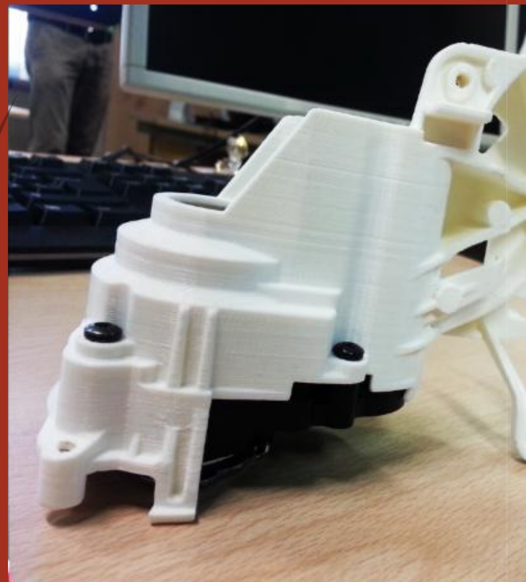
November

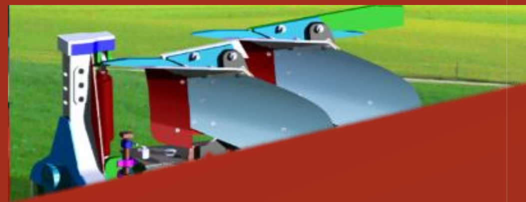
2018

DAuto Newsletter

DAuto Newsletter 112th Edition

Edition
2018





> *Design engineers turn designs into reality. Without them, a great idea but nothing more than,... well, a great idea.*

November 2018 refresh

- ✓ *Honda Rugged Open Air Vehicle Concept*
- ✓ *Custom-built 2JetZ futuristic hot rod set to become a Hot Wheels official die-cast model*
- ✓ *Low cost, energy-saving radiative cooling system ready for real-world applications*
- ✓ *New catalyst produces cheap hydrogen fuel*
- ✓ *Flexible electronic skin aids human-machine interactions*
- ✓ *Switching identities: Revolutionary insulator-like material also conducts electricity*
- ✓ *How to share health and safety information through building information modelling*
- ✓ *The all-new Mazda3*
- ✓ *Dodge Super Charger 1968 Concept*

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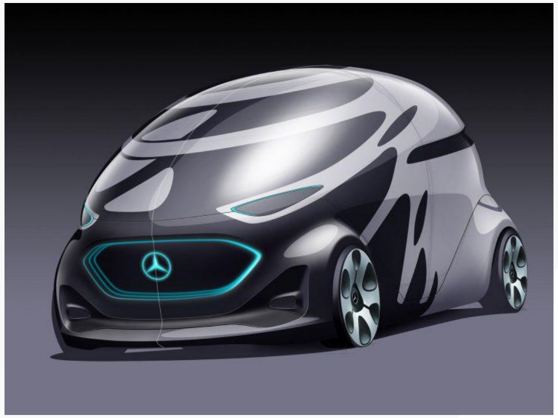
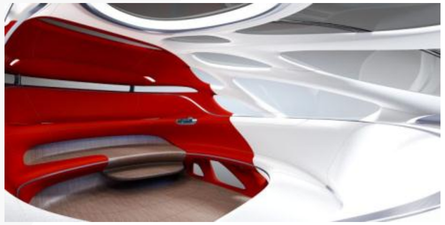
Edition
December 2018

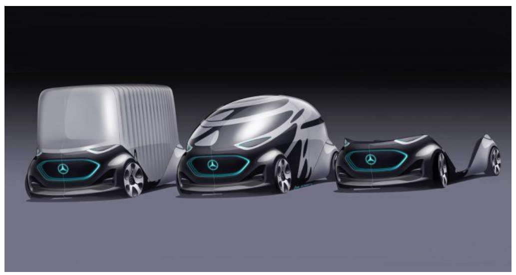
Mercedes-Benz Vision Urbanetic Concept

The Mercedes-Benz Vision Urbanetic is an urban mobility concept that aims at combining people moving and goods transportation thanks to its interchangeable bodies.





Another highlight is digital shadowing around the side door. Several hundred light units display the contours of approaching individuals along the flanks, signaling to them that the vehicle has noticed them.



Revealed back in September 2018 at the IAA Commercial Vehicles 2018 in Copenhagen, the concept was created by Mercedes-Benz Vans as an urban mobility solution capable of reducing traffic flows and relieving city-center infrastructures, and is part of a plan for a new line-up of autonomous vehicles.

The vehicle consists of an autonomous, electrically powered platform – dubbed "skateboard chassis" – which can be coupled with a cargo module or a cabin module so that, depending on the configuration, the van will either move people or transport goods.

The modules are switched either automatically or manually, with the automated process taking just a few minutes.

The study also carried out a research on a possible infrastructure with self learning IT features, capable of operating the autonomous fleet on flexible and efficient routes planned based on current transport needs.

