DVN-I
Automotive Interior

Thu, 18 June 2020 Weekly Newsletter **NEWSLETTER #30**

Editorial

DVN Interior Livestream Workshop: 24 September

Considering the sanitary situation, and as the automotive industry is extending work from home and limiting travels, we've decided to switch our first DVN Interior workshop to a livestream event, to make sure it is accessible to a maximum of community members.

New Technologies for Car Interior and Mobility will be the rubric for the event. New use cases for increasingly automated and connected vehicles, flexible interior and system perspective, seating, interior lighting, formerly passive surfaces becoming functional, HMI, design and decoration are among the topics which will be presented.

24 lectures, structured in five sessions, are expected from Audi, BMW, Honda, PSA, Renault, DS, Faurecia, Valeo, Adient, Yanfeng, ZF, Brose, Marelli, Recticel, Preh, NBHX, Sensata, Texas Instruments, ANSYS, FLT, ISELED, and EPIC. Powered by ExpoWizard, the event will include a virtual expo remaining open 7 days after the event, as well as video recordings. There'll be a pre-

organized tour, and chat/business meeting option. Online **registration** is open; please go ahead and sign up!

This week's Newsletter puts in-depth focus on everything you always wanted to know about photonics. The Design Lounge starts a series of articles on how specific automakers are designing their future interior environments regarding UX/HMI and the emergence of the EV, starting with Audi, and then VW Group brands. And the Mobility News section is very special, with three extracts from an extremely interesting position paper (download here) on how the 2020 pandemic generated a paradigm shift with static stay-at-home users, enhancing the physical aspect of mobility, raising many mobility questions, and food for thoughts for new types of vehicles, new relationship with the surrounding space, and establishing new values.

We're glad you're here!

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Photonics and Car Interiors

SOURCE: HAMAMATSU PHOTONICS

Special to DVN Interior by Dr. Eneka Idiart Barsoum, Senior Expert on Photonics

Photonics is the science of detecting, collecting, transmitting, amplifying, modifying, and generally mastering light. It is considered a Key Enabling Technology by the European Commission. It touches numerous areas of modern life—communications, life sciences, health, power generation, automotive, aeronautics, defense and security, precision agriculture, quantum computing, displays—and it provides solutions opening up new horizons.

The global photonics market is estimated around €525bn in 2020. The top producer is China (displays, photovoltaics); Europe is № 2 with 16% of global market share, then Japan and North America. 80% of European companies—about 5,000 of them—are SMEs (small and midsize enterprises), and 40% of them have been in business less than 10 years.

SOURCE: MATMATCH

What are the main areas in the cockpit, which could be impacted by photonics?

Reinforcement of safety and security, decision assistance, connectivity and communication for driver and passengers, personalization, comfort, wellbeing, health, entertainment, air quality and sanitary safety—the list seems to have no end!

The large volume of data that will be generated from autonomous driving requires high-capacity data links with extreme low-latency where photonic and THz technologies can play an important role.

SOURCE: OSRAM @ CES 2020

To realize these capacities practically, the main technical functions are:

- Autonomous vehicle security: quantum-optics cryptography, enhanced by AI.
- ADAS
- Connectivity by LiFi, geolocation
- Optical high rate communications
- Head up displays
- Augmented reality
- Glazing and surface treatments
- Physiological parameter measurement
- Physical effects of lighting: wellbeing, emotional occupant monitoring, state of alertness, surface and air sterilization (UV lighting), etc.

In Europe two main organizations have been representing for 15 years the Photonics ecosystem: The Photonics 21 platform, the role of which is to influence the European Commission strategy on photonics market, and thus the European collaborative projects (Horizon 2020 and Horizon Europe ICT). Photonics 21 has a variety of working groups; for two years there has been an emerging one in Automotive and Transport.

The second organization is EPIC (European Photonics Industry Consortium), which is the main photonics industry affiliation group worldwide with more than 500 industrial members, and connections with analogous American and Asian organizations.

Some companies of interest in automotive are for instance Lumibird, Obeo, Laser Components, Osram, Amplitude, Vixar, NIT, Hamamatsu, LG, Panasonic and others. It is increasingly apparent that participants in the display, telecom, and defense and security markets have technologies that could be transferred to the automotive realm, in particular for AVs and EVs.

