



## Editorial

### The Golden Age For Rear Lamps Is Now!

Most DVN Reports on technology and technique have focussed on headlamps and other front lighting, as there are so many astonishing innovations to speak about in that domain. But rear lighting also deserves attention, don't you think? We do! Design at the rear is at least as important as the front face of the car; in traffic when we're following other cars, we see only the rear design. Moreover, signalling is only growing in importance, with a growing list of functions and modalities for safety and communication, now and in the autonomous-vehicle future.

In the DVN Report published today, we review the surprisingly predictive history of automotive rear lights—from the first oil-burning lanterns through the long coloured-plastic-box-with-bulbs era, leading up to today's advanced LED, OLED, and sensor-integral technologies. We present the major styling trends exerting on the appearance of rear lamps: thinner and thinner, more and more commonly spanning the whole width of the car, with precise internal decorative elements, and more. One of their most important roles is now to express the signature of the car in conjunction with the DRL and position lamps on the front.

Rear lamp technology is also heralding the introduction of new ideas like pictographic or text displays and road projection. These are not yet allowed by the regulations, but several studies are demonstrating the potential for safety benefits, a prelude to the introduction in regulations as explained in the report. Along the same line, rear lamps—located as they are at two of the four ideal positions, the corners of the car—will likely also come to incorporate a variety of ADAS sensors.

Early on in the AV discussion, there were rumblings and whisperings that signal lamps would become obsolete as humans relinquished the driving task to the cars themselves. Clearly that's not so; in the future, rear lamps will for sure continue to embellish our cars' styling, augment their communicative capabilities, and expand the scope and technique of their message presentations...to everyone's benefit! We hope you'll enjoy reading this latest [DVN Report № 160](#) as much as we've enjoyed working to bring it to you.

And don't forget to **register now for our DVN US workshop will take place in-person in Novi, MI, on September 21-22, 2021, at the Hyatt Place Hotel.** Early bird fee valid only until end of July.



A handwritten signature in black ink, appearing to be 'JP Ravier'.

Jean-Paul Ravier  
*DrivingVisionNews Development Advisor*  
*Formerly R&D Director, Valeo Lighting*

# In Depth Lighting Technology

## The Fascinating World of Rear Lamps



Rear lamps have existed since very shortly after the dawn of the automobile. The first ones, like the cars they were attached to, were basic and addressed the need for nighttime conspicuity in a primitive manner. Safety functions were progressively improved by adding new functions—reverse light, rear fog light—and more stringent requirements for the basic functions: larger lit areas, wider distributions of light, higher intensities. The introduction of LEDs with instant-on illumination and more stabilized beam has carried this trend forward. Regulation has also evolved to allow and then require high-mounted auxiliary stop lamps, emergency braking display, hazard warnings, and other suchlike. The still-optional adaptive rear-light systems seek to improve safety performance in difficult conditions.

Besides this important role for safety, rear lamps are currently considered as a priority design feature, and more precisely the most important element at the rear to express the signature of the car.



Triangle signature of Seat Ibiza

X signature of Citroën C5X

Design has in fact been the real engine for innovations at the rear in recent years and this will likely continue in the future.

Before the arrival of LEDs, the challenge was steep to be original. Bulb technology imposed severe design constraints. Nevertheless, engineers and designers are

innovative, and figured out ways to have very homogeneous lit surface, a variety of unlit appearances (sometimes with colours totally different to those of the emitted light), perfect fit and finish, and other innovations with optical systems using reflectors, fresnel lenses, coloured internal filters, multicolour injection, new welding techniques, and other complex processes to fulfil these needs and wants.

The introduction of LEDs opened the gates to boundless opportunities by dint of compactness, low operating temperatures, pure colour, and the freedom to use as many LEDs as wished.



One of the most important new techniques is the light guide, either by tube or by surface, with so many abilities to produce thin, long, or decorated elements as in the Cadillac Lyriq shown here.

OLEDs recently joined in as an interesting addition, bringing new prospects for illuminated facets, as on this Audi Q5 tail lamp.



Thanks to this large spectrum of technical possibilities, the current trends from designers demands are orientated to thin lights, illuminated logos, full-width rear lamps as shown here on the Geely Xingyue, and precise internal decorations as on this Mercedes EQS.



Above all, the demand is to express a signature, and the tail function is the cornerstone for that specific function – whether or not the lamp is lit.