As a ride-sharing vehicle, The Vision Urbanetic can carry up to twelve passengers, while the cargo module can accommodate up to ten EPAL palettes and offers a volume of 10 cubic meters.

Due to the height/length balance the dimensions are actually not evident, however the total length is 5.14 meters, with a load length of 3.70 meters – and the height reaches 2.33 meters.

The vehicle autonomous driving system uses multiple cameras and sensor systems to observe its surroundings in their entirety and communicates actively with them. It uses the large-format display on the front of the vehicle to inform pedestrians crossing the street in front of it that it has noticed them.

Edition
December 2018

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The interior design of the people-mover module has been systematically configured for the diverse needs of the passengers. The passenger cabin is divided into three different zones connected seamlessly with one another: a lounge in the rear, a zone in the middle for standing and a seated area up front.

The rear section offers passengers a protected space with a cocooning effect. They can't be seen from outside and can enjoy their privacy during the journey. In the central area close to the door is a space where passengers on short journeys can stand or lean. The front area is open and surrounded by windows. Tourists sitting here can relax and enjoy views of the city along the way.

The Design

The Concept features an original design that aims at combining intelligence and aesthetics. "Mercedes-Benz designers were faced with the challenge not only of creating a standalone design language and standalone aesthetic for a completely new mobility concept, they also had to combine the autonomous driving platform with two bodies for entirely different purposes. At the same time, they had to generate striking contrasts between the individual elements. The outcome is a vehicle consisting of three different elements that nevertheless looks like a whole, regardless of the combination."

Skateboard chassis

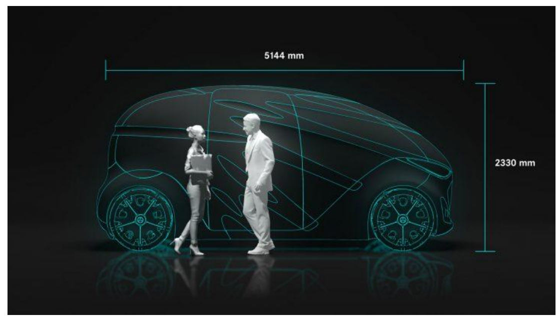
The skateboard chassis serves as a technology prototype and incorporates all driving functions. It is therefore designed purely for functionality.

LED displays front and rear communicate with the outside world and inform pedestrians and other road users about the vehicle's imminent actions and reactions. Instead of headlamps, the skateboard chassis is fitted with sensors that deploy or retract depending on driving status and thus serve as an indicator for autonomous driving.

People-mover module

A visual highlight of Vision URBANETIC is the people-mover module with its characteristic design language and unconventional proportions.

The aim was to find a new exterior and interior design for a previously non-existent form of people moving. The designers incorporated elements from urban architecture into the exterior. They chose an organic form with a natural structure, which enabled a high degree of aesthetics to be coupled with a form that offers maximum bodyshell stiffness using the lowest possible amount of material. The exterior design is, on one hand, business-like, while, on the other, open, emotional and inviting due not least to its unique communication features.



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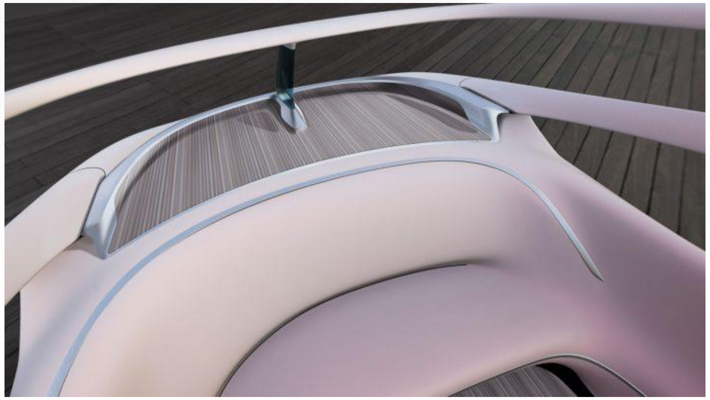
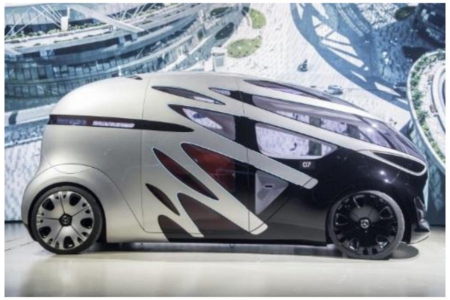




A number of different lighting elements along the outside, the organic structure, provide the vehicle with a new way of entering into dialogue with the world around it. One particular highlight is the person recognition, which projects the intelligence of the sensors onto the outer skin of the people-mover. This gives passers-by in the vicinity a feeling of safety, while at the same time stimulating the urge to engage light-heartedly with the vehicle.

There are premium materials like wood and leather throughout the interior, with brand accents set by the Silver Arrow trim on the doors and frames.

