

OPTOELECTRONICS

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From the Editors

Optoelectronics is the technology of systems and devices that emit, modulate, transmit, or sense light. Optoelectronic devices include lasers and other light sources, optics, fiberoptic components, detectors, displays, and imaging devices.

Optoelectronics Report, now incorporating *Laser Report*, covers both national and international business news and market trends and tracks technology advances to interpret their business implications.

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Tomorrow's light could get moody

SANTA CLARA, CA--Several of the presentations at the Strategies in Light 2008 conference (www.strategiesinlight.com) touched on the concept of "intelligent light"--the combination of either internal (embedded) or external software with solid-state light sources. From "local dimming" of light-emitting diode (LED) television displays to enhance the viewing experience, to automobile lighting that self-adjusts to meet varying driving situations, intelligent light will enable a host of novel (and previously impossible) approaches to the way in which lighting and illumination is applied.

In fact, keynote speaker Bas van de

Kieft of Philips Lighting cautioned against "myopia" in this regard. Noting that early versions of the motor car were based simply on existing (horse drawn) carriage designs in which an engine was installed, van de Kieft suggested that one-for-one replacement of today's light bulbs with LED-based bulbs is short-term thinking, and the real benefit of solid-state lighting will come in the future from innovative out-of-the-box applications.

Now in its 9th year, Strategies in Light 2008, whose theme was "Emerging Applications Driving the LED Market Forward," provided some interesting

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Cluster Summit highlights need to maintain momentum

SAN JOSE, CA--The culmination of several months of planning, the Photonics Cluster Summit at the Fairmont hotel on Wednesday, January 23rd during Photonics West began with an initial idea by Jim Pearson, acting executive director of the Florida Photonics Cluster (FPC; www.floridaphotonicscluster.com), and this year's FPC president, Alex Fong. "Although the Florida Photonics Cluster organizes local events within the state of Florida, we recognized that BiOS/Photonics West is a terrific opportunity to meet since it has become the de facto event where the entire industry converges," said Fong. "And because part of the Florida cluster's charter is to strengthen liaisons between itself and other clusters and technical societies, we decided

to expand our initial idea of a small gathering during Photonics West into a 'Photonics Cluster Summit' and asked leaders from other clusters in the U.S. if they were interested in participating."

Pearson, a past SPIE president, suggested the involvement of SPIE in the event as it had been active in promoting Cluster activities in the past. Together with Pearson and Fong, Peter Hallett from SPIE, Bob Breault from the Arizona Optics Industry Association (AOIA), Tom Battley from the Rochester New York Regional Photonics Cluster (RRPC), and Barbara Ihde from the Colorado Photonics Industry Association (CPIA) began to define their objectives and work through the logistics of the meeting.

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NEWS BRIEFS

Display glass partnership: ZC&R Coatings for Optics (Torrance, CA) and Abrisa Industrial Glass (Santa Paula, CA) have joined together to produce display glass and LCD glass plates for a wide variety of glass substrates. Precision coated indium tin oxide (ITO) and index-matched ITO (IMITO) transparent thin films from ZC&R have high transmittance and low resistance. Abrisa's Ekra X4 fully-automated printing system delivers production printing on glass materials for a variety of industrial and military-grade applications. For rugged environments, such as cockpit displays, bonding of connecting wires and flex cable bonding can be provided.

Solar-cell partnership: ersol Thin Film GmbH (Erfurt, Germany), a subsidiary of ersol Solar Energy AG (ersol), and SCHOTT Solar GmbH (Alzenau, Germany) have concluded a cooperative agreement under which they will jointly develop micromorphous technology for thin-film solar cells. In contrast to amorphous thin-film modules, micromorphous thin-film modules have a double-layer structure consisting of an amorphous and a microcrystalline silicon film. This arrangement results in improved exploitation of sunlight because the two silicon layers convert the whole light spectrum into power. The two companies will be combining their resources in the area of research and development with the aim of achieving faster product maturity and hence a leading market position in micromorphous solar modules.

