

## Editorial

### ISAL '19 Gets Under Way

This year's IAA just wrapped up. Our DVN Report went live last week with seven key takeaway points, 150 pictures, and analysis.

Today is the first day of ISAL 2019, and the DVN team are here attending the lectures and viewing the expo booths for technical and technological updates on what's doing in our world. Many DVN readers will be there, and we're happy to see you. For those who cannot attend, have no fear; we'll be carefully taking notes to bring you a DVN Report with full coverage of the lectures, posters, discussions, and expo-booths. The symposium, chaired again this year by Professor Khanh, is organised into topical blocks including matrix beam technology, road projection and positive/negative aspects, evaluation of headlamps as system, new technology for rear lamps on the ground of LED-matrix display, AV communication with pedestrians, and virtual reality for tests and simulations.

*Photo: Keynote speech by TU Darmstadt's Professor Dr. Hermann Winner*



Last night's meet-and-greet soirée was a grand opportunity to renew acquaintances and catch up informally on the endless innovations in vehicle lighting.

This morning, after the keynote speech by TU Darmstadt's Professor Dr. Hermann Winner, the session High Resolution Headlamps and Digital Light got under way. Moderated by Ralf Klädtke, it started off with an introductory talk by S.Töpfer from Daimler, followed by 4 lectures :

- Real Driving Benefits and Research Findings with Digital Light Functions (Dr. M. Hamm, Audi)
- Traffic Safety Benefits provided by High Resolution Head-lamp Systems (Dr. E.O. Rosenhahn, AL)
- Boost Safety & Styling—New HD-LED Systems for front and rear (Dr. M. Kleinkes, Hella)
- Micro-Pixel-LED-Headlights (Dr. J. Roth, Volkswagen)

This week we give a friendly sendoff to Lennart Dellby, who is retiring after a long and fruitful career in lighting at Volvo.

And don't forget to mark the dates for the 2020 DVN Workshops: 28-29 January in Munich and 26-27 May in Tokyo.

Sincerely yours

DVN President

A handwritten signature in black ink, appearing to read "W. Frally".

## In Depth Lighting Technology

## Volvo Lighting Luminary Lennart Dellby Retires

Lennart Dellby will retire next week after a long and fruitful career in lighting. He started at Volvo Cars in 1984, recruited by Jan Vulcan—a friend of DVN President Hector Fratty. Dellby held the position of Technical Specialist-Expert in exterior lighting, responsible for developing lighting performance of Volvo models from 1987 onwards. He has been the expert in applying, understanding, and interpreting vehicle lighting regulations and related certification issues in Volvo's Research and Development department.



### **GTB Prag 2008**

*W. Huhn: "I know Lennart since was first time at GTB in the early '90s"*



### **GTB Gothenburg**

*Lennart with W. Huhn, P.H.Matha, and R. Neuman*

He became a member of the Swedish GTB delegation in 1985, serving as head delegate from 2003 until 2016, representing Volvo in the Eureka Project "Advanced Frontlighting Systems" from 1995 until the end of that project.

Geoff Draper recalls that when he joined GTB for the first time, May 1986 in Eastbourne UK, Lennart was already well established and that, unbelievably, was 33 years ago! One of Geoff's longstanding memories is of the GTB social event in the restaurant of an English vineyard. A number of the GTB characters, including Lennart, were dressed as farmers to perform the English children's song "Old McDonald had a farm". Lennart's performance was truly memorable and perfectly underlined his character that GTB has appreciated over the many years".



DVN asked two questions:

### **DVN: What is your feedback after several decades in lighting?**

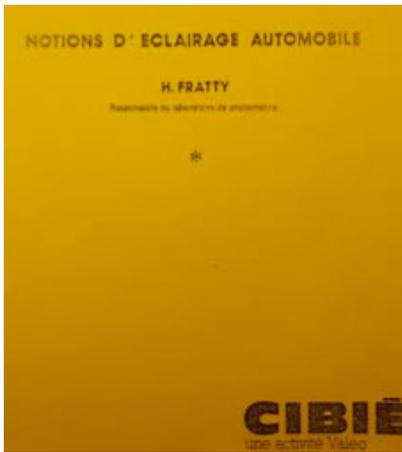
**Lennart Dellby:** It has been a wonderful experience to have had the privilege to work in this field. Specially to work in a field with human connection, after all the purpose of vehicle is to reduce risks of human suffering and human life in traffic environment. Also, at the same time, having worked in a technical area with such rapid development pace has been really rewarding. Back in 1984, halogen light sources combined with parabolic reflectors were still the benchmark. Then came Xenon bulbs followed by LED light sources, optical systems development including ellipsoidal systems, and complex-surface reflector shapes. Lately we have witnessed the revolution in the rapid advance of adaptive systems.

