 (2006).

13. Narurkar VA. Nonablative fractional resurfacing in the male patient. *Dermatol Ther.* 20(6):430-5 (2007).

14. Branzan AL, Landthaler M, Szeimies RM. In vivo confocal scanning laser microscopy in dermatology. *Lasers Med Sci.* 22(2):73-82 (2007).

15. Podoleanu AG. Combining SLO and OCT technology. *Bull Soc Belge Ophtalmol.* (302):133-51 (2006).

16. Marshall J, Trokel S, Rothery S, Schubert H. An ultrastructural study of corneal incisions induced by an excimer laser at 193 nm. *Ophthalmology*. 92(6):749–758 (1985).

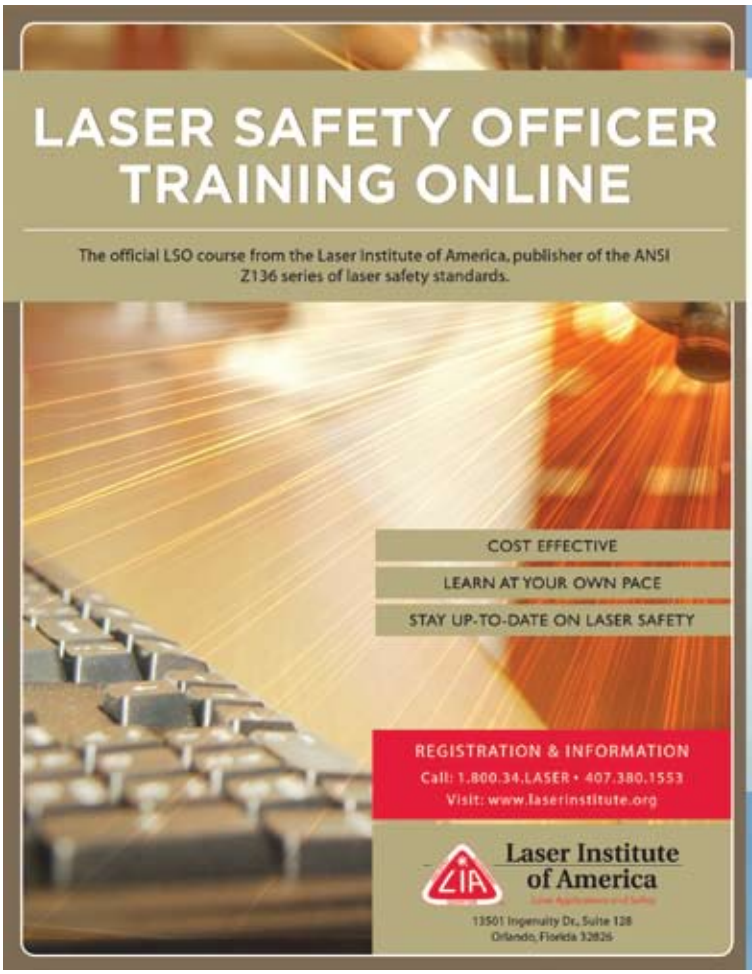
17. Seiler T, Kahle G, Kriegerowski M. Excimer laser (193 nm) myopic keratomileusis in sighted and blind human eyes. *Refract Corneal Surg*. 6(3):165–173 (1990).

18. Trokel SL, Srinivasan R, Braren B. Excimer laser surgery of the cornea. *Am J Ophthalmol*. 96(6):710–715 (1983).

19. Jonas JB. Intrastromal lamellar femtosecond laser keratoplasty with superficial flap
Br J Ophthalmol. 87(9): 1195 (2003).

20. Achauer BM, Vander Kam VM, Berns MW. *Lasers in Plastic Surgery and Dermatology*, New York, Thieme Medical Publishers, Inc., (1992).