Aculight wins yet another medical-laser SBIR

BOTHELL, WA--On the heels of its October 2007 \$750,000 Phase II Small Business Innovation Research (SBIR) award from the National Institutes of Health for a joint effort with Northwestern University (Evanston, IL) to develop an optical cochlear implant (OCI), laser technologies developer Aculight Corporation was awarded a new SBIR contract--an \$850,000 two-phase fast-track award from the National Institutes of Health that will fund a joint effort with the University of Washington (Seattle, WA) to develop a laser-based vestibular implant.

"Balance disorders such as vertigo and dizziness are among the most common reasons that elderly Americans seek health care," said Mark Bendett, Aculight's director of medical products. "We're laying the foundation for an optical implant that could treat patients with balance and vision impairments due to vestibular system damage. This SBIR will enable Aculight to produce a laser-based nerve stimulation device that can be used in research studies at the University of Washington prior to developing a model for clinical applications."

The vestibular system is located within the inner ear. It is the body's balance system and sends signals to the muscles that keep us upright and to the neural structures that control our eye movements. Balance and vision impairments occur when the vestibular hair cells become

damaged, prohibiting the transmission of sensory signals to the brain. According to Aculight, there are no clinically available treatments to restore the loss of sensory information. However, researchers believe that direct vestibular stimulation may alleviate symptoms in many patients. Infrared stimulation, in particular, could provide a precise, controlled, non-contact method of stimulating the nerve.

"Aculight is pioneering infrared neural stimulation," said Bendett. "We first developed our Capella infrared nerve stimulator to enable and encourage research applications. We've also received an SBIR award to develop the first optical cochlear implant. Now we're working with two leading vestibular groups to develop an optical vestibular implant. We believe that optical nerve stimulation could revolutionize treatment for many of the neurological disorders plaguing patients today."

Aculight hopes its optical vestibular implant technology will be a key element in the company's medical platform, which includes the Capella R-1850, the first infrared neural stimulator. Aculight's neural stimulation technologies will be manufactured in its ISO 9001:2000-certified manufacturing facility along with its proprietary Perseus pulsed fiber lasers and Argos optical parametric oscillators. Aculight also designs and manufactures laser-based products on an OEM basis.

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Christine Shaw

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Stephen G. Anderson

Editor
Gail Overton

Senior Editors
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Intel researchers move silicon photonics into the mid-IR

SANTA CLARA, CA--The feasibility of extending the wavelength of operation of silicon lasers from the near- to the mid-infrared has been given a boost. In a paper published online last month in *Nature Photonics*, researchers from Intel demonstrated the world's first cascaded Raman silicon laser, extending the operating wavelength out to 1848 nm, with even longer wavelengths possible. This achievement establishes a pathway to extending the laser wavelength into the mid-IR region for gas sensing and other important spectroscopy applications that are possible today only with complicated, bulky, expensive, or cryogenically cooled lasers.

Cheap and powerful semiconductor lasers that operate in the mid-infrared (2 to 5 micron) region are highly sought for applications such as medical diagnostics and environmental monitoring, but do not exist at present. Haisheng Rong and colleagues at Intel have demonstrated that silicon-chip-based lasers that exploit cascaded Raman lasing may provide the answer. Although silicon Raman lasers have been made before, their wavelength of operation has always been limited to around 1.6 microns.

The Intel team has successfully demonstrated that, by exploiting the Raman effect not once but twice within a silicon waveguide, it is possible to create a silicon-chip laser that emits milliwatt-scale powers at a wavelength of 1.848 microns. This is the longest wavelength reported so far for silicon Raman lasers

and is tantalizingly close to the mid-infrared window. The research offers hope that by optimizing the design it should be possible to make lasers that operate at even longer wavelengths.