### **DVN: What is the message you wish to leave to the lighting community?**

**Lennart Dellby:** I have several messages to the lighting community:

&am;First, regarding my family I am happily married to Eivor, we have been together for 43 years, we have a son, Fredrik. My interests will be divided into travel, maintaining our summer/winter retreat in the middle of Sweden, reading and much more. Two very important messages:

- 1) Never ever forget that you are primarily working with SAFETY, this is our raison d'être.
- 2) There has never been a time with more possibilities and challenges as now thanks to development in lighting and vehicle technology such as HD systems AD vehicles to name but a few. Your best days are still ahead of you!!



On a personal level it has been a great pleasure to work with you Hector, first in Valeo and lately together with you, Salomon Berner and the other colleagues in DVN. Again, thanks for everything and please continue with the great work you are doing with DVN. I still remember very well when we met in your Bobigny office in October 1986 and you offered me a copy of your written document "Notions d'éclairage automobile". I still have it!!

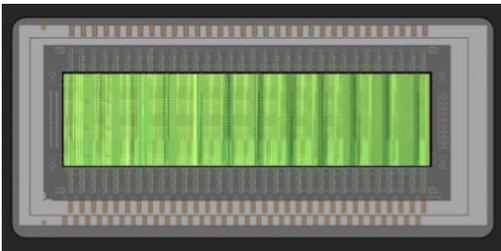
### **In conclusion**

Hector Fratty and many of his colleagues have in mind a very competent and effectively working guy, who never tried to play a dominant role in the Lighting community. He always was an expert in lighting and a team player searching to help. Hector met him already around 40 years ago, just when he started in Volvo, making several night drives with the Volvo 740 with big headlamps equipped with twin H1 then H4, seeking excellent performing headlamps with the largest size using the well known parabolic technology. Later, he worked with a great success in the GTB front Lighting group discussing innovative technologies. The lighting community does wish Lennart all the best in his retirement phase and most of all good health for a long life.

## **LIGHTING NEWS**

### **ADB Light Engine Has 16,000 MicroLEDs**

Nichia and Infineon have announced collaborative development of a high-definition light engine with more than 16,000 micro-LEDs for front light applications. In an improvement over other HD solutions, the new device will provide high resolution light for the driver's entire field of view.



Nichia Advanced R&D Center director Kanji Bando says it offers a resolution "about 180 times as high as that of comparable solutions on the road today".

HD light can be used to warn the driver of hazards by highlighting people or objects on the roadside, for it can project markings on the road. And established features such as ADB or bending lights run more precisely and smoothly.

The new HD light engine has micro-LED technology from Nichia and a new driver IC from Infineon. Infineon's Andreas Doll says their chip controls and keeps tabs on each one of the 16,000 microLEDs, and "will also significantly increase energy efficiency because it allows us to turn on only those LEDs actually needed for a light pattern".

The new HD light can also contribute to reducing design and production complexity for car manufacturers and make things easier for the driver. Left- and right-hand traffic can be easily catered for either automatically or with a few simple button pushes.

The production launch of the new HD light engine is planned for 2023.

### **Osram enables intelligent automotive lighting in HD quality**

For the second generation of Eviyos, Osram is developing a groundbreaking 25,600 pixels on a single LED chip. Two years after the announcement of the world's first hybrid LED "Eviyos", Osram proposes more than 25,000 individually controllable pixels, the LED has a footprint of just 40 mm<sup>2</sup>. The individual light pixels are brought together to a pixel pitch of only 40 μm, creating a particularly space-saving component.



