

REPORT
THE WONDERFUL STORY OF LIGHTING
History, Current Technologies & New Challenges

Preview the first chapter "History" [CLICK HERE](#)

Editorial

Audi's Hamm: A Figure Of Merit For Headlamps?

ADB is becoming more and more popular. Everybody knows that compared to any low beam the high beam function provides much more visibility distance, so a full-time (glare-free) high beam is a big push towards nighttime traffic safety.

Unfortunately, the path to U.S. allowance for ADB is even more tangled up than was estimated some months ago. There are two proposals in the pipeline, the one worked out by SAE at NHTSA's request (J3069) which NHTSA then rejected, and the agency's own proposal put forth in their 2018 NPRM. Looking at the various reactions to it filed in the short period allowed, it seems unlikely the NHTSA proposal can be pushed through into the regulations without drastic and massive changes to bring it closer to realistic feasibility. All of this creates a strange situation: one of the two proposals does not work, and the other one is not liked.

Outside the U.S., in China two different approaches want to rate headlamps, but both concentrate on low beam. The question is why low beams are still at the forefront of safety attention now in the age of ADB which is so much better for the very simple reason that they give much longer visibility and more visibility means better safety. Even a weak high beam outperforms the most perfectly aimed best low beam in terms of visibility distance, lux, and candela—its only drawback is the glare to other traffic participants, and ADB surgically eliminates that drawback.

So it might be helpful to combine ADB in a new solution: an extension of the TC4-45 headlamp rating system published 2011 by CIE. The New Headlamp Safety Performance Rating System has been discussed in GTB and will be part of the VISION 2020 conference. It will combine low beam, high beam, and ADB and will also respect the different use case scenarios. And, most importantly, it is based on TC4-45 and UN R123 ADB descriptions—both accepted standards.

ADB exists since 2010. At the last DVN U.S. Workshop in January 2019, a conservative calculation estimated that about 1.4 million cars were at that time driving around with ADB and without any complaints, recalls or adverse administrative attention about the ADB at all. This car fleet of more than 50 car models drives about 5.8 *billion* kilometres at night, *per*

year. This is definitely a large-scale field test. Clearly, ADB systems according to UN R123 are working. We should use the new rating system to evaluate the safety performance and move past outdated low-beam-only thinking.

So: yes. A reliable figure of merit for headlamp safety performance is coming.

A handwritten signature in black ink that reads "Michael Hamm". The signature is written in a cursive, flowing style.

Michael Hamm, in charge of headlamp development at Audi

And don't forget [to see the first chapter](#) "the History of Lighting" of our video series titled the Wonderful Story of Automotive Lighting which we introduced last week.

In Depth Lighting Technology

VISION Program Finalised

The 10th SIA VISION Congress will be held (assuming the world is back to normal) on 7–8 October, at Cité des Sciences et de l'Industrie in Paris. As always, it will bring together the world's thinkers, researchers, experts, practitioners, and suppliers in the variety of fields that make up the driver and vehicle vision community. Nighttime drive-and-ride trials, the unique star attraction of the VISION event, will be carried out on test tracks at Mortefontaine to demonstrate the latest innovations practically, so as to allow real-world assessment of their effectiveness in improving safety and comfort while driving at night.



The VISION Congress Scientific Committee's 20 members met at the beginning of this month to select 23 abstracts concerning lighting and 12 abstracts concerning ADAS. Authors are now informed, and the program is finalised. We will have:

- **Keynotes** from PSA R&D Director Nicolas Morel and from Stephane Buffat, who directs the LAB accidentology, biomechanics, and human behaviour laboratory in France.



•
Nicolas Morel



• Stephane Buffat

- **Six sessions on lighting:** headlamp technologies, ADB technologies, lighting communication, signal lamp technologies, styling and safety, and rating systems; this last session will be extended with a discussion on this important subject of headlamp rating. The selected speakers of these sessions are from automakers Audi, BMW, Honda, PSA, Renault, and SEAT; from set makers Hella, Hyundai Mobis, Koito, Marelli Automotive Lighting, Odelo, Stanley, Valeo, Varroc, and ZKW; from tier-2 suppliers Lumileds and Osram, and from research bodies ELS, LRC, and TU Darmstadt.
- **Three sessions on ADAS:** development and architecture, expanding sensor visibility, and ADA systems. The selected speakers are from Cyclope AI, ELS, Elektrobit, Hyundai Mobis, Intempora, Lynred, Valeo, Varroc, and Yole Développement.