Silicon is particularly suitable as Raman laser material for the near and mid-infrared (IR) regions due to its high Raman gain and optical transparency in these regions. Through cascaded Raman lasing in silicon, one can convert pump wavelengths in the near IR region for which sources are well-developed and widely available, to wavelengths in the mid-IR region, providing low-cost, compact, and high-performance room-temperature lasers. Such laser sources are highly desirable for many applications ranging from trace-gas sensing, environmental monitoring, and biomedical analysis, to industrial process control, and free-space communications.

Cascaded Raman lasing was previously achieved in glass fibers. However, the high optical losses of glass at longer wavelengths prohibit cascaded lasing into the mid-IR region. In contrast, silicon has a transparency window of up to 6 microns, and low-loss silicon waveguides can be fabricated. Other advantages of using silicon as cascaded Raman laser material include its unique material properties such as high thermal conductivity and optical damage threshold, as well as its extraordinary material purity and great natural abundance.

--Kathy Kincade

Tomorrow's light could get moody, continued from page 1

insights into the rapidly developing trends in applications, markets, products, and technologies that will affect the industry's future. It is the leading event in the world of LEDs and this year attracted more than 1500 people from 28 countries to an exhibition and conference at the Santa Clara, CA convention center. According to analyst Bob Steele of Strategies Unlimited (Mountain View, CA), who organized the

event, the global market for high-brightness LEDs has apparently recovered from its "slow growth" phase of 2004 to 2006. Steele, who opened the conference with a review and forecast of the global LED market, noted that demand for LEDs is currently healthy across all applications with global revenues gaining 9.5% in 2007 to reach \$4.6 billion. Price erosion is sig-

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NEWS BRIEFS

Laser materials processing job

shop: J P Sercel Associates (JPSA; Manchester, NH) expanded and strengthened its Job Shop's micro processing capabilities with new Class 10000 Clean Room facilities as well as a new IX-200 Galvanometer-equipped laser materials processing workstation. JPSA is a designer, supplier, and systems integrator of laser materials-processing workstations. JPSA's job shop expertise runs from wafer singulation and LED lift-off for the semiconductor packaging industry, to micromachining a full spectrum of materials for biomedical research and medical products manufacturing. In addition to UV laser technology, JPSA's job shop and applications laboratory now have different laser types available including IR and "Green" lasers for emerging industries such as thin film solar panel manufacture.

DARPA sensors contract: The Defense Advanced Research Projects Agency (DARPA) selected Goodrich Corporation (Princeton, NJ) to develop next-generation night-vision sensor technology for helmet-mounted and micro vehicle applications. A three-year contract released under DARPA's MicroSensors for Imaging (MISI) program to Goodrich's ISR Systems division covers engineering and initial prototypes of highly sensitive lightweight imaging cameras based on the company's commercially successful shortwave infrared (SWIR) sensors. Work will be performed in Princeton, NJ.

NEWS BRIEFS

Advanced laser development

contract: The Boeing Company was awarded a \$49 million U.S. Air Force contract to advance the state of the art in laser technology. Under the Laser Application Support and In-house Research and Development (LASIR) contract, Boeing will support research, design, development, and testing at Air Force Research Laboratory sites at Kirtland Air Force Base in Albuquerque, NM. Specific efforts will include working to advance gas, hybrid electric-gas and chemical laser systems, as well as technologies related to high-power fiber lasers, fiber laser pumps, non-linear optics, solid-state lasers, and diode-pump lasers, and rapid prototyping of directed-energy technology, including semiconductor lasers, thin-disk lasers, laser-based infrared countermeasures, and mid-wave and long-wave infrared lasers.

MEMS packaging center opens:

With the recent investment of \$5 million in packaging capabilities, the Infotonics Technology Center (ITC; Canandaigua, NY) has positioned itself as a full-service partner for customers seeking to create new devices and microsystems. "By bringing this state-of-the-art packaging facility on line, ITC now offers the largest array of world-class, MEMS-related services in the industry," said ITC CEO David R. Smith. ITC's offerings now include microsystems design, fabrication, packaging and testing. "As a project matures beyond initial prototypes," Smith said, "ITC can do pilot-scale manufacturing, then work with clients to develop processes and to refine designs to ensure a smooth transition to high-volume manufacturing."