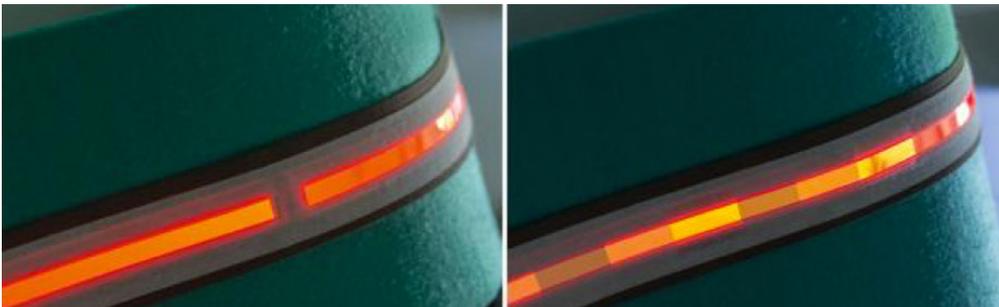
"With more than 25,000 individually controllable pixels, the second generation of Eviyos will bring HD-quality projections onto the road. In the future, vehicles will be able to visually display warnings or symbols to vehicle occupants or other road users," explains Wolfgang Lex, VP and GM Automotive at Osram Opto. "Car owners can also be greeted by a variety of welcome scenarios when approaching their vehicle thanks to this product." In addition to the outstanding high resolution, the second generation of Eviyos will offer decisive advantages over comparable solutions, especially in terms of energy efficiency and space. An essential feature of the Eviyos family is that only the pixels that are needed are illuminated for a particular situation. This means that only the necessary energy is consumed - a crucial point, especially for electric vehicles.

The second generation of Eviyos is currently still under development - but it already shows how automotive lighting will change in the coming years. They can fade out areas with unprecedented precision, while other areas shine in full light. This technology also opens the door to new fields of application beyond classic lighting. Depending on the application, customers will be able to combine several Eviyos with each other or other conventional LEDs.

At the beginning of 2020, the first generation of the world's first hybrid LED Eviyos, featuring 1,024 individually controllable pixels will be launched to the market. The market launch of the second generation of Eviyos is planned for 2023.

## OLED Light Strips Bring Interior, Exterior Design Prospects

Researchers at the Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology have developed light strips from individual OLEDs, which can act like a single luminous surface without interruption.



Claudia Keibler-Willner, head of the "Sheet-to-sheet OLED Technologies" department at Fraunhofer FEP, says "We manufacture flexible OLEDs with appropriate control electronics in such a way that any number of OLED modules can be connected without creating visible interruptions to the active surface. This makes it possible to produce infinitely long OLED light strips. An additional highlight is the individual control of the segments. This allows additional lighting effects such as different dimmings or dynamic warnings to be realised".

In contrast to point-source LEDs, OLEDs are surface illuminators—homogenous by nature, so they don't need reflectors, light guides, or additional optics. And they're very thin and light in weight. That lets them achieve effects and appearances difficult or impossible with conventional LED technology.

OLED strips can be flexibly applied to curved surfaces such as car bodies. They can be transparent when switched off so that the underlying surface remains visible. Dynamic control or dimming opens up additional possibilities, such as for welcoming scenarios at the car. The scientists are now looking forward to concrete industry inquiries to develop prototypes or small series of these light strips for innovative designs and applications.

## Mind Optoelectronics' Lighting Portfolio

Mind were spun off from Great Wall Motors last year, and have three main activities: lighting, thermics, and electrical systems. Located in Baoding, close to Beijing, Mind make lights for Great Wall vehicles and now are looking to expand to other automakers. They presented some of their new products and capabilities at IAA, the Frankfurt motor show. Among them we noticed:



**Full laser headlamp:** Twin module Laser HB/LB head lamp, with welcome function and an interesting battery state-of-charge monitor for EVs.



**Smart headlamp:** Ultra narrow (15 mm height) HB & LB modules in addition to an 18-segment ADB module and a laser HB assistant.



**Star dust rear lamp:** an attractive combination of LEDs and light diffusers with unique style. An example of the company's capability not only on optical design but also in injection process.



**Glass OLED rear lamp** with complex optical shape

They also presented infrared and DLP module applications. Mind's lighting VP and GM Hossein Nafari was formerly R&D Manager at Valeo. He drives Mind's development and engineering capabilities, backed by more than 1,600 engineers in the three Mind divisions, including 500 employees in development and engineering in the lighting division. The company also have integrated electronic design and manufacturing for chips and drivers, saving cost and time on drivers, modules, and lighting products.