Some highlights from Photonics 21 automotive working group analysis (2019): Main advances can be classified as Advanced HMI.

That means:

- Enhanced physiological effects of light in automated vehicles cockpits (HMI)

- Image quality enhancement in automated mode by using high rate communications
- Volume/packaging reduction
- Augmented reality solutions
- Novel types of smart displays (transparent, conformable, 3D—e.g., holographic)
- New strategies for virtual displays
- Multimodal interaction strategies
- Functional coatings on windows, windshield, interfaces, sensors

Photonics technologies are really key enabling technologies, that are moving fast to expand capacities inside the vehicle cockpit. A lot of SMEs in Europe are providing these photonics technologies. The main challenge, besides automotive integration, is to support these SMEs to ramp up their production, in order for them to achieve automotive volumes.

Dr. Eneka Idiart Barsoum is in charge of Eneka Consulting is an innovation consulting firm dedicated to Photonics technologies. It provides services in technologies expertise, innovation strategy and management, collaborative projects, photonics and innovation ecosystems intelligence. It covers applied industrial markets as automotive, defense and security, communications, quantum technologies, digital health,
Some industrial references: Ariane Group, Thales, Safran, Corning, Valeo, Schneider Electric, Sanofi, Orange.

Interior News

No-Glasses 3D Dashboard for All Occupants By '22?

Continental, in partnership with California-based display technology startup Leia, are creating a 3D car dashboard that can be seen without wearing special glasses. Continental says the dashboard allows drivers to absorb information faster, therefore more safely and with less distraction. The 3D dashboard can present pertinent information, such as projections of GPS directions and a 360-degree parking assist view.

Leia is a startup company in Silicon Valley developing display technology that uses nanostructures to diffract a backlight directionally into a light field and create pseudo-holographic visual effects. The company was founded in 2014 as a spinoff from HP Labs. In July 2019, Leia and Continental announced a long-term partnership to bring lightfield displays and content to the automotive world.

To ensure that the front passenger and occupants in the rear seats can also enjoy the 3D experience, Continental is currently developing a new 3D display based on what they call DLB™: Diffractive Lightfield Backlighting. This makes possible to walk through the image, touch it or interact with it. Streams of barely visible fog become an image carrier and their laminar structure allows to display high resolution images. Leia's patented way to produce laminar airflow for very long distance from the output makes Leia Display the steadiest mid-air screen on the market.

This natural 3D Display not only saves weight, space and costs, but also opens up an entire world of digital services to all the passengers in a connected car—video conferences and online shopping, augmented-reality games and 3D movies, and more, accessible to passengers at will (and to the driver when the car is in an autonomous driving mode).

BMW 4 Coupé Gets New Style, Better Safety

The 4-Series coupé, a pillar of BMW's car lineup in markets like Germany and the US, is undergoing a major refresh with improved styling and safety for 2021.

The 2021 4-Series uses a suite of ultrasonic sensors, cameras and radars to drive semi-autonomously under certain conditions. BMW's driver-facing, camera-assisted, extended traffic-jam assistant system is part of an optional package. The optical camera, mounted in the instrument cluster, monitors whether the driver's eyes are open and facing the road—but it doesn't record in-cabin activity.