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nificant, he said, so units actually grew 26% to reach 39 billion.

The mobile appliances segment, which includes mobile phones, accounted for 39% of high-brightness LED sales in 2007, a share that's buoyed by LED sales for phone-camera flash and other mobile devices, despite the maturing phone market. Other applications segments include illumination (37%), signs and displays (8%), signals (6%), and automotive (4%). Highest growth segments in 2007 were signs and displays, illumination, and automotive.

On the automotive front, market penetration of LEDs is expanding but there is no comprehensive approach by auto makers to LED adoption. Their use is determined on a model by model basis by styling requirements, reliability issues, functionality and cost, said Steele. Last year saw introduction of the first production vehicle (Lexus) with LED headlights (low beam only) and 2008 will bring low- and high-beam LED headlights from Audi and Cadillac.

In his presentation entitled "LEDs in the Automotive Environment: Possibilities and Opportunities," Luis Sampedro Diaz of Volkswagen America's Electronics Research Laboratory (ERL; Palo Alto, CA) described some of the work being done with LEDs at the ERL. The "holy grail," he said, of automotive LED development is dynamic lighting with no moving parts. Examples include intelligent high-beam headlights with addressable LED chips that provide drivers with dynamic and selective light distribution in real time; intelligent tail lights that immediately adapt to varying ambient conditions (such as fog) by changing their intensity; and--

believe it or not--software controlled styling that allows drivers to "express their mood" by, for example, instantly changing the shape of the rear turn signal.

The LED lighting market in 2007 was \$330 million (a 60% increase from 2006) and is projected to grow to \$1.4 billion in 2012. Steele noted that many companies are now entering the market with new products and ideas, especially with luminaires and fixtures. Standards are at last being finalized, he said, which should help accelerate adoption and growth of LED lighting. But he also cautioned that luminaire product quality and efficiency is highly variable with many poorly performing products coming to market.

Looking forward, Steele highlighted several issues and opportunities for solid-state lighting. The high initial cost of LED lighting will likely deter initial adoption unless products can deliver value on a cost-of-ownership basis, he said. However, one of the major market drivers will be energy efficiency (a theme that spanned many other presentations) and the market will likely get a boost from government subsidies related to the phase out of energy hungry incandescent bulbs.

Energy efficiency (extended battery life) is also a factor in the penetration of LEDs into notebook PC displays, which hit 3.2% in 2007--an increase from 0.7% in 2006. Other market drivers are lower weight, and their slim profile, but cost is an issue. Existing cold-cathode fluorescent-based backlights are cheaper and offer a better color gamut than today's white-light LEDs. Nonetheless Steele expects penetration to continue growing in 2008 to reach 10%.

--Steve Anderson

Cluster Summit highlights need to maintain momentum, continued from page 1

"The group came to a consensus that it wanted to create the opportunity not only for dialogue between these groups, but also allow Cluster leaders to learn from one another," said Fong. "We wanted SPIE involved because of the central role they play with respect to the industry and their international reach--

extremely important in assuring we had clusters from outside the U.S. in attendance. Peter took on a central role in channeling and catalyzing our many ideas for the summit and having SPIE host the event as a complement to BiOS/Photonics West, providing the