## Laird Peltier Coolers for DLP Headlamps

The Peltier Effect is a fascinating bit of thermoelectric magic. A Peltier Junction has a hot surface, a cold surface, and two wires. Applying DC electricity to the wires heats the hot surface and cools the cold surface. It's used in compact, silent refrigerators, for example, which don't have to have a bulky, noisy compressor. And now it's being applied in lighting. DLP headlight systems operate in temperature environments that can reach 110 °C—well above the 70° maximum operating temperature of a DLP. Laird Thermal Systems' HiTemp ET Series thermoelectric cooler module, they say, protects the sensitive DLP electronics and ensures optimum performance.



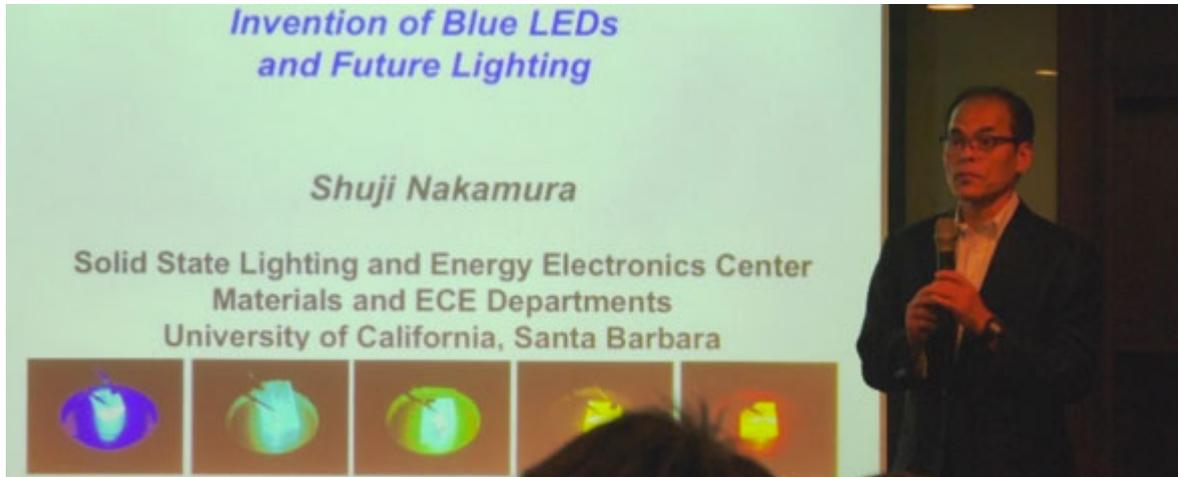
The HiTemp ET Series is a Peltier cooler that delivers active spot cooling, it can lower the control temperature by as much as 40°C below ambient dependent on active heat load.

The Peltier cooler offers reliable solid-state construction, long life operation, and compactness that fits into tight space constraints commonly found in headlamps. Compared to passive cooling solutions, the active HiTemp ET Series can be integrated similarly into a DLP automotive headlight system. A cold block and interface material are typically used on the cold side and comes in direct contact with the DLP. The cold block then comes in contact with the Peltier Cooler. When power is applied to the HiTemp ET Series, heat is absorbed by the Peltier Module and pumped to the hot side. A heat dissipation mechanism—typically a heat sink and fan—then sheds the heat into the surrounding environment. The HiTemp ET Series is

designed to operate in temperatures between 80 and 150°C.

## Laser Lighting is the Future: Shuji Nakamura

Shuji Nakamura, winner of the Nobel Prize in Physics in 2014 for the blue LED (which made the white LED possible), delivered speeches at Taiwan's National Tsing Hua University and Chung Hsing University, as well as at Micro LED company PlayNitride. Nakamura shared his research experiences in Japan and the U.S. on the way of blue LED development and pointed out the trends and potentials of the LED industry.



Back in the 1990s, ZnSe was the material that the majority believed to be critical for blue LED manufacture. Nakamura, however, chose a different approach with GaN, which was considered a dead end by researchers at the time. But by inventing two-flow MOCVD system, Nakamura successfully developed high efficiency GaN-based blue LED. Apart from energy efficient LED lighting applications, blue LEDs also created breakthroughs in backlight display, smart lighting, and the next-gen display technologies, Micro LED and Mini LED.