• VISION 2018

- **A panel discussion** to discuss challenges, benefits, and drawbacks of sensor integration in headlamps and front-ends.

- **Eight posters** on lighting and ADAS.

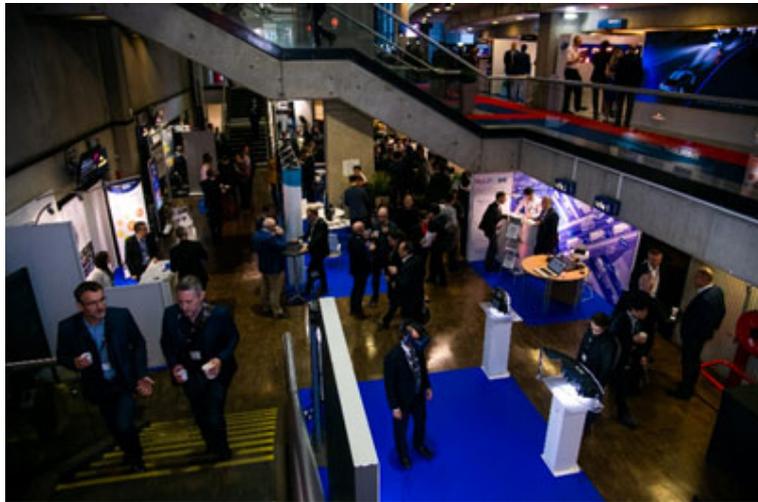
The night drives will be held the evening of 6 October, this time *before* the two days of the congress on 7–8 October to help attendees to directly arrive at the track area from the airport and to allow the drivers to totally follow the lectures. This will also give attendees the chance to discuss their observations during the night drives in context of the lectures and panel discussion.



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Demo-cars on one of the three circuits at Mortefontaine

Expo booths are fully booked



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Networking at VISION 2018

More information and pictures/video of the previous 2018 VISION Congress are [available online](#).

Lighting News

"The world will not be the same" after Coronavirus: Opel's Schneider



Ingolf Schneider started his career at Opel in 1981. After getting his degree in mechanical engineering he came to the Electric department as a design engineer. After some years as Project Engineer, he took the lead of Opel's Exterior Lighting group in 1997, and still holds that post today.

Thanks to his visionary work, Opel is one of the most innovative generalist automakers in lighting, with the first introduction of projectors, of AFS, and now of matrix beams.

Asked about the coronavirus crisis and its consequences for the automotive industry, he told us: "It seems that it will take some more time to improve the situation. After it, the world will not be the same any more. In some areas negative, in some areas positive. People are learning again to help others or to communicate directly with telephone, and not with mail, whatsapp and others. So I see the current proposal from you as a good example how networking can happen in a positive way. We must stay in communication, telling the world that the lights are still on!"

NAIAS Cancelled, Venue Becomes Emergency Hospital

Detroit's 2020 NAIAS (North American International Auto Show) has been canceled as FEMA (the U.S. Federal Emergency Management Agency) is expected to convert the TCF Center—formerly known as Cobo Center—into a temporary hospital for at least the next six months amid the coronavirus pandemic.

The annual auto show was scheduled to take place during Summer rather than Winter for the first time this year; event organisers say the show will resume in June 2021 and will include the events planned for this year.



Area hospitals are already nearing capacity, and Michigan Governor Whitmer has issued a stay-at-home order for the state. "The health and welfare of the citizens of Detroit and Michigan is paramount", said NAIAS Executive Director Rod Alberts. "TCF Center is the ideal location for this important function at this critical and unprecedented time." NAIAS Chairman Doug North said "Our primary concern is the health and wellbeing of the community and all of our partners are supportive of trying to help get this virus under control", adding that the

organisations that would have benefited from the 2020 NAIAS charity event are still expected to be taken care of as a new fundraising event is being discussed.

Ford expressed their support of the auto show's postponement amid the international outbreak: "We fully support NAIAS organisers in their postponement. The health and safety of our community and those working throughout the industry is our top priority. We look forward to seeing the show's return in 2021", Ford officials said.

Still expected to be taken care of as a new fundraising event is being discussed.