The interior is a digital experience that uses interlinked communication media to offer passengers a continual feed of key information on their respective journeys as well as a variety of entertainment features to make the ride as enjoyable as possible.

It is based on a new kind of 360-degree display that can show everything from the classic information on stops to the location of nearby points of interest to its own little games.

Thanks to augmented reality, passengers can now also bring the city into the vehicle. This feature offers the opportunity to explore the surroundings during the trip based on a diverse array of criteria.

The passengers in the Vision URBANETIC also retain all of the familiar luxury. Tucked away beneath a skirt running around the entire cabin is a powerful air-conditioning system.

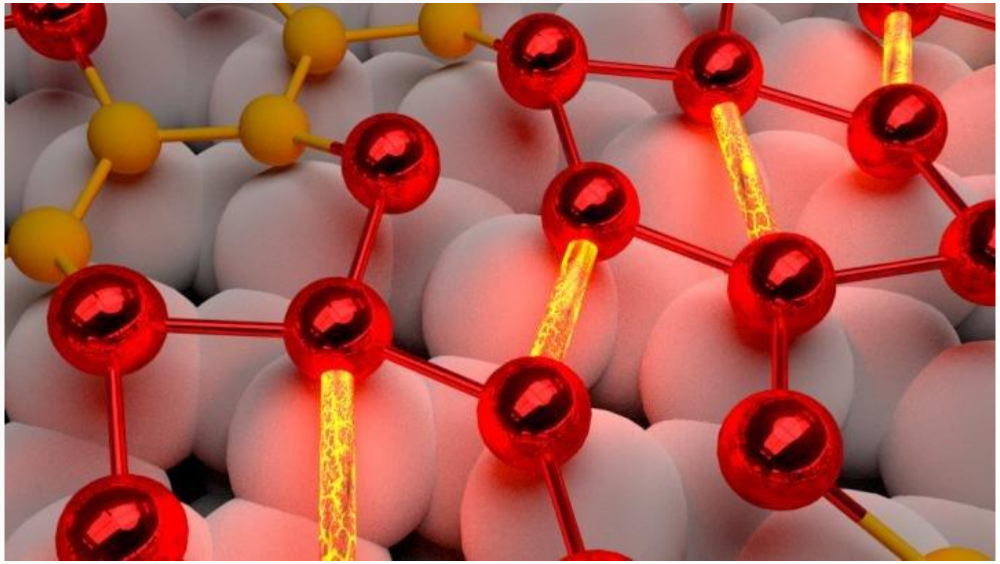
Cargo module
As per the skateboard chassis, functionality defines the design of the cargo body. The aim was to use the form to ensure maximum possible load space and corresponding load volume.

This has been achieved through the triangular design language, in contrast to the rounded people-mover module, and the intelligent Cargo Flex Floor, which provides a second load level as required or folds away for maximum load height.

The functional emphasis of the design underscores the sparing use of materials and focus on lightweight construction.

Edition
December 2018

Researchers monitor electron behavior during chemical reactions for the first time



In order to better understand electrons' behaviour during a chemical reaction, Schmidt and his collaborators have been using supercomputing resources at the High-Performance Computing Center Stuttgart (HLRS) to model this phenomenon. "The experimental group at the Fritz Haber Institute came to us about this research, and we had actually already done the simulation," Schmidt said. "In this case, theory was ahead of experiment, as we had made a prediction and the experiment confirmed it."

In a recent publication in Science, researchers at the University of Paderborn and the Fritz Haber Institute Berlin demonstrated their ability to observe electrons' movements during a chemical reaction. Researchers have long studied the atomic-scale processes that govern chemical reactions, but were never before able to observe electron motions as they happened.

Electrons exist on the smallest scales, being less than one quadrillionth of a meter in diameter and orbiting an atom at femtosecond speeds (one quadrillionth of a second). Experimentalists interested in observing electron behaviour use laser pulses to interact with the electrons. They can calculate the energy and momentum of the electrons by analysing the properties of the electrons kicked out of the probe by the laser light.

The challenge for researchers is recording events that are taking place on a femtosecond scale -- they must first excite a system with a laser pulse, then watch the next few femtoseconds. Then, they send a second laser pulse with a short time delay of a few femtoseconds. Achieving this level of resolution is difficult, as femtoseconds are extremely short -- light can travel 300,000 kilometers in one second, but just 300 nanometers in one femtosecond.

After being excited with the first laser pulse, the atoms' valence electrons -- electrons on the outside of an atom that are candidates for helping form chemical bonds -- may re-arrange to form new chemical bonds, resulting in new molecules. Because of the speed and scale of these interactions, though, researchers have only hypothesized how this re-arrangement takes place.

In addition to experimental methods, high-performance computing (HPC) has become an increasingly important tool for understanding these atomic-level interactions, verifying experimental observations, and studying electron behaviour during a chemical reaction in more detail. A University of Paderborn group led by Prof. Dr. Wolf Gero Schmidt has been collaborating with physicists and chemists to complement experiments with computational models.