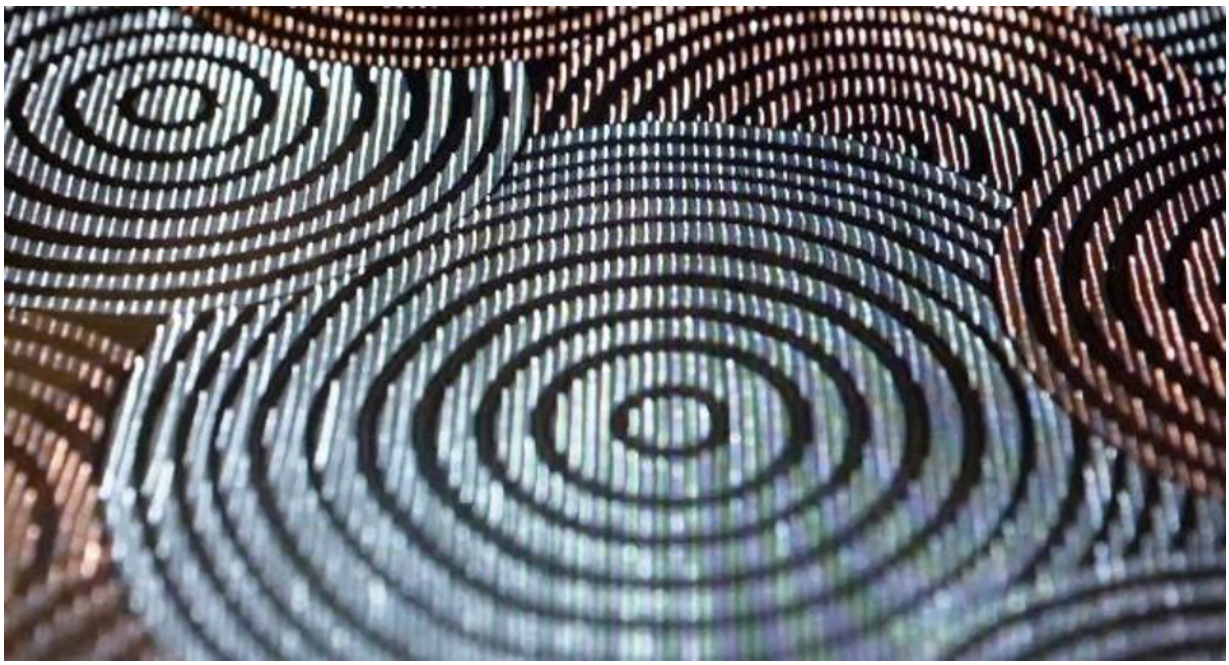
The drive recorder, a new optional feature on a BMW 4-Series equipped with a parking-assistance package, uses the cameras of the various driver-assistance systems to record video from the front and/or rear viewpoints of the vehicle before storing the recordings. The saved video files can be watched later on the center control display when the car is stationary or exported via the USB port. When activated, the drive recorder shoots and stores up to 40 seconds of video. In the event of a collision, a period of up to 20 seconds around the moment of impact is automatically recorded and saved. Very much an EDR (event data recorder), like the "black box" on every commercial airplane.

The interior designed is aligned entirely towards the driver for maximum ergonomics within a sporty ambiance with maximum driver focus. Exclusive materials are used in designing the interior, including Dakota leather in Coral Red, accent stitching, and aluminum trim strips.

The highly adjustable sport seats provide excellent body support for even the sportiest driving style, thanks to higher bolsters on cushion and backrest together with cushion length adjustment. The sporty sensation is extended to the rear seats, with integrated head restraints and sculpted seats.

Thanks to the innovative design and the long door mirrors, all occupants have the impression of being comfortably enclosed by the interior. Door trim strips enhance the sporty ambiance, designing cockpit design to flow up to the rear passengers.

Smart Textiles for Lighting, Heating and Contactless Switching



SOURCE FA.FLT: LIGHTED TEXTILE

Textiles for A surfaces in the car interior are becoming ever smarter and increasingly multifunctional. Textiles can contain light, heating, switching, electronics and sensor technologies, realized in laminated composites with a thickness of about 1 mm. Companies like FLT (Future Lighting Technologies) deal very intensively with this topic.

Lighting:

Optical fibers are woven into the textiles and laterally connected with LEDs, to couple light into the light guiding optical fibers. To create a homogeneous illuminated area or a light pattern on demand, the optical fibers have to be activated by implementing light scattering centers on the surface or in the volume of the light guiding materials. Another technical solution for luminous textiles is the processing of current-carrying threads with soldered Micro-LEDs, collected and connected to smart electronics with an electric power supply, separated or also integrated in the textile.