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Company	Ticker	Feb. 13	Feb. 29	52-week	
				Low	High
Agilent	A	31.99	31.12	30.26	40.42
Avanex	AVNX	0.81	0.81	0.74	2.10
Bookham	BKHM	1.55	1.47	1.39	3.39
Ciena	CIEN	25.95	26.52	21.40	49.55
Clearfield	CLFD	1.02	0.96	0.25	2.00
Coherent	COHR	28.25	28.41	22.10	33.38
Corning	GLW	23.80	23.49	19.82	27.25
Cree	CREE	33.27	32.31	16.07	35.50
Cymer	CYMI	27.81	28.86	25.44	45.16
Dalsa*	DSA.TO	12.92	13.15	7.27	14.36
Data Translation	DATX	0.75	0.65	0.51	1.40
Eastman Kodak	EK	19.53	17.45	16.66	30.20
Electro Scientific	ESIO	16.52	16.55	15.57	25.64
Emcore	EMKR	14.10	11.25	4.29	15.90
Enablence Tech.	ENAFF.PK	2.59	3.05	N/A	N/A
Excel Tech.	XLTC	26.00	25.85	24.06	28.50
EXFO	EXFO	4.56	4.42	3.75	7.83
GSI Group	GSIG	8.43	8.05	8.02	11.71
II-VI	IIVI	32.54	32.95	24.00	36.99
Infineon	IFX	8.45	8.01	7.80	18.74
Infinera	INFN	13.12	12.82	8.28	30.00
IPG Photonics	IPGP	18.38	17.05	15.48	24.25
ITT Industries	ITT	57.94	57.17	52.71	73.44
JDS Uniphase	JDSU	13.25	13.27	9.49	17.15
JMAR Tech.	JMAR.OB	0.05	0.10	0.04	0.24
Lightpath Tech.	LPTH	1.75	1.77	1.36	7.18
LSI Industries	LSI	5.22	5.21	3.75	10.68
MRV Comm.	MRVC	1.72	1.68	1.52	4.06
Nanometrics	NANO	5.75	6.44	5.00	11.71
Newport	NEWP	10.41	10.67	9.90	17.67
Nortel Networks	NT	11.26	8.84	8.84	29.52
Omnivision	OVTI	13.05	15.91	11.29	25.17
PerkinElmer	PKI	25.53	24.97	21.88	30.00
QPC Laser	QPCI.OB	0.58	0.58	0.31	1.69
Rofin-Sinar	RSTI	41.25	38.90	27.38	48.83
Thermo Electron	TMO	56.67	56.04	43.60	62.02
Three-Five Systems	TFSI.PK	0.03	0.03	0.03	0.13
Universal Display	PANL	17.39	17.71	11.97	23.35
Veeco Instruments	VECO	16.53	16.09	12.04	22.28
Zygo	ZIGO	12.28	12.86	10.51	16.67

*Figures quoted in Canadian dollars.

N/A--Not available.

All information is believed to be accurate at the time of publication, but *Optoelectronics Report* is not responsible for errors.

NEWS BRIEFS

Optical communications software: RSoft Design Group (Ossining, NY), provider of photonics design automation software, celebrates the ten-year anniversary of its optical communication system design tool by announcing OptSim 5.0. The new release will include advanced features to model next-generation optical networks, with a particular focus on maximum likelihood sequence estimation (MLSE) decoding, electronic dispersion compensation (EDC) equalization, bi-directional transmission, and advanced modulation formats such as D(Q)PSK and OFDM. The new OptSim features are instrumental in designing dispersion-tolerant and faster optical networks.

Optics website/discussion

forum: Optics and optical component supplier Edmund Optics (EO; Barrington, NJ) launched its newly redesigned website (www.edmundoptics.com) that offers access to EO's more than 15,000 optical products, components, and instruments, and is considerably more user/researcher friendly and features dramatically improved navigation as well as new product selection and application tools. The major feature of the redesigned site is the totally new online discussion forum (forum.edmundoptics.com) that is designed to serve as a technical resource that allows users to connect with each other globally, as well as with EO professionals and engineering staff throughout the world. EO expects the new online forum to emerge as a leading industry professional hub for engineers to discuss industry and technical problems and solutions.

NEWS BRIEFS

People in the news: The IEEE has named Joe C. Campbell as the recipient of its 2008 Photonics Award, recognizing his work in avalanche photodiodes that has led to advancements in fiber-optic communications technology.