Animated light is another trend requested both by design and marketing. It is applied for turn indicators with a wiping effect, and more and more for numerous kinds of welcome scenarios profiting from the tolerance of regulation when the car is stopped.

In the foreseeable future, rear lamps play a central role in innovations for safer and more connected vehicles: rear lamps with displays, with road projection, perhaps with LiFi, will progressively morph from conspicuity devices to versatile communication tools, with the ability to provide granular messages to relevant traffic participants, including more and more autonomous vehicles.



Communication with Display



Communication with road projection

Rear lamps occupy two of a vehicle's four strategic corners, and sensors including cameras and radars will likely be increasingly integrated into rear lamps to offer optimal field of view and detection aptitude.

So, the future of rear lamps will prioritise style with unfettered imagination, while at the same time realising long-awaited features to enhance functional safety.

# Lighting News

## MicroVision Hires Dr. Thomas Luce, former Optoflux CEO

LIGHTING NEWS



MicroVision, a leader in MEMS based solid state automotive lidar and micro-display technology for augmented reality, yesterday announced the hiring of Dr. Thomas Luce as VP of Business Development, focused on European and Middle East markets, as well as plans to open a new office in Germany to help promote the Company's automotive lidar technology and sensor to OEMs and Tier 1 suppliers.

"As interest in our lidar technology grows, our presence in Germany allows us to work more closely with potential partners and customers," said Sumit Sharma, MicroVision's CEO. "I am thrilled that Dr. Luce will lead our business development efforts in Europe and the Middle East. "

Joining MicroVision on September 1, 2021, Dr. Luce is a seasoned executive with more than 25 years of experience in Automotive Lighting and Optics. He held various leadership roles at Philips Automotive Lighting, Schefenacker, Valeo and Eschenbach Optik. Most recently, he served as CEO for Optoflux, where he grew the company into a global automotive and optics company, adding LED and lidar optics to the company

portfolio. With an extensive career in the automotive area, he has deep insight into the automotive sensor and lighting community.

"I am thrilled by the opportunity to join the MicroVision team and to develop the MicroVision business in Europe," said Dr. Luce. "I believe that especially the premium car manufacturers are now strongly pushing for autonomous driving, and I am convinced that the lidar solution MicroVision could provide to its Automotive customers will be an enabler for autonomy and safety for the future."

# Cepton Win Giant OE Lidar Supply Bid

LIGHTING NEWS



Cepton Technologies will supply ADAS lidar—the largest-scale single order for it to date—to a major American-brand global automaker. Cepton say it's a landmark milestone both for the lidar industry and for Cepton themselves, who celebrate their five-year anniversary this month.

The automaker will put Cepton's lidar in next-generation ADAS across multiple vehicle classes and models, not just luxury cars. This marks the potential for an industry-first, mass-market adoption of lidar technology for automotive ADAS, with an anticipated deployment in consumer vehicles starting in 2023.

Cepton won the bid in partnership with Koito, who are affiliated with Cepton both as a partner and as an investor. Koito have a non-exclusive licence to manufacture a version of Cepton's MMT<sup>®</sup>-based Vista<sup>®</sup> X90 automotive-grade lidar, using key Cepton components and technologies. Substantial progress has been made in the Vista X90 product development over the past 18 months.

The multiple vehicle models to be included as part of this series production program makes this win the largest in the industry so far. The deployment of Cepton lidars in these models, as well as anticipated models to be added in the coming years, is expected to significantly exceed that in any of the other publicly-announced lidar series production programs.

Cepton's patented MMT lidars are compact and power-efficient. This maximises flexibility for vehicle integration, enabling various placement options—including in headlamps.

# Momentive's Hardcoat Solutions

LIGHTING NEWS



Sprayable hardcoats facilitate innovative plastic part designs. Momentive's new sprayable thermal-cure Silfort AS4700SP1 siloxane hardcoat caters for large, complex pieces such as for EV front modules with lighting and ADAS functionalities. The precise application of multiple uniform coating layers can greatly improve overall part performance with exceptional weatherability, scratch and abrasion resistance, and resistance to chemicals and solvents.