Laser-like focus

Last year, Schmidt's group partnered with experimentalists from the University of Duisburg-Essen to excite an atomic-scale system and observe photo-induced phase transitions (PIPTs) in real time. Phase transitions -- when a substance changes from one physical state to another, such as water changing to ice -- are important in studying and designing materials, as a substance's properties may change wildly depending on the state it is in.

Edition
December 2018

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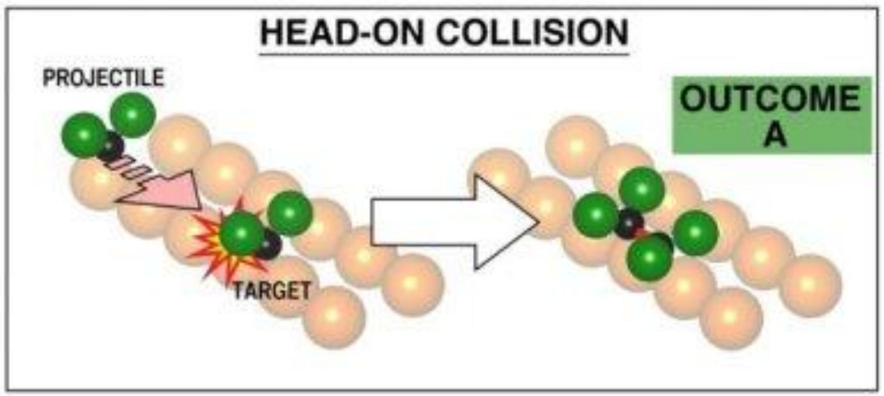
Between its former work and its current project, the team now better understands the important role that photoholes play in shaping how energy is distributed across a system, ultimately giving the researchers a reliable computational method with which to simulate extremely fast phase transitions.

Complex Chemistry

The team's current simulations consist of around 1,000 atoms, which, while small, allows them to get a representative sample of how a system's atoms and their constituent electrons interact. The Paderborn group got help from the HLRS team in optimizing its code, allowing it to run efficiently on up to 10,000 cores in parallel. Schmidt explained that while the overall research would benefit from growing the system size to the order of 10,000 atoms, the next phase of the team's work is to work on more complex systems.

"The current research is a complex calculation, but a simple system," he said. "Our next step is to develop this research as it relates to photocatalysts or systems that are relevant for large-scale energy production -- we want to apply this to a real system." By better understanding electrons' behaviours at the atomic level, researchers aim to design better materials for converting, transporting, and storing energy.

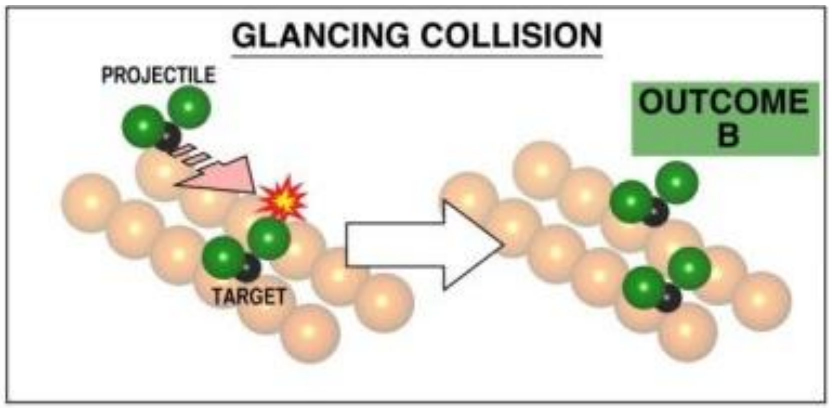


For example, the team found that when excited with a laser pulse, indium-based nanoscale wires would essentially change from an insulator into an electrical conductor. These indium wires, while not necessarily of immediate technological interest for electronic applications, serve as a good test case and a solid basis for verifying simulations with experiments.

This year, the team wanted to take what it had learned about the indium wires previously and study chemical reactions on an even more fundamental level -- it wanted to track how the constituent electrons behave after being excited by a laser pulse. "Last year, we published a Nature article that demonstrated the measurement of the atomic movement on this scale," Schmidt said. "We could show how the atoms moved during the chemical reaction. This year, we were even able to monitor the electrons while the reaction took place."

Figuratively speaking, electrons serve as the glue that chemically binds atoms together. However, a laser pulse can kick out an electron, creating what researchers call a "photohole." These photoholes only last for several femtoseconds, but may lead to the breaking of chemical bonds and the formation of new bonds. When the indium nanowire is hit with a laser pulse, the system forms a metallic bond, which explains its phase change into an electrical conductor.

Supercomputing simulations allow researchers to put the electrons' paths in motion, ultimately helping them study the full reaction "pathway." Researchers run first principles simulations, meaning that they start with no assumptions about how an atomic system works, then computationally model atoms and their electrons under the experimental conditions. These types of intensive, first principles calculations require leading-edge supercomputing resources, such as those provided through the Gauss Centre for Supercomputing at HLRS.