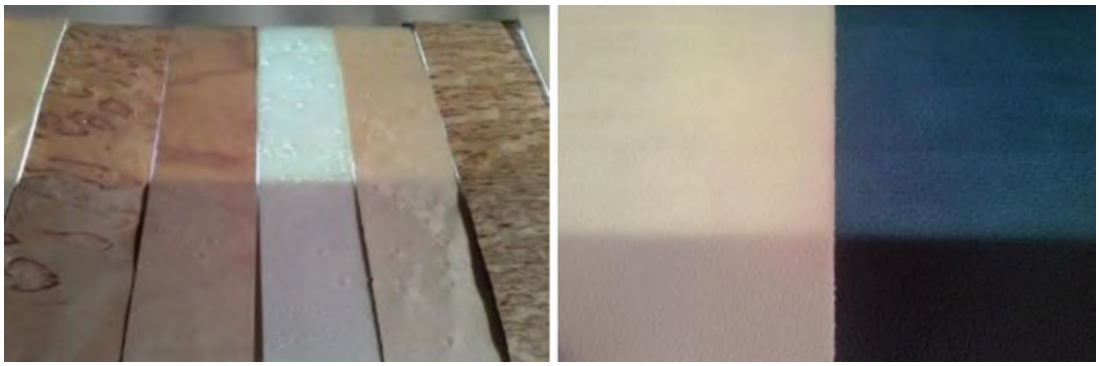
SOURCE FA.FLT: TEXTILES WITH WEAVED LIGHT GUIDING THREADS

Light patterns on demand with sharp contours and hidden-until-lit structures can also be made by screen printing of electroluminescent paste.

SOURCE FA.FLT: LIGHTED TEXTILES WITH PRINTED ELECTROLUMINESCENCE PASTE

The advantages of lighted textiles compared to rigid plastic light guides:

- light emissions out of very thin light guiding materials over the whole textile surface
- large area backlighting of translucent materials
- 2D and 2.5D geometries by using special weaving structures or elastic yarns
- low or no tooling costs

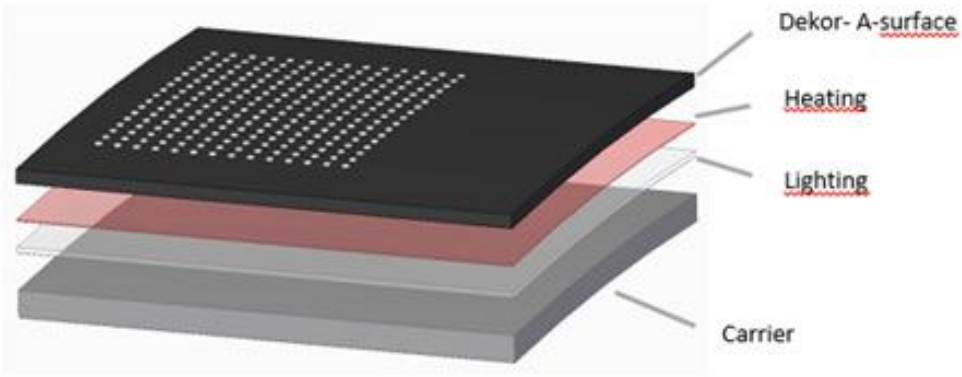


SOURCE FA.FLT: BACKLIGHTING OF DIFFERENT MATERIALS LIKE WOOD AND LEATHER WITHOUT TOOL COSTS

Heating:

Electrically conductive threads can be woven or knitted into textiles. Connected with an electrical power supply, the filaments can be heated up to 65 °C for an automotive seat heating and up to 100 °C for other technical applications—to eradicate viruses, perhaps?

Another material for homogeneous heated surfaces is nonwoven fleeces with pressed and fixed conductive metallic or carbon particles. A laminated composite of a heated and a lighted fleece has a thickness of about 0.5 mm and allows—directly below the A surface—a very fast heating of the surface material.