Momentive have a long history of developing, producing, and supporting a broad range of hardcoats to protect and enhance the performance of lightweight plastics and metals in demanding automotive applications, with R&D centres, application development labs, and production facilities around the world. Vehicle lighting components must meet stringent requirements over an ever-longer lifespan as the average age of vehicles carries on growing. Momentive's Silfort hardcoats provide long-term resistance to weathering, abrasion, and chemical attack. They comply with regulations for front and rear lighting.

And durability enhancement isn't the only tune Momentive's coatings can play. Condensation on the inside of headlamp lenses and driver assistance sensors can limit their function, spoil aesthetics, and give rise to safety threats. Silfort TAC2000 is a coating to prevent water droplets forming fog on plastic surfaces for front and rear lighting, front modules, and ADAS sensor covers.

# Valeo Confirm Outlook, Foresee Chip Shortage End

## LIGHTING NEWS



Valeo confirmed their 2021 financial outlook as they posted increased H1 sales and profit. Optimism was also on the docket, as Valeo expect the chips shortage to ease up.

H1-21 EBITDA rose to €1.21bn from €202m for H1-20, while sales rose from €7.1bn to about €9bn. Their 2021 financial outlook forecasts sales between €17.6bn and €18.2bn (from €16.4bn in 2020) on backdrop of growth in global automotive production of around 9%.

CEO Jacques Aschenbroich says he thinks the worst of the chip shortage is past, and that the situation will improve by the end of the year.

Valeo have four business units: Comfort & Driving Assistance Systems; Powertrain Systems; Thermal Systems, and Visibility Systems (Lighting and Wiping)

Visibility Systems sales were €3.014m in H1-2019, €2.169m in H1-2020, and €2.662m in H1-2021.

# Stellantis Announce Launch of ‘Stellantis Design Studio’

LIGHTING NEWS

## STELLANTIS DESIGN STUDIO

Stellantis last week, announced the creation of ‘Stellantis Design Studio’, a creative agency that will provide global brand design services across a broad range of companies, from transportation to industrial, manufacturing and tertiary businesses. The Stellantis Design Studio will build on the PEUGEOT Design Lab expertise and expand it to the Company’s portfolio of brands, such as Maserati, Jeep, DS Automobiles, and Lancia.

Stellantis Design Studio will connect its network of clients with its iconic brands and move beyond design consultancy by defining inter-company design partnership.

Klaus Busse and Arnault Gournac will join forces to lead Stellantis Design Studio:

- **Klaus Busse** oversees Maserati, Jeep in Europe and Stellantis Design Studio as Head of Design and leads the strategic development of the Studio expanding to the Company’s brands.
- **Arnault Gournac**, Director of PEUGEOT Design Lab and Cycles PEUGEOT, led the Studio expansion to support Stellantis globally.

# Driver Assistance News

## Magna Snap Up Veoneer for \$3.8bn

DRIVER ASSISTANCE NEWS



Canada-based auto parts conglomerate Magna International are buying Swedish rival Veoneer for about USD \$3.8bn in cash—that's \$31.25 a share, nearly 60 per cent up from the stock's closing price. Veoneer were spun off from longtime safety equipment supplier Autoliv in 2018, and will be merged with Magna's existing ADAS business, an activity of their Electronics division.

Magna CEO Swamy Kotagiri said "Veoneer's complementary technology offerings, customer base, and geographic footprint make it an excellent fit with our ADAS business, and the acquisition strengthens our global engineering and software development talent base".

Annual synergies of about \$100m are expected by 2024 from the deal, which was unanimously approved by both Veoneer's and Magna's boards and expected to close by the end of this year.

# Veoneer, Baraja to Field Spectrum-Scan Lidar

## DRIVER ASSISTANCE NEWS



Veoneer have signed an agreement to commercialise Baraja's Spectrum-Scan lidar technology, aimed at the next market wave of L<sup>2+</sup> through L<sup>4</sup> AVs. Under the non-exclusive agreement, Veoneer will develop, market, and integrate a scalable Spectrum-Scan platform from Baraja to serve the automotive market.

Veoneer say they chose to partner with Baraja for their robust technology and a development route toward the creation of smaller lidars to simplify vehicle integration. The Spectrum-Scan system connects a wavelength-tunable laser to prislime optics, deflecting the light in different directions to achieve scanning with claimed higher reliability and lower cost. Baraja say their technology enables excellent interference rejection and the ability to measure instantaneous velocity, which distinguishes it from traditional ToF (time of flight) approaches.