21. Gregory R.O. Overview of lasers in plastic surgery. *Clin Plast Surg*. 27(2):167-71 (2000)



LASERVISION·USA

LASERVISION•USA is your leading source for laser protective equipment. We are the market leader in design, manufacturing and distribution of safety solutions for all laser applications. Our laser safety solutions include:

Laser Protective Eyewear
Laser Barrier & Curtain Systems
Laser Protective Viewing Windows
Laser Safety Signs & Labels
Laser Safety Training

Contact the certified laser safety experts at LASERVISION•USA. We are pleased to discuss your application and assist you with your laser safety program requirements.

1-800-393-5565

©2007 LASERVISION•USA, all rights reserved.

LASERVISION·USA
www.lasersafety.com

1-800-393-5565
phone: 651-357-1800
fax: 651-357-1830

ALAW – GREAT IN '08!

The Automotive Laser Application Workshop (ALAW) will be held May 13-15, 2008 in Plymouth, Mich. ALAW is a three-day event that starts with a golf tournament on the first day followed by two days of sessions designed to improve productivity and reduce manufacturing costs with laser processing for manufacturers and job shops as well as automotive manufacturers and their suppliers.

The expanded ALAW 2008 conference will focus on laser solutions for new product design and real-world manufacturing challenges. Automotive manufacturers, laser integrators, and tier one and two suppliers from the global automotive industry will deliver presentations and offer solutions on laser processing for automotive components; diode, fiber, and disk laser applications for welding and cutting, and how lasers are being used worldwide in the automotive industry. Topics include body in white, advanced propulsion, powertrain, frame and more!

ALAW is hosted by LIA in partnership cooperation with the Fabricators & Manufacturers Association, Intl., (FMA). The conference co-chairs are Eckhard Beyer of Fraunhofer WLT and Stanley Ream of Edison Welding Institute.

WHO SHOULD ATTEND

Owners, managers, supervisors of fabrication and job shops as well as new end-users who want to learn about the benefits of using laser technology for new or different applications should attend the fabricators sessions of ALAW. The automotive sessions should be attended by manufacturing, production, product design and research/development engineers, and anyone interested in using and/or developing flexible applications for automotive laser material processing systems.