SOURCE FA.FLT: COMPOUND OF LAYERS FOR LIGHTING AND HEATING

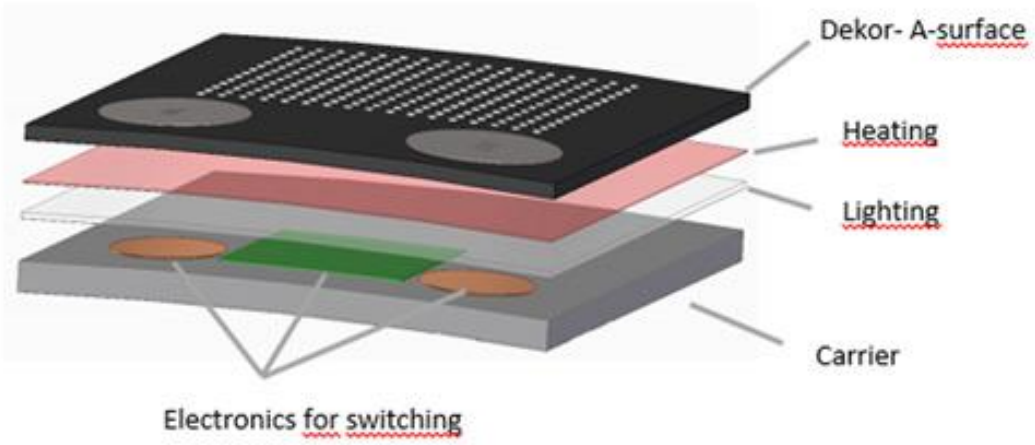
Advantages of heated textiles and fleeces compared to conventional heating systems:

- Power of heating can be adjusted by:
  - electrical power input
  - definition and composition of raw materials
  - number of processed heating fibers
  - perforation of heated fleece

- 2D deformable, thin, breathable, robust, laminable, light weight
- uniform heating output
- very low tooling costs

Contactless switching in textiles:

For a switching operation in textiles, e.g. for a seat or door heater, during the lamination process nearly invisible electronic contact foils can be incorporated for a touchless capacitive switching below the surface material. The contacts are connected to an electronic control unit with thin contact wires or FPC-foils. For haptic feedback of the switching operation, vibration micro-motors can also be incorporated into the composite.



SOURCE FA.FLT: COMPOUND OF LAYERS FOR LIGHTING, HEATING AND CONTACTLESS SWITCHING

Augmented Perception Enriches Mobility with Art

Epicnpoc is a Paris, France-based startup supporting all aspects of user-experience driven innovation and development with dedicated software solutions. They have been selected in the Ubimobility program, as one of the

7 French companies to spend two weeks between Detroit and San Francisco this coming September to meet the US autonomous and connected vehicle industry. Ubimobility is powered by Business France and BPI France to promote French technology abroad.

Epicnpoc developed SC-1 (Sociable Cart), an electric fake autonomous vehicle—it's actually a remotely-driven vehicle—for 5 people, created jointly by Sony and Yamaha. It replaces windows with high definition displays and sensors. When getting in the car and driving, the passengers see perfectly the surrounding thanks to the 5 displays and the cameras. It aims at enriching the daily routine of mobility through augmented perception of exterior with artistic imagination and finally enables the passengers trust of the autonomous vehicle by experiencing its supernatural perception of the surroundings.

At night, high-quality displays and cameras provide a much better vision of exterior than looking at reality through the door. This reality is augmented with virtual graphics, tags and sounds, as well as new elements (people, animals, etc) to provide a better understanding of the surrounding, and to generate emotions.

The project has three goals: to enhance the exterior perception for passengers, to transform mobility time into a fantastic experience, and to boost the public acceptance of autonomous mobility. It illustrates a complete paradigm shift from techno-push concepts enabling occupant activities to a passive and kind of contemplative attitude.

Interesting food for thought: after the e-mirror and the rearview and sideview cameras, will e-windows and e-windshields create a more desirable autonomous experience for the
(ex-)driver and passengers?

Opel Teases '21 Mokka's 'Pure Panel' Cockpit

MOKKA CAMOUFLAGE OUTFIT

Opel/Vauxhall continues to tease the next-generation Mokka urban SUV, and is now directing attention to the interior design, which draws inspiration from the Opel GT X Experimental concept car shown in 2018.