Edition
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Extremely strong and yet incredibly ductile multicomponent alloys developed

A research team led by City University of Hong Kong (CityU) has developed a novel strategy to develop new high-strength alloys which are extremely strong and yet also ductile and flexible. The strategy overcomes the critical issues of the strength-ductility trade-off dilemma, paving the way for developing innovative structural materials in future.

Multiple-principal element alloys, generally referred as high-entropy alloys (HEAs), is a new type of materials constructed with equal or nearly equal quantities of five or more metals. They are currently the focus of attention in materials science and engineering due to their potentially desirable properties for structural applications. Yet most of the alloys share the same key detrimental feature: the higher the strength of an alloy, the less the ductility and toughness, meaning that strong alloys tend to be less deformable or stretchable without fracture.

Recently, however, a research led by Professor Liu Chain Tsuan, University Distinguished Professor of the Department of Materials Science and Engineering at CityU, has found a breakthrough solution to this daunting decades-long dilemma -- by making high-entropy alloys both strong and yet also very ductile through massive precipitation of nanoscale particles. The research has just been published in the latest issue of the journal Science, titled "Multicomponent intermetallic nanoparticles and superb mechanical behaviours of complex alloys."

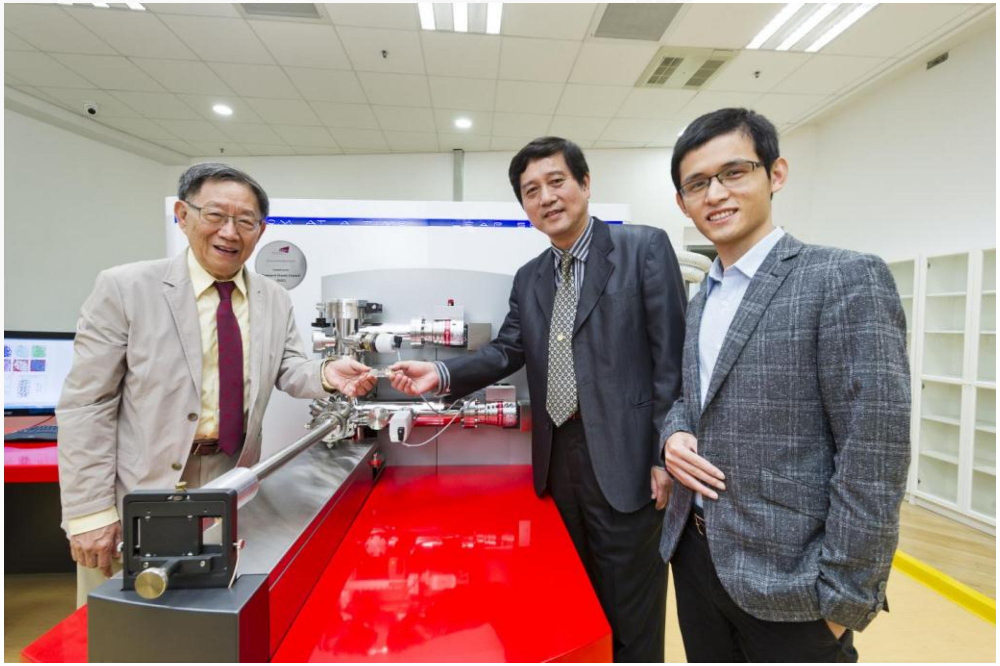
Solving strength-ductility trade-off

"We are able to make a new high-entropy alloy called Al7Ti7((FeCoNi)86-Al7Ti7) with a superior strength of 1.5 gigapascals and ductility as high as 50% in tension at ambient temperature. Strengthened by nanoparticles, this new alloy is five times stronger than that of the iron-cobalt-nickel (FeCoNi)-based alloy," says Professor Liu.

"Most conventional alloys contain one or two major elements, such as nickel and iron to manufacture," he explains. "However, by adding additional elements of aluminium and titanium to form massive precipitates in the FeCoNi-based alloy, we have found both the strength and ductility have significantly increased, solving the critical issue of the trade-off dilemma for structural materials."

Moreover, high-strength alloys usually face plastic deformation instability, known as the necking problem, meaning that when the alloy is under a high strength, its deformation would become unstable and very easily lead to necking fracture (localized deformation) with very limited uniform elongation. But the team has further found that by adding "multicomponent intermetallic nanoparticles," meaning complex nanoparticles made of different element atoms, it can greatly strengthen the alloy uniformly by improving the deformation instability.

Extremely strong and yet incredibly ductile multicomponent alloys developed



Tackling "necking problem"
And they have found the ideal formula for these complex nanoparticles, which consists of nickel, cobalt, iron, titanium and aluminium atoms. Professor Liu explains that each of nanoparticle measuring 30 to 50 nanometres only. The iron and cobalt atoms which replace some of the nickel components helps to reduce the valence electron density and improve the new alloy's ductility. On the other hand, replacing some of the aluminium with titanium largely reduces the impact of moisture in air to avoid induced embrittlement in this new strong alloy.