Bookham (San Jose, CA) appointed 20-year telecommunications industry veteran Yves LeMaitre as VP of global sales for Bookham's telecommunications division and VP of corporate marketing. LeMaitre, who will be based in Bookham's headquarters in San Jose, will be responsible for leading the Company's telecom sales team and corporate communications group.

Semiconductor manufacturing and test equipment maker SUSS MicroTec (Munich, Germany) appointed Thomas Breser to the position of VP of sales.

Don W. Cochran, chairman and CEO of Pressco Technology (Cleveland, OH), was presented with the 2008 Automated Imaging Achievement Award during a ceremony held at the Automated Imaging Association's (AIA; Orlando, FL) 16th Annual Business Conference in Orlando, and was selected from a pool of candidates for his contributions to the machine vision and imaging industry.

PRIMA North America (Champlin, MN), the North American subsidiary of PRIMA INDUSTRIE (Torino, Italy), a manufacturer of industrial laser systems, appointed Carl Bryant to the position of North American Sales Manager for Laserdyne Systems. Bryant is being promoted from a position of regional sales manager, and in his new position, will manage all Laserdyne sales activities for Canada, Mexico, and Latin America as well as the U.S.

Cluster Summit highlights need to maintain momentum, continued from page 4

event with the profile it deserved."

I've been to a number of events at trade shows, but this was the first "working" event that I can remember in quite a while. Hallett took the floor and asked the attendees to form small groups and answer two questions: (1) What is working within your cluster; and (2) What isn't working?

Regarding what is working within photonics clusters (according to the assembled crowd of about 70 people), an overwhelming consensus emerged that clusters are able to attract new members, and benefit from having an influential leader who is able to rally the members to advance the goals of a cluster.

Unfortunately, what isn't working within clusters is a much longer list.

In the notes compiled by Peter Hallett from the Photonics Cluster Summit, two of the biggest challenges facing clusters were listed as finding funding sources, and maintaining the momentum of current membership. To find funding, solutions included forming strong relationships with universities and to win SBIR contracts via relationships with large industry players. And to maintain momentum within a cluster, groups at the Summit listed several solutions including a) to define the value of the cluster to members, b) provide opportunities for networking, c) create a directory of members, d) utilize the Internet to connect members that are separated by geographic distance, e) survey membership so that the cluster can stay focused on what is important to members, f) focus on maintaining strong leadership, g) network with other clusters and internationally, and h) to find ways to foster partnerships with universities and industry.

"Getting people to join is one thing,

but getting their time is another," said Fong. "The Florida Photonics Cluster, for example, has had tremendous growth over the past two years but the same small group of people remains the most active and involved." Fong continued, "We offer a multitude of opportunities to promote our members products and capabilities as well as a chance to collaborate with other firms in pursuing opportunities that might be out any single company's scope. It's getting people to see that which is the big challenge."

The FPC was incorporated in 1995 as the Florida Electro-Optics Industry Association by William C. Schwartz. Schwartz was a real giant in the industry having been a serial entrepreneur in photon-

ics and lobbying for the creation of the University Central Florida's Center for Research in Electro-optics and Lasers (CREOL) which eventually became one of the country's first Colleges of Optics. Since these early days under strong leadership, the FPC has not had difficulty maintaining momentum for its members. And current president Alex Fong has every intention of keeping that momentum going. "Lack of human resources and intellectual capital are a huge problem in the photonics industry and that is public-policy driven and ties into legislation on education and immigration," said Fong. "Clusters allow the rational voice of photonics firms to be heard amongst policy makers whose bills on these critical topics can either help or hinder their efforts. Photonics represents the bedrock of present future technological fixtures in our lives, in everything from entertainment to health care. We need to ensure that we support its development as ultimately all of this has an impact in determining our future and the quality of our lives."

--Gail Overton

**"Getting people to join
is one thing, but getting their time
is another."
--Alex Fong, president of
the Florida Photonics Cluster**