Baraja's system creates high-resolution point clouds to accurately detect objects at a distance of more than 250 m, at speed, while remaining immune to interference from other sensors or light sources. The technology is also more tolerant to heat, shock, and vibration which have hindered traditional lidar systems.

# Luminar Buy OptoGration

DRIVER ASSISTANCE NEWS

The logo for LUMINAR is displayed in a large, white, sans-serif font against a black rectangular background. The letters 'M', 'I', and 'N' are highlighted with vertical bars in red, green, and blue respectively.

Luminar are buying one of their key component suppliers as they move their latest Iris system into series production. Massachusetts-based OptoGration have been close collaborators with Luminar for five years, providing InGaAs (indium gallium arsenide) photodiodes operating at 1550 nm.

That wavelength, longer than what's used by most automotive lidar companies, is seen as critical by Luminar, as eye-safety regulations allow higher-power systems which will augment system performance at long range.

San Francisco-based Luminar say OptoGration has capacity to produce about a million InGaAs chips with Luminar's design each year at their specialised fabrication facility in Wilmington, Massachusetts, with the opportunity to expand to up to ten million units per year. OptoGration's technology is based around a proprietary technique called ELT (epitaxial layer transfer), which enables monolithic integration of optical devices on foundry-processed semiconductor wafers.

Luminar combine the InGaAs photodiodes with silicon devices produced by their own chip design subsidiary, Black Forest Engineering. The resulting lidar receiver and processing chip is claimed by Luminar to be the most sensitive, highest dynamic range InGaAs receiver of its kind in the world, able to acquire and process gigabits of precise lidar data each second. The latest iteration of that proprietary chip now features in Luminar's Iris sensor.

Last month Luminar revealed that the Iris hardware will equip the fully-electric successor to Volvo's XC90 vehicle, which is set to be unveiled next year.

# AEye's Electric Eye Sees Pedestrians on Dark, Stormy Nights

DRIVER ASSISTANCE NEWS



An AEye sensor mounted on a test vehicle detected small objects far away through difficult conditions. The [test](#) was conducted in heavy rain, with the sensor peering into a dark tunnel. The AEye sensor detected five bricks and a black dog not visible to the human eye at 120 metres, as well as a pedestrian and child at 110 metres.

Design-centric vehicle integration is made possible by AEye's bistatic architecture which separates the transmit and receive paths, providing optical isolation that ensures any retroreflected light doesn't blind the sensor. It also ensures optimal performance even in the most adverse weather conditions. This performance is further enhanced by AEye's use of 1,550-nm lasers, for this longer wavelength better penetrates obscurants, providing superior detection in rain, snow, dust, and smoke.

AEye's intelligent lidar uses adaptive sensing to deliver this industry-leading performance, which addresses the most difficult challenges facing autonomous driving, while meeting automotive functional safety requirements. Unlike traditional sensing systems, which passively collect data, AEye's adaptive lidar scans the entire scene while intelligently focusing on what matters in order to enable safer, smarter, and faster decisions in complex scenarios. As a result, AEye's lidar uniquely enables higher levels of autonomous functionality at a lower price.

*AEye make high-performance adaptive lidar systems for vehicle autonomy, ADAS, and robotic vision applications. AEye's AI-enabled and software-definable iDAR™ (Intelligent Detection and Ranging) platform combines solid-state adaptive lidar, an optional low-light HD camera, and integrated deterministic artificial intelligence to capture more intelligent information with less data, enabling faster, more accurate, more reliable perception.*