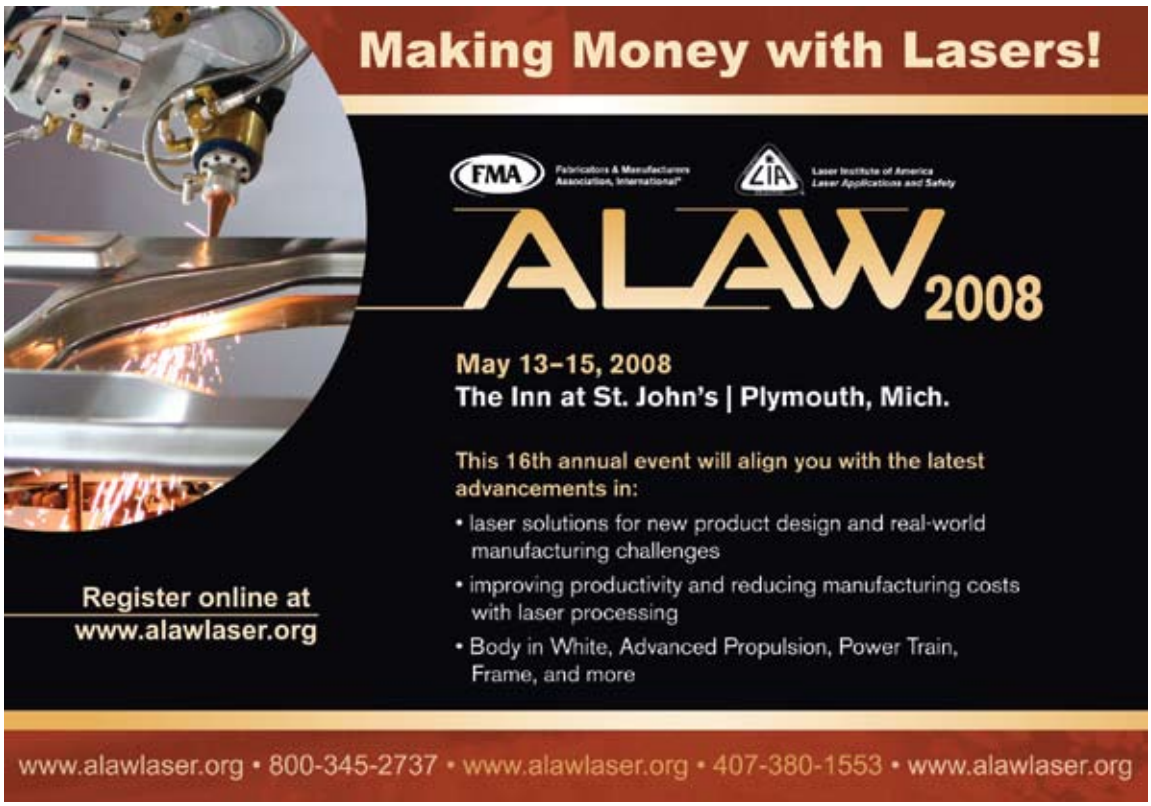
GOLF OUTING

This year ALAW is having a networking golf outing. It will be the day before the conference sessions begin, which is Tuesday, May 13. The format is a four-man scramble and includes 18 holes of golf with cart at The Inn at St. John's golf course, a boxed lunch, two complimentary drinks on the course, bag drop service, and reception following the event. There is an additional $60 fee for those wishing to participate.

REGISTRATION INFORMATION

Registration can be completed in two ways – online or by downloading a PDF registration form at www.alawlaser.org. Full conference registration is $395 for nonmembers and $345 for LIA, FMA and cooperating institutions members. There is an early bird registration discounted fee of $345 and $295 respectively if you register at least five weeks prior to the conference. Full conference registration (Wednesday and Thursday, May 14-15) includes admission to all plenary and technical sessions, admission to tabletop exhibits, Wednesday night reception, breakfasts, luncheons, breaks, and a copy of all presentations.

A one-day only registration (May 14 or 15) includes admission to all plenary and technical sessions for that day only, admission to tabletop exhibits, Wednesday night reception, breakfasts, luncheons, breaks for that day only and a copy of all presentations. The cost is $295 for nonmembers and $195 for members or if early bird $245 and $195 respectively. For more information contact LIA's Director of Conferences Beth Cohen at 407-380-1553, e-mail bcohen@laserinstitute.org, or visit www.alawlaser.org. ■



NORTHEAST CHAPTER

The Northeast Chapter of the LIA held its last meeting in December 2007 at the Old Sturbridge Village, a Colonial history museum in Sturbridge, Mass. The event took place in a Colonial-era banquet room with a large fireplace, rustic flooring and period furniture. Around 60 people attended the social, which featured a local version of the Beer's Law Band providing live music for the LIA members who dined on delicious hazelnut chicken and New England clam chowder. A raffle with door prizes donated by LIA, PhotoMachining, Coherent, Pennwell and a variety of local businesses and individuals produced over 20 winners.

LIA President Bill Shiner gave a short talk regarding benefits of LIA membership as well as next year's scheduling. The next event will be held in February at Springfield Community College and will feature the topic of lasers in education. This meeting will be hosted by Prof. Nick Massa of the college, who is collaborating with Prof. Judy Donnelly of Three Rivers Community College and Fenna Hanes of the New England Board of Higher Education on developing a web-based curriculum for photonics-related, problem-based learning scenarios. The upcoming year will also feature a spring event sponsored by Trumpf, as well as events sponsored by Aerotech and General Electric later in 2008.

Beer's Law Band provided music during the meeting.

About 60 people attended the festive NE Chapter December meeting.

Here are some comments from the recent event:

"You and your wives did a wonderful job of putting together a fruitful and merry celebration last night. The location was beautiful, with a roaring fire and delicious food. The networking was great and of course the entertainment was outstanding. The door prizes really hit the mark, too. Nick was thrilled with his book." (LIA Handbook, one of the door prizes!)

"The meeting was a lot of fun last night. It was great seeing everyone. It's a tight bunch. I haven't seen some folks in about 10 years so it was nice to catch up."