The centerpiece of the cabin is the new "Pure Panel" arrangement featuring large displays. Opel describes the setup as "a high-tech cockpit that is both fully digital and yet focused—'detoxed'". As is increasingly the trend, the widely stretched screens make a multitude of buttons and controls superfluous.

OPEL/VAUXHALL MOKKA PURE PANEL

The Opel Pure Panel is also said to provide the latest digital technologies and present important information for the driver "without any irritating visual stimuli", which we take to mean it's been designed for maximum ease of use with minimal distraction.

By reducing the number of buttons and controls, Opel/Vauxhall says the interface offers the right balance between digitalization and purely intuitive operation, without needing to navigate into sub-menus.

"With the new Mokka, we bring the Opel Pure Panel to our customers for the first time. Large displays, seamlessly integrated into one horizontal information format, a minimal number of physical controls and clear detoxed digital information, all together create an optimized customer experience", says Opel Design Vice President Mark Adams.

The next-generation Mokka heralds the Opel models of the 2020s, which the automaker describes as "pure, precise, reduced to the essentials". According to Opel, the crossover will retain a typical German design language that combines clarity with bold expressiveness. This philosophy will apply to the interior as well as the exterior of the next-generation Mokka.

Based on PSA's CMP architecture also used on the DS3, the 2021 Mokka will be up to 120 kg lighter than its predecessor, and 16 cm smaller in at least one dimension, and will offer an all-electric variant (the Mokka-e) for the first time.

News Mobility

Special to DVN Interior by INDUSTRIOUS, a design professional, an urbanism researcher, a mobility optimist, and a Technology enthusiast and an always inspired maker.

Mobility vs Landscape; Cars vs City

Up to now, we have been the masters of our mobility, in charge of driving, riding and marking trajectories, while observing the surroundings. We have built the modern world by using vehicles to discover new destinations, get there and build more. Therefore, as the vehicle was creating its own environment, a bit at a time and by practice, we became observers of the moving scape.

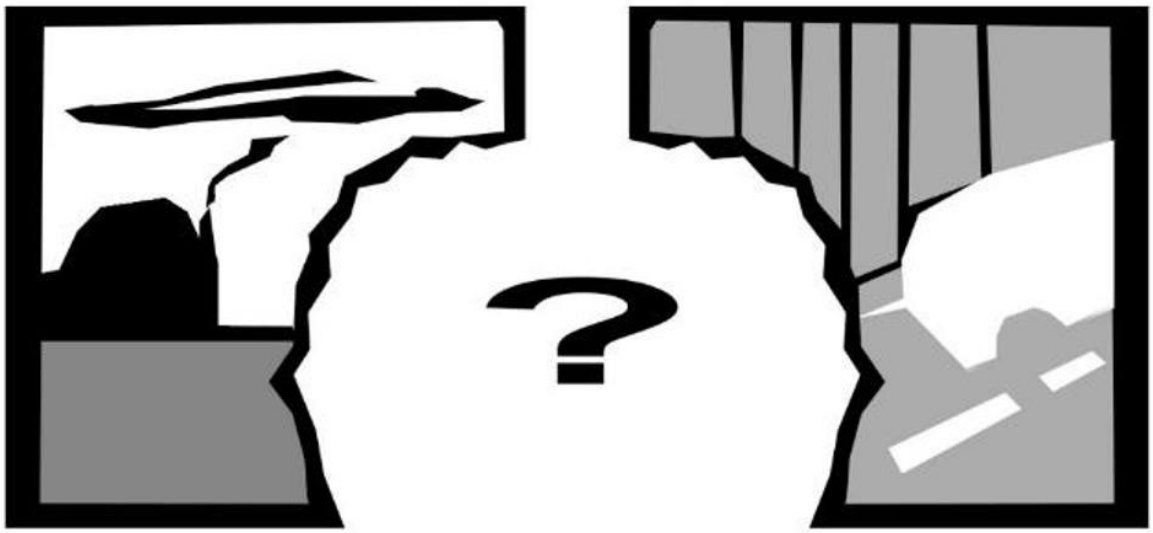
Any transition in history between mobility systems, has been proven a complex process involving various factors. We have assisted paradigm shifts that cannot be managed singlehandedly while unforeseen phenomena have always occurred.