# General News

## Stellantis' New CTO

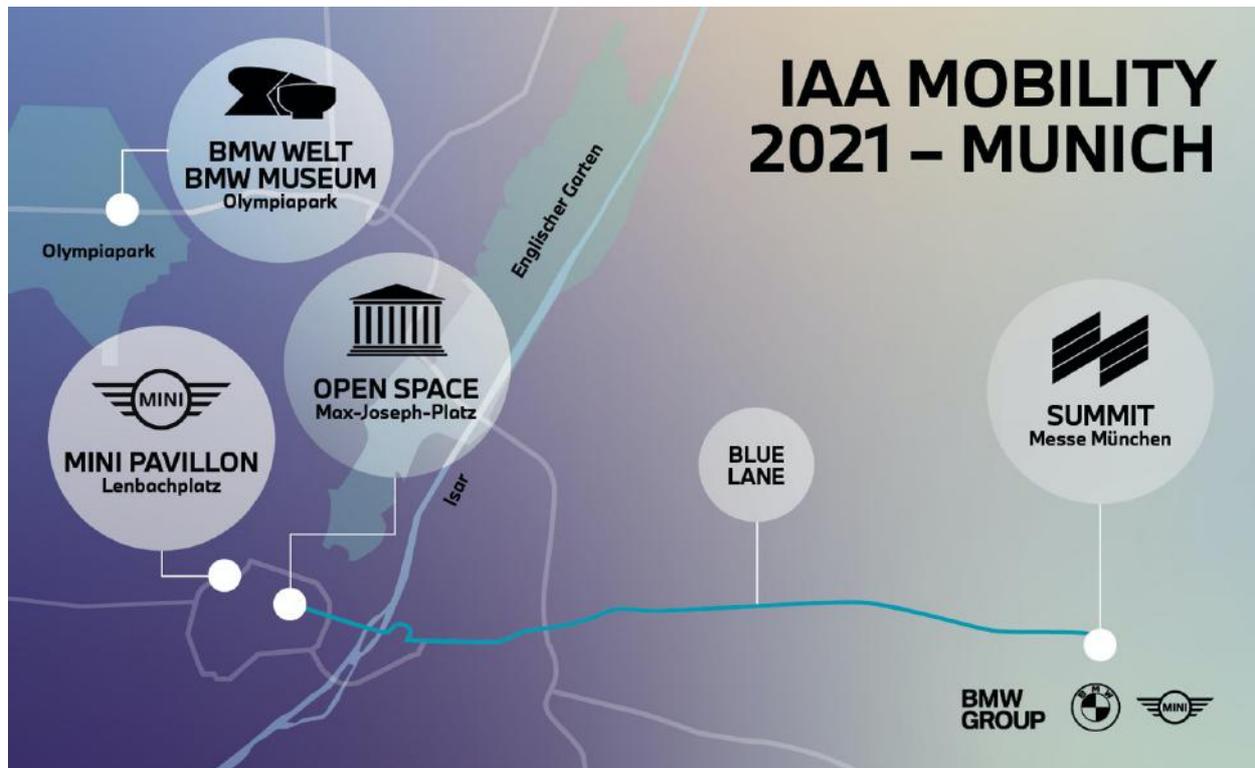
GENERAL NEWS



Stellantis announced the arrival of new CTO Ned Curic, one of the industry's leading figures, who previously worked for Amazon. Curic will manage all the resources relating to Stellantis' technology, and will report directly to Carlos Tavares. After starting at Microsoft, from 2013 Ned Curic held the position of CTO for Toyota in North America before taking responsibility for their software engineers, data scientists, and designers. He arrived at Amazon in 2017 as VP of Alexa Automotive, and worked to develop Alexa's presence in high-end cars. Alexa is already available on Stellantis-made vehicles including the Fiat 500 and Jeep Compass.

# BMW Group: Largest Exhibitor at IAA

## GENERAL NEWS



After 70 years in Frankfurt am Main, the IAA motor show will take place for the first time in the BMW Group's home city of Munich. Over the six days from 7-12 September, exhibitors will showcase their latest innovations and discuss the mobility of the future with trade professionals and members of the public.

The IAA is looking to strike up dialogue with visitors at various locations in the Bavarian regional capital—both the traditional exhibition halls and the open space made up of Munich's most attractive city squares. Visitors who can't be there in person can live-stream the IAA or catch up with events using recorded coverage.

With its open-space stage for new mobility concepts, the IAA will create an easily accessible format for visitors and take the personal mobility of the future to where it will take place: in the heart of the city. On city squares in the centre of Munich, such as Marienplatz, Odeonsplatz, and Max-Joseph-Platz, visitors will be able to explore automakers' latest vehicles and innovations and get involved in live discussions and an extensive entertainment and cultural program.

The BMW Group will be the largest exhibitor at the IAA and will welcome visitors to the halls at the exhibition grounds, to BMW's Four-Cylinder Building headquarters, BMW Welt and the BMW Museum, and to the BMW Hubs exploring the themes of sustainability and circular economy at Max-Josef-Platz in front of the Bavarian State Opera.