Paris Auto Auto Show which should be held end of September-October will not be maintained in its current form said yesterday, the organisers who are studying all the alternative solutions in close collaboration with their main partners and will continue to keep us informed, in real time, as and when decisions are taken.

Vehicle Vision From Newsight Imaging

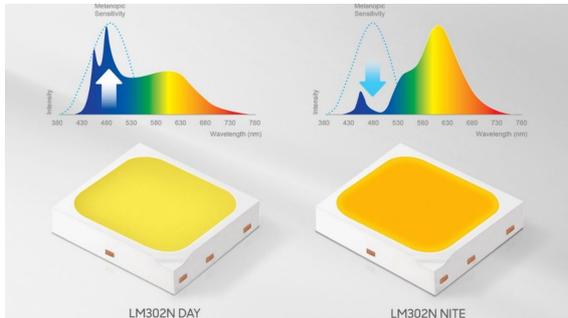


Newsight Imaging develop affordable CMOS-based high-performance 3D image sensor chips and pulse lidars for high volume applications. With them, vehicles will be able to see and detect objects up to 250 metres away. Newsight's technology is also expected to be integrated in a leading German-brand vehicle to be rolled out in the near future as part of that vehicle's ADB system.



Frost & Sullivan have described opportunities made possible by the likes of Newsight's chips, such as the introduction of a lidar costing less than \$100 at series-production quantities.

Samsung's "Human-Centric" LEDs



Samsung Electronics' LM302N LED packages are engineered with a carefully-tailored light spectrum to help adjust human melatonin levels indoors, making people feel more energetic or relaxed depending on their daily life patterns.

Melatonin, a hormone which regulates the sleep-wake cycle, responds to cyan light. More cyan in the output of a light source suppresses the body's production of melatonin, increasing

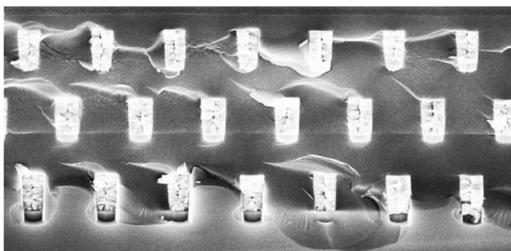
concentration and enabling a greater overall sense of alertness. Lower cyan content minimises disturbances to the natural onset of the body's melatonin production, helping to improve sleep quality.

The LM302N LEDs give precisely designed light spectra with optimal amounts of cyan to accommodate lighting needs on both sides of that equation; the LM302N DAY improves alertness, while the LM302N NITE enhances relaxation. The DAY package can suppress the body's melatonin level more than 18% below that of conventional LED lighting.

Available in a variety of colour temperatures from 3000K to 6500K, the DAY package can be used in a diverse range of indoor applications such as schools, offices, libraries, and industrial sites, to enhance awakesness and energy level.

The NITE package, on the other hand, can provide a proper level of brightness without hindering the release of melatonin, helping people to maintain the hormone level as if they were in a calm natural atmosphere at night. The body releases about 5% more melatonin under lights built around the NITE package than with conventional LED lights. It's come under increasingly concerned scrutiny that spending a lot of time in conventional LED light that isn't cyan-reduced can cause excessive alertness that makes it harder to fall asleep. The NITE package is offered in colour temperatures between 1800K and 4000K, providing design flexibility to bring the benefits of relaxing light to a variety of lighting spaces.

New Material Emits Light when Heated, Exceeding Plank Law



A [new research published in Nature Scientific Reports](#) by researchers at Rensselaer Polytechnic Institute presented a material that emits light when heated that appears to exceed the limits set by that natural law.

The new material discovered by Shawn Yu Lin, lead author and a professor of physics at Rensselaer Polytechnic Institute, defies the

theory proposed by Max Planck in 1900, which mathematically described a pattern of radiation. The material emits a coherent light similar to that produced by lasers or LEDs, but without the costly structure needed to produce the stimulated emission of those technologies.. "This doesn't violate Planck's law. It's a new way to generate thermal emission, a new underlying principle. This material, and the method that it represents, opens a new path to realize super-intense, tunable LED-like infrared emitters for thermophotovoltaics and efficient energy applications." said Lin.