"THANK YOU for such a great event! Food was great, networking was invaluable." – Robert L. Koch, district manager, Aerotech, Inc. ■

Report courtesy of Ronald Schaffer, CEO of PhotoMachining, Inc. and NE Chapter board member.

WELCOME NEW MEMBERS

CORPORATE MEMBERS

Calmar Optcom, Inc., Sunnyvale, CA
nLight Corporation, Vancouver, WA
PRC Laser, Landing, NJ

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

INDIVIDUAL

Noriyuki Yamaguchi, Fremont, CA
Michael McCormick, Oakland, CA
Iraj Kavosh, San Jose, CA
Michelle Law, Boulder, CO
Martin Graham, Storrs, CT
Terrie Grecp, Melbourne, FL
John Minor, Tampa, FL
Candace Bevers, Evansville, IN
Sherri Ganucheau, New Orleans, LA
Syed Naveed, Marlborough, MA
Zahedul Huq, Grand Forks, ND
Andrew Birnbaum, New York, NY
Carol Williams, Rochester, NY
Howard Fein, Cleveland, OH
Joseph Vinciquerra, Highland Heights, OH
William Kenny, Center Valley, PA
Jeff Loftis, Cookeville, TN
Lori Graves, Nashville, TN
Brenda Sandlin, Nashville, TN
Lino Costa, Tullahoma, TN
Lynn McMillan, Draper, UT
John Gough, Seattle, WA
Gregory Nightingale, Vancouver, WA
Mark Pass, Waukesha, WI
Jeanne Koppinger, Cheyenne, WY
Vivian Merchant, Vernon, BC, Canada
Jennilyn Santa Ana, Niagara Falls, ON, Canada
Michel Dupuis, Quebec, QC, Canada
Adekunle Awosika, Dakar, Senegal

LASERS • OPTICS • DETECTORS • IMAGING • FIBER OPTICS • INSTRUMENTATION • SOFTWARE

Global Reach
Technical Depth
Complete Coverage

PUBLISHED SINCE 1965 *Laser Focus World* is a global media franchise for engineers, researchers, scientists, and technical professionals providing comprehensive global coverage of optoelectronics technologies, applications and markets. Each month, the magazine reports on and analyzes the latest developments and significant trends in both technology and business in the worldwide optoelectronics and photonics industry. The magazine offers greater technical depth than any other publication in the field.

Subscribe today.
www.laserfocusworld.com

PennWell

LED LENSES MAKE EYES LIGHT UP

Contact lenses with imprinted LEDs could benefit drivers, pilots, or patients with impaired vision. The prototype lenses developed at the University of Washington include red light-emitting diodes and an electronic circuit, although trials to date have focused on wearability studies and have not included turning on the LEDs, reports the Jan. 21 issue of *Optics.org*.

"Looking through a completed lens, you would see what the display is generating superimposed on the world outside," said Babak Parviz of the university.

Researchers built the circuits from layers of metal a few nanometers thick and LEDs one third of a millimeter across using microscopic-scale manufacturing techniques. The shape of each tiny component dictated which piece it could attach to, and a self-assembly process driven by capillary action pulled the pieces into position on a sheet of flexible plastic. The trial lenses did not provide vision correction, but the technique could be used on a corrective lens and does not obstruct the wearer's vision.

"There is a large area outside of the transparent part of the eye that we can use for placing instrumentation," said Parviz.

Other improvements in the future could include adding wireless communication to and from the lens. The researchers hope to power the whole system using a combination of radio frequency power and solar cells placed on the lens. Drivers or pilots wearing functioning lenses could see their vehicle's speed projected ahead of them, video-game players could feel themselves immersed in a virtual world, or Web surfers could see the Internet on a virtual screen visible only to them.