In addition, Nakamura works on laser-based lighting which he believes to be the lighting technology of the future. The emitting area of a laser diode is even smaller than LEDs, allowing further applications with advanced technology. The high power feature also makes it suitable for vehicle lighting.

In addition, for the rising development of autonomous driving technology, laser-based lidar plays a key role.

In his speeches, Nakamura mentioned the potential of Li-Fi as well, which offers high speed data transfer and provide better security and a wider range of applications.

## IMS to Deliver Full Assembly Line for Matrix Headlamps

At the IAA, IMS showed off their expertise in micro-assembly and how they can support their customers with optimal production automation and the best fitting assembly machines for micro-optics and sensors.

The Newest matrix, micromatrix, and DMD headlamps require advanced industrial technologies. With 120 employees, IMS focus on engineering and building highly accurate assembly machines for the automotive market and for mobile phones.



IMS Business Developer Hans Velten says "Isn't it exceptional that a machine builder is exhibiting on the IAA? It might look so, but we are right in the middle of our customers. We see the need for new and advanced industrialisation technologies for the newest headlamps, but also for the production of e.g. the upcoming lidar. Since headlamps are becoming smaller for design reasons, the need of accurate aligning of the optical components arises. Next to that, the assembly could take place in a cleanroom environment, since dust particles can harm your projection.

Velten says IMS will deliver a fully automated assembly line for a major tier-1's matrix headlamp. He says "A key element in this assembly line is the extreme precise aligning of the optics to the light source. We are proud to work in this field, and we are preparing for the assembly technology of the next generation headlamps like Micromatrix or DMD and also for (dynamic) side projection and lidar. The IAA is for us, next to the DVN Workshops, a place to talk to our customers and prepare the industrialisation for what's next" in vehicle lighting.

## LG Innotek at Automotive World Nagoya



LG Innotek demonstrated their latest automotive products—LED modules and communication modules—at Automotive World Nagoya last week in Japan.

LGI say their Nexlide LED modules contain the company's unique light-emitting structure design technology. Nexlide-HD emits bright and even light from all five surfaces except the substrate contact surface. They give uniform light without extra parts like plastic molds or inner lenses, and spread the light almost 180° wide.

## Hella-FAW Group Increase Cooperation

Hella's Dr. Frank Huber and FAW Group's Zhang Pijie have signed an agreement intensifying their coöperation: they've agreed to make their JV Changchun Hella Faway Automotive Lighting a strategic partner of FAW's premium Hongqi car brand. This includes provision of sophisticated headlamp systems and innovative car body and interior lighting products. Both partners also seek to strengthen their coöperation along similar lines for other FAW brands and JVs. brands and JV of FAW.



Pijie, who is Chairman of FAWAY and Head of Purchasing for FAW, says "We are a leading automobile manufacturer in China. We want to steadily expand this position and are therefore entering into strategic partnerships. Automotive lighting technology will continue to gain in importance and, not least, play a great part in shaping the appearance and indeed the image of our vehicle models, especially the Hongqi brand".

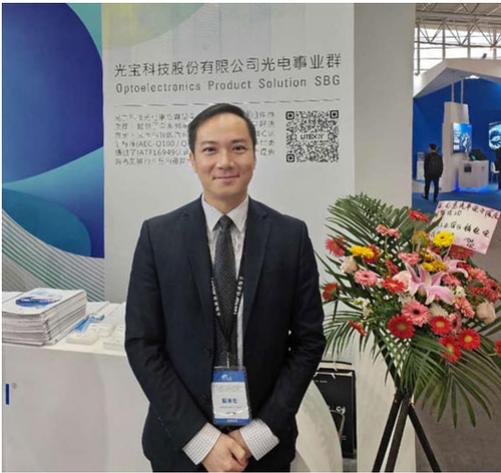
Huber, member of Hella's Management Board responsible for the global lighting business, says "FAW and FAWAY have been close and important partners of ours for many years. We are therefore delighted to be able to expand this coöperation further and to support various FAW brands even better with our lighting solutions".