For his research, Lin built a 3D tungsten photonic crystal — a material that can control the properties of a photon — with six offset layers, in a configuration similar to a diamond crystal, and topped with an optical cavity that further refines the light. The photonic crystal shrinks the spectrum of light that is emitted from the material to a span of about 1 μm . The cavity continues to squeeze the energy into a span of roughly 0.07 μm .

In Nature Scientific Reports, Lin presents spectral analysis taken in five positions as the aperture of an infrared spectrometer moves from a view filled with the blackbody to one of the material. Peak emission, with an intensity of 8 times greater than the blackbody reference, occurs at 1.7 μm .

Although theory does not fully explain the effect, Lin hypothesizes that the offsets between the layers of photonic crystal allow light to emerge from within the many spaces inside the crystal. The emitted light bounces back and forth within the confines of the crystal structure, which alters the property of the light as it travels to the surface to meet the optical cavity.

Ecosense Acquires Assets from Soraa



U.S.-based LED technology company Ecosense announced that it has acquired assets from Soraa, co-founded by Nobel Laureate Shuji Nakamura focusing on full-spectrum LED lamps. Under the terms of the deal, Ecosense acquires the Soraa name, intellectual property and lamps, including the company's signature VIVID,

BRILLIANT™ HL and HEALTHY™ product lines. This move is the first foray into the professional lamp category for Ecosense.

"This acquisition accelerates our strategy into the next wave of lighting," explained Mark Reynoso, CEO of Ecosense. "Soraa has an unparalleled reputation for beam and spectral quality. Their intellectual property and technology portfolio—including ZEROBLUE™, full spectrum, and healthy lighting—highly complements our own intellectual property and related technologies. We will prioritize enhancing and accelerating their antibacterial technology to market."

Nakamura commented, "Soraa is a pioneer in full spectrum and circadian lighting. Combining with Ecosense, we significantly expand our leadership and intellectual property rights in these and related fields. We are excited about our next phase of growth together."

Nichia Sue "LED Bulb" Maker for Patent Infringement

Nichia have filed a patent infringement lawsuit in Tokyo District Court seeking an injunction and compensatory damages against IPF Corporation, a Japan-based distributor of automotive aftermarket parts. Nichia accused IPF of selling so-called "LED bulbs" that infringe Nichia's patent

IPF [describe](#) their X2 series of "LED bulbs" as incorporating " an optimum LED chip developed by Lextar Electronics". Nichia say that LED chip infringes Nichia's patent JP5526782 related to LED package structure—the English-language equivalent European patent is available online as [EP1437776B1](#). According to Nichia, the technology described in the patent is used in the field of high power LED, wherein the company have relevant



patents registered in Japan, Taiwan, the U.S., China, South Korea, Germany, the U.K., France, Netherlands, Italy, Russia, and India.

"LED bulbs" designed to replace halogen headlight bulbs are popular aftermarket items, but all of them so far completely violate UN and U.S. lighting regulations and none of them so far meets any legitimate technical standard for such devices—in part because working groups within SAE and GTB are still in the early-to-middle stages of devising such standards. Significant

technical challenges remain before this sort of "LED bulb" can take real steps toward legitimacy, with or without patent-infringing LED chips.

AMS Expect Osram Deal Done By Midyear



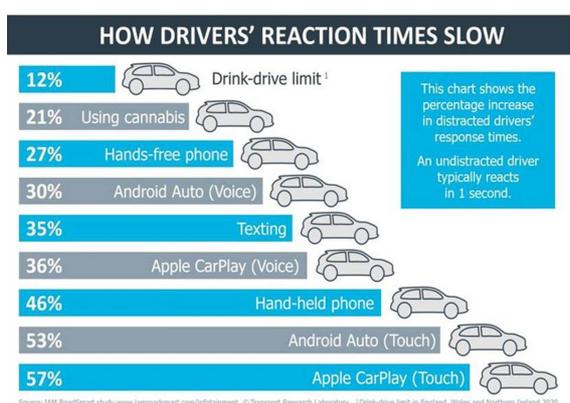
Austrian sensor manufacturer AMS say their planned takeover of Osram should proceed as expected, despite the uncertainties thrown up by the global coronavirus crisis.

Last week AMS, who are listed on the Swiss stock exchange, said the all-cash deal should close by the end of this June, while their €1.65bn rights issue, needed to partially finance the deal, also is proceeding as planned. Through that deal, AMS aim to create a global leader in optical sensors and photonics with expertise across VCSELs, 3D illumination, image sensors, automotive lidar, and other such fields.