In early 2020 the unexpected pandemic confirmed the above, enhancing the physical aspect of mobility.

This static period of confinement has certainly raised many mobility questions. In the future, new types of vehicles will create our relationship with the

surrounding space and will establish new values. (download full position paper)

Mobility Paradigm Shift



Mobility during confinement was diluted into its very basics and gradually took another shape. In just a few hours, an optimized logistic ecosystem was emerging and transforming the city into a new type of mobility platform with all social activity and human interaction kept behind walls. Immobilized citizens relied to all available services reaching out to them. An inverse paradigm: the definition of mobility segregation.

By being limited in our district, we became observers of movement through our windows. An unusual new experience took place, since we mostly spend our time on the other side of mobility: the moving one, looking through the window of a car, bus, or tram at the cityscape.

The contrast arising during confinement is stunning since for one moment we believed that we have passed on the other side and we are now part of the static scape observing the path of mobility. What seems to be devastating though, is that feeling of not being in charge any more of anything that moves. It feels like we've delegated to mobile devices all our needs and we expect to be served: an optimized autonomous mobility scenario.

On the verge of autonomous vehicles and while pioneering technology is put in place by new tech industrial participants, Covid-19 draws a different picture of future mobility. Observing and serving mobility now becomes the purpose. This new perception of surroundings is maybe the paradigm shift in our mobile history that will bring about new applications, perceptions and codes. It is the new frontier.

Experience Becomes the Purpose

Between vehicle and landscape and beyond all measurable and objective achievements, there is a subjective parameter that forms the environment in motion as we understand it: our perception of space.

From the Renaissance spatial frame to the French-style garden and from the framed carriage window to railways and automobiles, we have built a reality of motion observation to the point where the vehicle becomes invisible and the experience turns into a purpose.

Our mobile selves evolve hand in hand with vehicle architecture, and every era has addressed our relationship to surrounding spaces. Any new mode of transport participated in a profound evolution of modern society and created strong links between man and his immediate environment. This factor is the constant catalyst of the perception of values and becomes an evaluation tool of our progress in any pivot moment in history.

For the last century we have lived in the most intense period of human mobility. Our modern mythology of motion exceeded all previous scenarios of speed, distance, and form. It has amplified our previous experience into an embedded muscle memory of movement. The automobile has been the center of our spatial observations up to now, and with the new tech it is rapidly transformed.

If our mobile anthropology is based on the distinction between being mobile and being transported, how does that change for future generations?

With COVID-19, we took a glimpse of the new era: transportation being the new frontier.

The Design Lounge

VW Group Design Language: Audi

Following up on our last Design Lounge installment, we will focus on how specific OEMs are designing their future interior environments regarding UX/HMI and the emergence of the EV. The initial focus will be on the Volkswagen Group as they are represented as not only the largest manufacturer but are now launching a new EV product line with the ID series about to be introduced this month.

So we'll look at the VW Group over the upcoming DVN-I Design Lounge instalments this way:

- Audi (today's overview)
- VW (including the new ID series)
- SEAT/Cupra and Škoda (the entry-level brands)
- Porsche, Bentley, Lamborghini and Bugatti (the premium and performance brands)

2020 AUDI RS6

Audi's latest design language and direction is best visualized with the RS6 shown above the empowers a strong trapezoidal form language within a horizontal theme.

A key element is the use of glossy black integrated touch screens and a dominant center console section. This is a departure from their more massive form vocabulary (the first-generation Audi TT, for example) and layered approaches used on their mid- to upper- segment vehicles such as the A4.

GEN 1 - AUDI TT: NO SCREEN AND BASED ON THE ICONIC SPORTS CARS OF THE '50S AND '60S

2019 AUDI A4: HORIZONTAL FORM LAYERING WITH SCREENS REPLACING THE CLUSTER AND A TABLET TYPE FLOATING DISPLAY

2020 AUDI E-TRON: DISPLAYS (INCLUDING SIDEVIEW CAMERA DISPLAYS) FULLY INTEGRATED INTO THE IP. BUTTONS AND SWITCHES LARGELY DELETED. STRONGER FLOOR/TUNNEL CONSOLE EMPHASIS

2018 AUDI A1

2020 AUDI A1

Comparing the implementation of this new design direction to the A1 series, we can see how the friendly but massive and traditional IP forms have been replaced with an angular and more aggressive trapezoidal form language that highlights the central display and IP ventilation functions. The traditional HVAC controls are still retained due to the price segment.