"This research opens up a new design strategy to develop superalloys, by engineering multicomponent nanoparticles to strengthen complex alloys to achieve superb mechanical properties at room and elevated temperatures," says Professor Liu.

He believes that the new alloys developed with this novel strategy will perform well in temperatures ranging from -200°C to 1000°C. Hence they can act as a good base to further develop for structural use in cryogenic devices, aircraft and aeronautic systems and beyond.

Professor Liu is the corresponding author of the paper, and Yang Tao, his PhD student and current senior research associate at CityU's Department of Materials Science and Engineering is the first-author. Other co-authors include Chair Professor Kai Jijung, Assistant professor Dr Alice Hu, post-doc fellows Zhao Yilu, Tong Yang, Wei Jie and PhD student Chen Da from CityU's Department of Mechanical Engineering and Center for Advanced Structural Materials; together with Dr Jiao Zengbao, Assistant Professor of Department of Mechanical Engineering at the Hong Kong Polytechnic University; Professor Han Xiaodong and Dr Cai Jixiang from the Institute of Microstructure and Property of Advanced Materials of Beijing University of Technology; Professor Lu Ke, Director of Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences; and Professor Liu Yong from the State Key Laboratory of Powder Metallurgy, who is also the director of Powder Metallurgy Research Institute at Central South University.

Nissan GT-R50 by Italdesign confirmed for production

Nissan has officially confirmed that the special edition GT-R50 developed in collaboration with Italdesign will be produced in 50 units without virtually any changes.

Nissan has confirmed that the exterior of the GT-R50 will be virtually unchanged from the prototype first shown in July at the Goodwood Festival of Speed in England.

Pricing of the limited edition supercar will start at 990,000 euros before taxes and options.

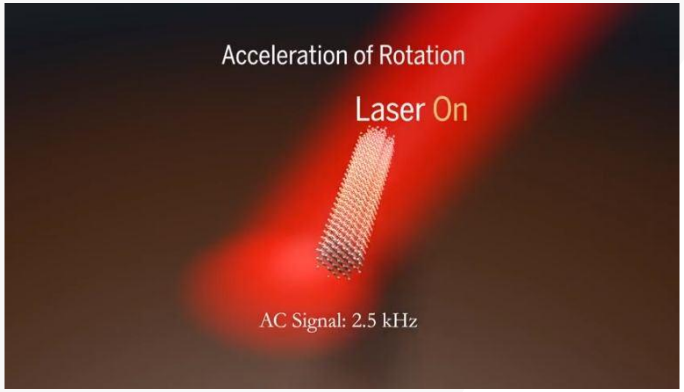
The NISMO-tuned model, which features a 720PS powertrain, is based on the latest Nissan GT-R NISMO, and built to celebrate the 50th anniversaries of the GT-R in 2019 and Italdesign in 2018.

While the prototype vehicle was finished in a special gray with gold accents, customers will be able to specify their preferred color combinations for the production version. They also will be able to choose interior colors and packages.

Customers who wish order the car can visit the official website: www.GT-R50.nissan and contact Italdesign to create their own bespoke car.

Deliveries will begin in 2019 and will continue through 2020.

Engineers develop first method for controlling nanomotors



"We successfully tested our hypothesis based on the newly discovered effect through a practical application," Fan added.

"We were able to distinguish semiconductor and metal nanomaterials just by observing their different mechanical motions in response to light with a conventional optical microscope. This distinction was made in a noncontact and nondestructive manner compared to the prevailing destructive contact-based electric measurements."

The discovery of light acting as a switch for adjusting the mechanical behaviors of nanomotors was based on examinations of the interactions of light, an electric field and semiconductor nanoparticles at play in a water-based solution.

This is Fan and her team's latest breakthrough in this area. In 2014, they developed the smallest, fastest and longest-running rotary nanomotors ever designed.

The research was funded by Fan's National Science Foundation Faculty Early Career Development Award and the Welch Foundation.

In a breakthrough for nanotechnology, engineers at The University of Texas at Austin have developed the first method for selecting and switching the mechanical motion of nanomotors among multiple modes with simple visible light as the stimulus.

The capability of mechanical reconfiguration could lead to a new class of controllable nanoelectromechanical and nanorobotic devices for a variety of fields including drug delivery, optical sensing, communication, molecule release, detection, nanoparticle separation and microfluidic automation.

The finding, made by Donglei (Emma) Fan, associate professor at the Cockrell School of Engineering's Department of Mechanical Engineering, and Ph.D. candidate Zexi Liang, demonstrates how, depending on the intensity, light can instantly increase, stop and even reverse the rotation orientation of silicon nanomotors in an electric field. This effect and the underlying physical principles have been unveiled for the first time. It switches mechanical motion of rotary nanomotors among various modes instantaneously and effectively.