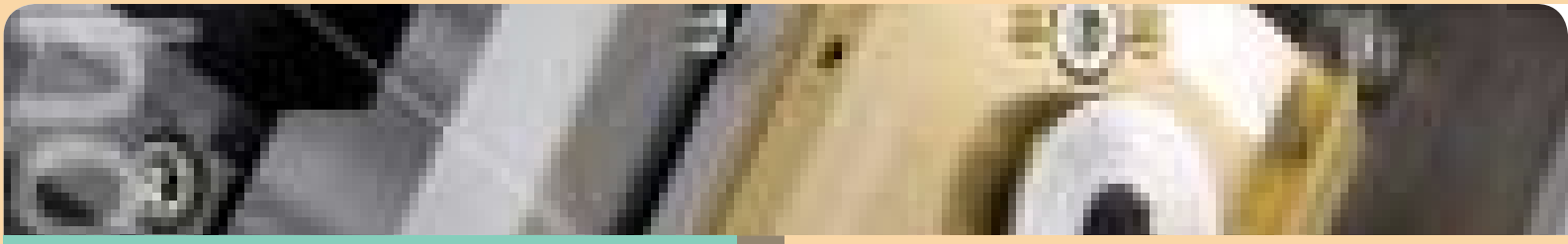
LASERS CLEAN UP DIESEL ENGINES

A technique known as laser induced incandescence is helping researchers in the Netherlands locate exactly where soot is generated. The aim is to understand optimal engine conditions and in turn reduce soot emission, reports the Dec. 20, 2007 issue of *Optics.org*.

"Our technique enables the in situ investigation of soot particles during the combustion process at very short time scales," Hans ter Meulen, a researcher at Radboud University, said. "The soot we are trying to measure causes the largest problem because it strongly attenuates both the laser beam and the signal."

The team made one of the engine's optically-accessible by mounting windows in its wall and head as well as the piston crown. "By elongating the cylinder, we were able to study the combustion process from below, through the window," said ter Meulen. "This technique enabled us to investigate the soot particle size during the engine cycle, without needing to sample the soot."

The team fired 10 ns 1064 nm pulses with an energy density of 0.25 J/cm^2 down through the engine. The particles are heated by the laser pulses to a temperature of about 4000 K. The time taken for the particles to cool down to ambient temperature is dependent on the size of the particles. The particle size was found to increase at the early stage of the combustion cycle due to agglomeration. During the later stages of the cycle, particle size decreases due to oxidation. The team will use its results in collaboration with a group from Eindhoven University of Technology to optimize diesel combustion models and eventually other engine types. ■



LASAG INDUSTRIAL LASERS

CORPORATE MEMBER PROFILE

An LIA corporate member since 1992, Lasag Industrial Lasers, Buffalo Grove, Illinois and Thun, Switzerland, manufactures pulsed Nd:YAG lasers (10 to 1000 W) for medical, electronic, automotive, aerospace and scientific applications. Lasag also offers fiber optic, conventional beam delivery, and other beam handling devices. Its lasers are primarily used for cutting, welding, drilling, marking and ablating of metals and other materials. Lasag's goal is to be the most successful global supplier of industrial solid-state laser solutions for material processing.

COMPANY ORGANIZATION

Lasag Industrial Lasers was founded in 1974 in Thun. In fact, the company is a direct descendant of the Watch Stones Corporation, which in 1965 issued a research contract to University Bern (Institute of Applied Physics) for drilling of watch stones and so initiated laser technology in Switzerland. The company was, at the time, producing rubies with a small hole used as bearings in watch movements.

Then in 1972 the Laser Research Center was founded in Thun with the goal to develop laser technology for material processing (drilling, cutting, welding) and in 1974 the foundation of Lasag Corporation spun off as a 100% subsidiary of ASUAG. Coincidentally, the first products released by Lasag were lasers for the drilling of rubies for the watch industry.

Today the company is owned by the Swatch Group and also has branches in Germany, Italy, and Japan. In 1990, LASAG was the first laser manufacturer, worldwide, that was certified according to ISO 9001 standards. This certification has been renewed annually. Lasag now operates its own R&D department in Thun along with an application research lab as the Institute of Applied Physics is now closed. The facility in Buffalo Grove also has an application research lab.