AMS say they've received positive feedback from a number of their large existing shareholders and other investors looking to participate in the rights issue, which received overwhelming support in a shareholder vote this past January.

Driver Assistance News

Infotainment Worse Than Alcohol for Driver Performance



Drivers' reaction times are worsened vastly more by using in-car infotainment systems than by being at the legal alcohol limit or being high on cannabis, according to a new study.

Experts at the U.K. Transport Research Laboratory, in conjunction with U.K.-based road safety charity IAM RoadSmart, found the world's two major infotainment platforms place enormous demands on driver attention, leading to a variety of negative behaviours on the road.

The study, which is [available online](#), comprised two experimental trials with 20 participants using the Android Auto system, with another 20 using Apple CarPlay. Both groups were tasked with completing three simulated drives on the same test route: a control drive without infotainment usage, a run using the infotainment system with voice commands, and a run while controlling the infotainment by touchscreen.

The test run, divided into three sections, involved following another vehicle while accessing music on Spotify and BBC radio, navigating through erratic motorway traffic to a railway station, restaurant and petrol station; and performing a figure-8 loop while reading texts or making a call via the infotainment system. Compared with the control drive, participants in both trials showed a reduction in average speed, increase in deviation of headway, and larger deviation of lane position for most tasks; the variation was most extreme when using the touchscreen. Eye gaze measures found participants did not meet the NHTSA eyes-on-the-road criteria for most of the touch-control tasks on both systems, but did when relying on voice control. This was backed up by the participants self-reporting that showed interacting via touch to be more difficult and distracting than voice. The study's authors conclude, "For both touch and voice control with both systems, reaction times were greater than established benchmarks of the effect of alcohol consumption (at the legal limit) and cannabis use on reaction time when driving".

Comparison with previous driver impairment studies showed that the increase in reaction time when interacting with either system using touch was higher than previously measured forms of impairment, including texting and handheld calls.

Melco's Mini MEMS AV Lidar

Melco (Mitsubishi Electric) have announced a compact new lidar solution incorporating a MEMS to achieve an extra-wide horizontal scanning angle to accurately detect the shapes

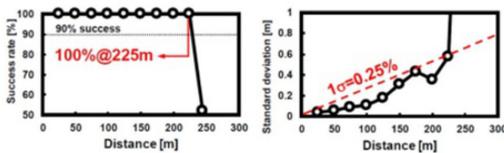


and distances of objects ahead in autonomous driving systems. The initial offering has a volume of 900 cm^3 , with a miniaturisation target of 350 cm^3 .

The new lidar irradiates objects by laser and uses a dual-axis (horizontal and vertical) MEMS mirror to scan for the reflected light, generating three-dimensional images of vehicles and pedestrians. Mitsubishi expect this compact, affordable solution to contribute to the realisation of safe, secure autonomous driving.

The new lidar solution features optimised design with a (relatively) large dual-axis electromagnetic mirror that enable wide scanning angle and acquisition of 3D images over a wide area. Melco say it's the industry's largest electromagnetic MEMS mirror at $7 \times 5 \text{ mm}$. Despite its size, the unique structure of the MEMS mirror facilitates a reduction in weight without sacrificing rigidity. The lightweight design and high electromagnetically generated driving force allows the mirror to achieve large horizontal movement of $\pm 15^\circ$. Vertical movement is currently $\pm 3.4^\circ$, and Mitsubishi aim to increase this to $\pm 6^\circ$ or more by improving the beam structure of the MEMS.

Toshiba & Toshiba Show Lidar Up To 200 Metres



Toshiba and Toshiba Device & Storage announced at ISSCC 2020 their latest high performance SoC lidar capable of measuring more than 200 metres for longer-range lidar systems.

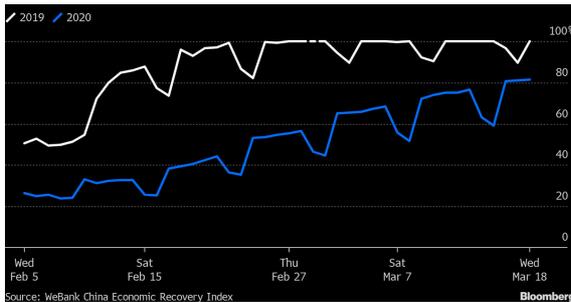
The SoC achieves two times more pixels than its predecessor model announced in 2018. This time the SoC has 240 horizontal and 192 vertical pixels for 10 frames per second. The test result was less than 0.25% error of distance measurement for 225 meters with 10% reflectivity target. The test was conducted under strong sunlight at 70k lux.