The researchers published their findings in the Sept. 14 issue of Science Advances.

Nanomotors, which are nanoscale devices capable of converting energy into movement at the cellular and molecular levels, have the potential to be used in everything from drug delivery to nanoparticle separation.

Using light from a laser or light projector at strengths varying from visible to infrared, the UT researchers' novel technique for reconfiguring the motion of nanomotors is efficient and simple in its function. Nanomotors with tunable speed have already been researched as drug delivery vessels, but using light to adjust the mechanical motions has far wider implications for nanomotors and nanotechnology research more generally.

"The ability to alter the behavior of nanodevices in this way -- from passive to active -- opens the door to the design of autonomous and intelligent machines at the nanoscale," Fan said.

Fan describes the working principle of reconfigurable electric nanomotors as a mechanical analogy of electric transistors, the basic building blocks of microchips in cellphones, computers, laptops and other electronic devices that switch on demand to external stimuli.

Edition
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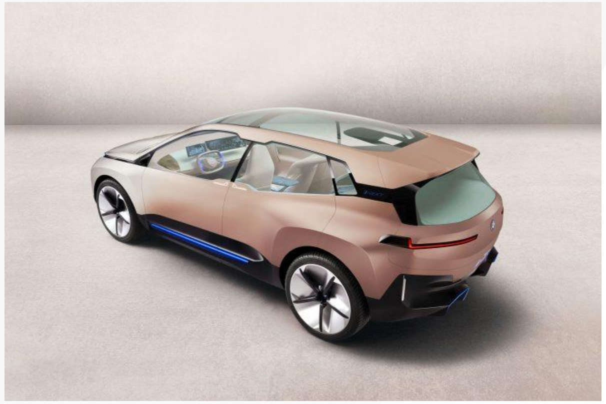
BMW Vision iNEXT Concept explores the future of personal mobility



Unveiled at the Los Angeles Auto Show, the Vision iNEXT features technology, design and new ways of thinking that preview the direction for BMW's future models.

Presented by BMW back in September and officially presented at the Los Angeles Auto Show, the concept incorporates several themes, that are going to play an important role in the brand's future: Autonomous driving, Connectivity, Electrification and Services (ACES).

The philosophy of the concept is a human-centered design, that takes into consideration the fact that in the future drivers will have greater freedom to decide how they wish to use the time spent in a car.

This leads to give more importance to the design of the interior, focused on providing occupants a "feel-good" sensation.

Interior Design

The geometry of the cabin is composed of few, clean-cut lines, placing the focus on materials and colors. A mix of cloth and wood recalls the feel associated with furniture design, helping to give the interior a "boutique" character.

The atmosphere is characterized by warm, welcoming colors, such as the nude shade Purus Rosé, Brown and Beige, while the shimmering metallic Mystic Bronze accentuates their effect.

The rear compartment is dominated by the petrol-colored Enlighted Cloudburst cloth upholstery with its intricate Jacquard weave, which runs asymmetrically across the seat area and extends into the side panelling and parcel shelf.

Onboard technologies are invisible to the passengers (Shy Tech), and include : there is virtually no need for either screens or buttons. Functions can be operated using surfaces made of materials such as wood or cloth, like the Jacquard cloth upholstery in the BMW Vision iNEXT.

Edition
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BMW Vision iNEXT Concept explores the future of personal mobility

Exterior Design

The exterior of the BMW Vision iNEXT is characterized by the latest evolution of the brand's design DNA: which features striking lines and clear forms, with powerfully sculpted surfaces curved like muscles onto the flanks.

The Liquid Greyrose Copper paint finish gradually changes in shade from warm copper to dark rose.

The front end of the BMW Vision iNEXT features a modern take on the classical BMW four-eyed front end, complete with slender headlights, while cameras (replacing exterior mirrors) show what's happening behind.

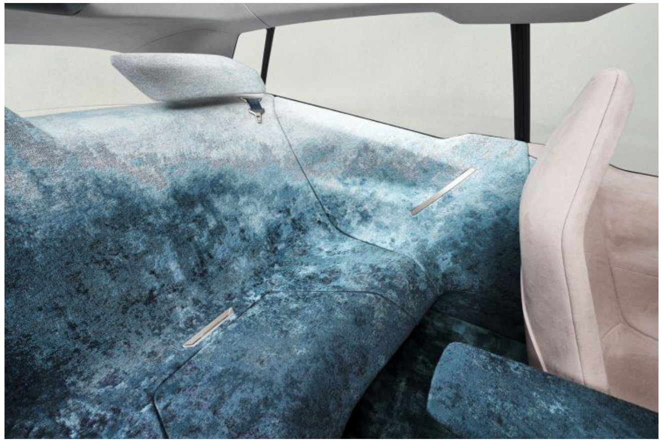
The windscreen merges seamlessly into a large panoramic roof, providing a clear view of the car's innovative interior.