COMPANY PRODUCTS

According to Robb Hudson, vice president and general manager of Lasag in Buffalo Grove, the company's biggest selling items are its SLS and KLS product lines. The SLS pulsed Nd:YAG series laser has been exclusively engineered to process materials via fiber optic beam delivery. More than 30 different laser models are available. The KLS pulsed Nd:YAG series lasers are ideal for fine cutting, drilling, scribing, precision joining and multiple-use applications. Six different laser models are available.

Regarding future products, Hudson explained that a fiber laser and a new control system for all lasers will soon be released.

FUTURE OUTLOOK

Asked what segment of the industry he's seen the largest growth in in the last five years, Hudson said, "The medical device industry. As the baby boomer's age, the need for various medical devices as well as the tools required for their respective procedures have resulted in a tremendous surge in new research and development. This, in turn, has led to scores of new products in order to ensure the baby boomer's quality of life."

Hudson has also seen the interest escalate in the fiber laser. "The applications for this type of laser expand on a steady basis, and fiber laser technology improves everyday; but, CO2 and Nd:YAG still have distinct advantages in many applications. Most agree that fiber lasers are quickly gaining ground, it's just a matter of when the developments will begin to seriously erode other source type market share," he said.

An LIA corporate member for over 15 years, Lasag Industrial Lasers recognizes the value of membership. "Being part of an organization that is interested in promoting safety and awareness of the laser industry as a whole is significant. It is important to educate all manufacturing sectors as to what lasers can do and how they can safely be implemented while replacing aging or antiquated technology."

For more information, visit **www.lasag.com**. ■

LASAG
INDUSTRIAL-LASERS
A COMPANY OF THE SWATCH GROUP

LIA ANNOUNCES

LIA SEEKING NOMINATIONS

LIA needs the help of its membership with nominations for 2008 fellows and award recipients. Visit www.laserinstitute.org/nominations/2008 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 1, 2008.

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.

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

GEORGE M. WILKENING AWARD IN LASER SAFETY The Wilkening Award recognizes an individual who has made outstanding contributions to laser bioeffects research, development of human exposure limits and safety standards, and to applied laser safety and/or the development of engineering control techniques to increase the wider applications of laser technology in industry, medicine and daily life.