2019 AUDI A3

2020 AUDI A3 SEDAN

With the latest A3 sedan, we can see how Audi has replaced the circle motif that was used for the steering wheel center, vents, and UX/HMI controller with trapezoidal forms. The layered IP and floating central display now dominate the interior environment so much that the traditional shifter is now a tertiary element of the design.

2020 AUDI Q2

2020 AUDI Q3

Although introduced only a few years ago, the Q2 is the last evolution of the previous Audi TT theme development. With the latest Q3, we can see how the fundamental feel of the interior environment has changed. The friendly, sporty heritage coming from the TT is replaced by an angular and more aggressive, tech-oriented approach.

2019 AUDI A5

2020 AUDI A6

This is more obvious by comparing the previous gen A5 and the newest A6. Though the tunnel/floor console was always a dominant element, the latest A6 further reinforces its width by eliminating the aluminum trim breakup that was used in the previous generations and adding two displays located between the console and the IP.

2020 AUDI A7

2020 AUDI A8

With Audi's top line/premium models, we can see some variations in detail form execution but also how the tunnel console and lower IP, due to the UX/HMI integration, have come to dominate and define the interior space.

2020 AUDI Q8

Because of this new UX/HMI technology which will be used throughout the entire VW Group, how Audi differentiates themselves will be critical. This will be discussed in the final episode of this series.

General News

VW, Ford Agree Global Alliance

Volkswagen and Ford have signed the contracts for their global alliance in the areas of electrification, light commercial vehicles, and autonomous driving. This paves the way for a Ford electric vehicle based on Volkswagen's Modular Electric Drive Box (MEB).

Discussions on the project have been public since last Summer, and both partners are now confirming the details: Ford will launch the MEB electric car in 2023, expecting within several years to deliver more than 600,000 units which they say will "combine generous space with the advantages of electric drive".

Ford electric cars are being developed in Cologne-Merkenich, Germany, and Ford is expanding their selection; in addition to the Mustang Mach-E, electric versions are in development of the Transit and F-150.

Both companies emphasize it is more important than ever to form strong alliances between strong companies during the economic difficulty due to the Corona crisis; best way to reduce development costs and enable greater global distribution of EVs and commercial vehicles.

In addition to cooperation in the field of e-mobility, the new alliance also targets a medium-sized pickup truck designed by Ford, which is to be included in the model range of Volkswagen Commercial Vehicles from 2022. Including two other commercial vehicle projects, the partners intend to develop and produce a total of around 8 million vehicles. In the field of autonomous driving, both groups rely on the SDS (Self-Driving System) from Argo AI. Volkswagen recently completed its announced investment in Argo AI, and Ford already holds ownership and development shares.

PSA, Punch Expand Electrification Pact

Groupe PSA and Punch Powertrain have signed an agreement to establish a second joint venture and expand their strategic partnership in the field of electrification, to reduce overall CO_2 emissions.

This new JV will design, manufacture, and supply components and subsystems for the future generation of the electrified transmission (e-DCT1), which will equip Groupe PSA's mild hybrid electric (MHEV) and plug-in hybrid electric (PHEV) vehicles and carmakers globally.

Punch Powertrain holds majority control in the new Joint 61/39 Venture, which will design, manufacture, and supply Punch Powertrain's DT22 dual clutch transmission for the same vehicle targets.

This move is supporting an overall vertical integration of components for key technologies such as electrified powertrains

The new entity is expected to be operational by the third quarter of this year. Punch Powertrain will also transfer their current DT2-related facilities in Sint-Truiden, Belgium, and Eindhoven, the Netherlands. In turn, Groupe PSA will make a cash investment in the JV.

Gaspar Gascon Abellan, formerly Renault's EVP of Engineering, recently joined Punch Powertrain as CTO.