Changchun Hella Faway Automotive Lighting was founded in 2012 as a JV between Hella and the FAW subsidiary Changchun FAWAY Automobile Components. They develop and manufacture headlamps for the Chinese market. Hella is currently represented in China with over 5,500 employees operating in 16 companies, including five JVs. In the fiscal year 2018-19, Hella's Chinese operations generated sales of over €800m.

## DRIVER ASSISTANCE NEWS

### Lite-On and II-VI Inc in Lidar Tie-Up

Optoelectronic component suppliers Lite-On Technology and semiconductor laser makers II-VI Incorporated have announced partnership for the volume manufacturing and commercialisation of packaged semiconductor lasers for mass-market lidar. LEDinside magazine interviewed Lite-On Associate VP Sander Suto, who shared his perspective on lidar market prospects and strategies.



Su says the lidar market is witnessing a boom, because the fast, highly precise detection and accurate simultaneous localisation and mapping have unlocked the potential of autonomous systems, including self-driving vehicles, intelligent transportation system, automated guided vehicles, and autonomous mobile robots. The automotive sector brings the biggest chunk of potential lidar market applications in the near future, he says.

More, the rapid proliferation of lidar in automotive, commercial and industrial applications is driving the demand for low-cost semiconductor laser devices that can be manufactured in very high volumes.

II-VI and Lite-On will leverage their respective high-volume manufacturing platforms for semiconductor lasers and optoelectronic packaging to jointly commercialise a broad portfolio of laser solutions spanning from near-infrared to shortwave infrared, with the first product to launch in mid 2020.

## Veoneer Awarded for AV Thermal Camera

Veoneer have won a production contract with an unidentified "world-leading" automaker to manufacture a thermal camera for an autonomous vehicle.



Veoneer's products include radars, vision systems, and advanced driver assistance and autonomous driving software. CEO Jan Carlson called the award a breakthrough for his company. Production start on the new thermal camera is planned for 2021, and Veoneer say although volumes are expected to be low, the contract is of high technical significance, with a representative calling it "the first time, as far as we know, that a carmaker has made the decision to include thermal cameras as a sensor on self-driving cars".

## OmniVision's Image Sensor, Arm's Processor

OmniVision have combined their OX03A1Y image sensor with Arm's Mali-C71 image signal processor (ISP) for what they're calling a 'dual-mode automotive camera module'.



OmniVision say their sensor features the automotive industry's best image quality across all lighting conditions for rear and surround view cameras, as well as a broad range of machine vision applications for ADAS—blind-spot detection, e-mirrors,

lane-departure warnings, and the like—and for autonomous driving platforms.

Arm's Automotive and IoT Product Management Director Tom Conway says the Omnivision sensor "showcases the Mali-C71's ability to process multiple real-time inputs with one pipeline, capturing both human display and computer vision images with a single image sensor, at the highest possible quality".

And Omnivision automotive product marketing manager Celine Baron says the Arm processor "is an important part of the automotive ecosystem, and they are a key partner for OmniVision...this collaboration demonstrates the high performance that can be achieved by combining our premium 2.5MP image sensor with Arm's ISP, for automotive applications that need both computer vision and human displays from a single camera module".

## GENERAL NEWS

### UVeye: From Bomb Detection to Vehicle Inspection

UVeye are a startup begun in Tel Aviv in 2014; they opened for business two years later. Their first application was bomb-checking at border crossings and other security settings. Now, the company are taking their Helios undercarriage inspection system and other technical products to the global auto industry, with product launches this year and next. Among other high-tech inspection products, they offer an under-vehicle scanner using high-resolution sensors and machine learning.



A Helios scanner for automotive clients would detect and record things such as frame damage, fluid leaks, brake and exhaust system problems. UVeye are working with five automakers, including Volvo and Daimler, to install the system at vehicle assembly plants and dealerships.

Other UVeye products include Atlas, a 360-degree inspection system that scans sheet metal and other external body parts for dents, scratches, and gaps the human eye might not readily see. Volvo plan to put Helios and Atlas inspection systems at manufacturing facilities and dealerships.

UVeye have raised more than \$35m in investment capital since 2017, much of it from Toyota, and envision product applications including final vehicle-quality checks at auto-plants and quick repair at dealerships.