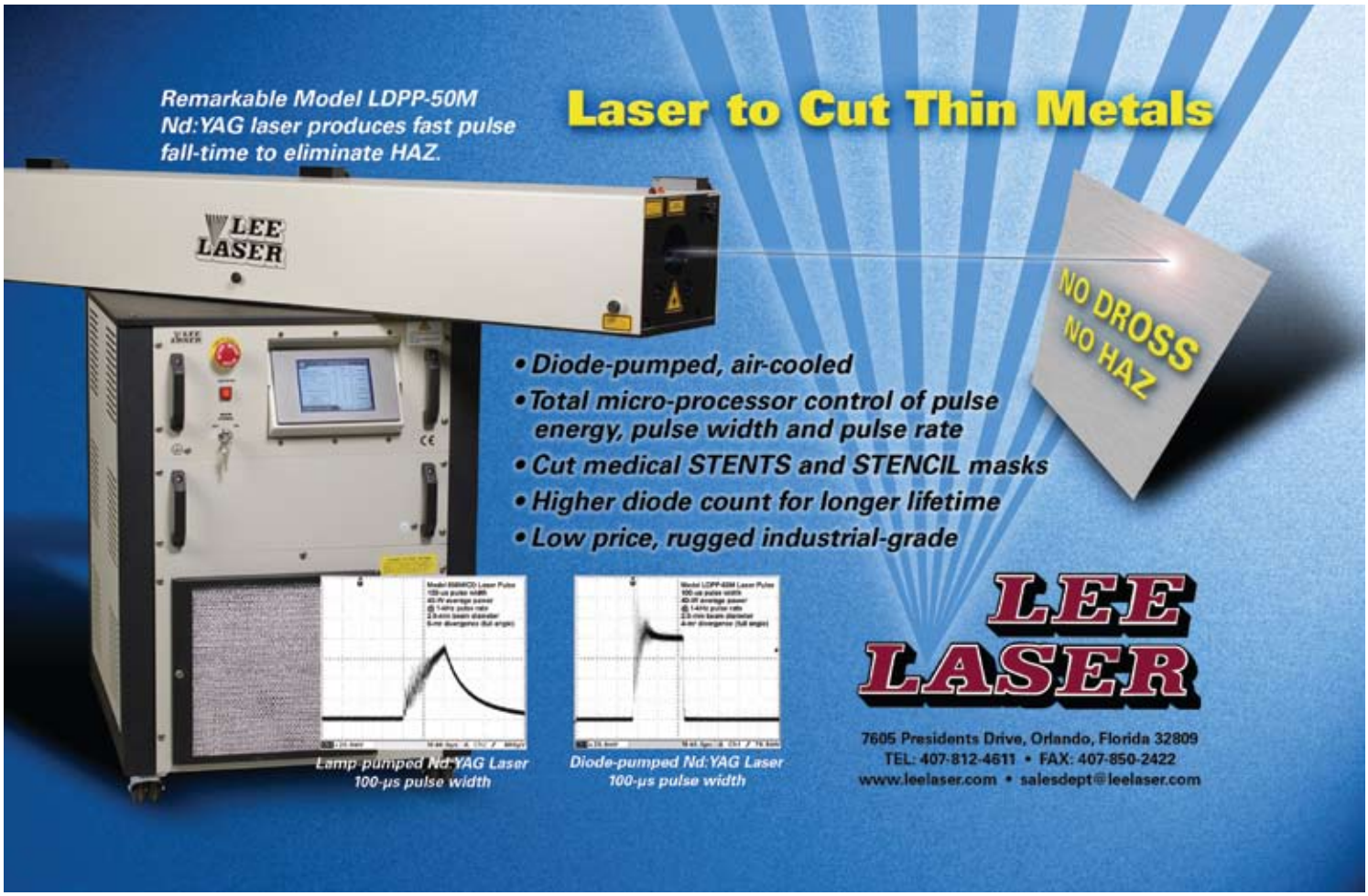
R. JAMES ROCKWELL, JR. EDUCATIONAL ACHIEVEMENT AWARD The R. James Rockwell, Jr. Educational Achievement Award recognizes an individual, organization, group, or institution of higher education that has made outstanding contributions to laser safety education.

LSO AND MLSO TRAINING ONLINE

Laser safety officer (LSO) and medical laser safety officer (MLSO) training are now available online from the LIA. All course materials are electronic and downloadable once the course is purchased. A username and password is good for 10 days of unlimited access for whichever course is chosen.

The LSO course is a non-mathematical approach designed to teach the administrative duties of the LSO as described in the ANSI Z136.1 *Safe Use of Lasers* standard. This course meets all LSO training requirements outlined by ANSI, OSHA and ACGIH. The MLSO course is designed to give medical personnel an understanding of laser biophysics, tissue interaction and laser safety in a medical environment. Laser safety protocols are addressed according to the ANSI Z136.3 *Safe Use of Lasers in Health Care Facilities* standard.

For more information, visit www.laserinstitute.org/education.



The Standard Has Been Set!

REVISED ANSI Z136.1

Safety starts here - order your copy now!

800.34.LASER

Get your copy of the revised ANSI Z136.1 *Safe Use of Lasers*. The ANSI Z136.1 is the foundation of laser safety programs for industrial, medical, military, and educational applications nationwide and is the parent document and cornerstone of the Z136 series of laser safety standards. The standard is recognized and used by OSHA as the authoritative document for laser safety. All previous versions of this standard are obsolete (1986, 1993, 2000).

Laser Institute of America
40th Anniversary
Laser Applications and Safety

13501 Ingenuity Dr., Suite 128
Orlando, FL 32826
www.laserinstitute.org
407.380.1553

Laser Institute of America
Laser Applications and Safety

13501 Ingenuity Dr., Suite 128
Orlando, FL 32826

Non-Profit Org.
U.S. Postage
PAID
Permit #2342
Orlando, FL