The previous model had two types of AFE (Analog Front End) circuits, for short range and long range. Toshiba successfully developed Dual-Data-Converter-Based AFE which works for both short and long range. As a result, the SoC could implement two times more AFE channels than the previous model. With 28 nm CMOS technology, the SoC area of AFEs shrank to just 20% of that of the previous model.

Toshiba expect the SoC to be applied for long range lidar by tier-1 automotive suppliers.

General News

World Shuts Down; Chinese Plants Restart



China is slowly emerging from its shutdowns by restarting production at factories and resuming some flights. A recovery in the world's second-largest economy provides some relief for global manufacturers in the months ahead as the outbreak continues to wreak havoc in Europe, India, and the Americas.

Production at BMW's Shenyang plants resumed, and the automaker expressed confidence the Chinese government will manage the crisis and defeat the epidemic.

Fiat Chrysler's Chinese manufacturing operations have resumed, and more than 90% of FCA dealers in China are back online. Ford says their Chinese plants have resumed production and are continuing to ramp up, as both of their local JVs have achieved almost 100% recovery, though some Hubei and Wuhan employees are still under travel restrictions. Honda's production is gradually recovering at their two Chinese ventures, and so far they have not had problems caused by parts shortage there due to strain in supply from outside of China. The PSA joint venture with Dongfeng has restarted car production at their plant in Wuhan city, the epicentre of China's coronavirus outbreak. Nissan said all factories in China have resumed work and production is set to align with government mandates, all SAIC plants in China have resumed production, Toyota plants have returned to their regular two-shift schedule, and all Volkswagen sites are back to operation, though challenges include a slow national supply chain and logistics ramp-up, as well as limited travel options for employees.

However, a second wave of coronavirus infections in China is widely expected. If it happens, it would once again slam the auto industry there. Fears of a second wave—or a first wave that hasn't really ended—are amplified by worldwide doubt China's coronavirus statistics. Reports have leaked out from China suggesting artificial reductions in reported infection numbers by simply refusing to test people who might be ill. Hong Kong's public broadcaster last week quoted a local volunteer in Wuhan, the Chinese epicentre of the virus, who said hospital staff there are turning away coronavirus patients and avoiding testing sick people in what he called "a political treatment, not medical treatment."

Suppliers Better Prepped For Crisis Than In '08

With North America's automakers halting production because of the crippling coronavirus pandemic, many of their suppliers have been forced to follow suit. In response, MEMA—the Motor & Equipment Manufacturers Association, a trade group for U.S. auto suppliers—asked congressional leaders last week to create a grant program to help prevent bankruptcies resulting from shutdowns.



Many major suppliers have already begun winding down to prepare for the worst. The sudden talk of industry bailouts, coupled with the plunge in the U.S. stock market and last week's production halts, has many observers making comparisons to the financial crisis of 2008. But the dire outlook due to COVID-19 is unlike the 2008 industry catastrophe, said Bill Diehl, who worked with suppliers then and is now the Executive Adviser for consulting firm Umlaut.

By the time the financial crisis hit, Diehl told Automotive News last week, many U.S. suppliers were already struggling financially. They had been starved for profits for years by unrewarding automaker contracts, and many faced bankruptcy before the crisis. Suppliers today have much healthier balance sheets, Diehl said: "Up until now, we've had a strong economy with strong consumer demand," he said. "Today, the OEMs and banks are healthy, and the private equity sector has significant dry powder."

Dietmar Ostermann, who tracks the supplier sector as advisory leader for automotive at PwC, said the industry went through a pruning process in the lead-up to the 2008 crash. Approximately 30% of auto suppliers were consolidated or left the industry in 2007 and 2008.

Today, he said, the top 100 global auto suppliers operate at a 13% margin for earnings before interest, taxes, depreciation and amortisation, compared with 8.6% in post-crash 2009.

Suppliers will struggle, he predicted of the new crisis. But with new-and-improved product lines and more agile business strategies, they should be able to weather an oncoming financial slump.