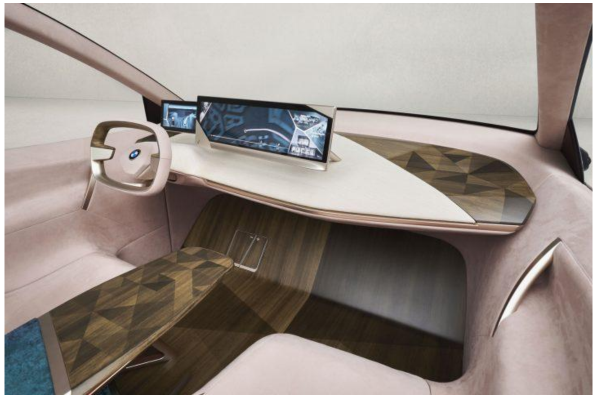
At the rear, the horizontal lines and surfaces create a wide and dynamic stance, and the slim rear lights cut deep into the car's tail.

The air flows along the roof all the way to its trailing edge, and this combines with a diffuser – illuminated for extra effect – to enhance the car's aerodynamics.

The diffuser increases aerodynamic efficiency while acting as a styling element, adding to the sporting presence.

The BMW iNEXT production model is expected to be launched in 2021.





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First 3d Printer For Construction In India Made By IIT Madras Engineers, Alumni

Researchers and alumni at IIT Madras have developed the first 3D printer in India for use in building construction, according to an NDTV report.

In partnership with a private manufacturing company, the Civil Engineering Department of IIT Madras has set up the IIT Madras Printability Lab to develop the technology for mass production.

“We have been working on developing 3D printing technology in construction since 2016 and have conducted international workshops and awareness sessions for this in Chennai,” Professor Koshy Varghese, lead author of the study, was quoted to have said in the report.

"In addition, the institute is exploring automated construction methods and novel formwork systems for rapid housing construction.”

Tvasta is an additives manufacturing start-up which intends to develop an automated construction process, beginning with a miniature single-storey house approximately 320 square feet in size in three days, the Times of India reported.

Towards this, a prototype was built at IIT Madras to test and accelerate R&D of the indigenously-developed technology.

Varghese said that IIT Madras is also collaborating with government agencies and industry players to disseminate knowledge, establish policies and processes and ultimately bring the technology to the field.

However, the primary focus of the technology once developed for mass market will be in the government’s “Housing for All” scheme under the Pradhan Mantri Awas Yojana and for the building of toilets as part of the Swacch Bharat mission.

“3D printing of concrete adds a new dimension to construction, and can best meet complex demands of modern architecture with concrete,” Prof Manu Santhanam from IIT Madras’s Civil Engineering Department who has been working with Tvasta, said in the official release.

Edition
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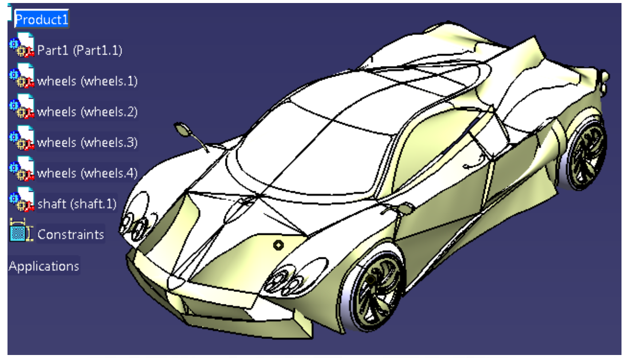
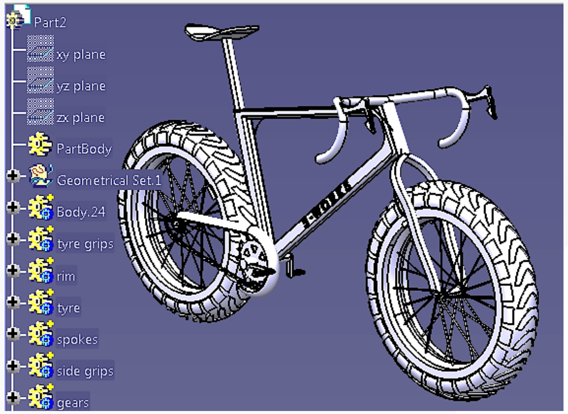
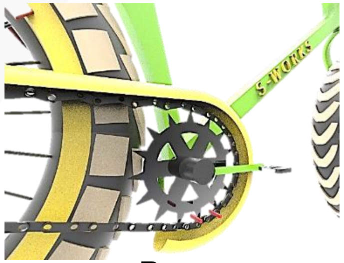
Student's Corner

More info about training:
Toll Free # 18001234011
E-mail : training@dauto.co.in







By :
Siddharth Jain
LNCTS, Bhopal
Design Tool : CATIA V5.

By :
Shivam Kumar
TIT-E, Bhopal
Design Tool : CATIA V5.

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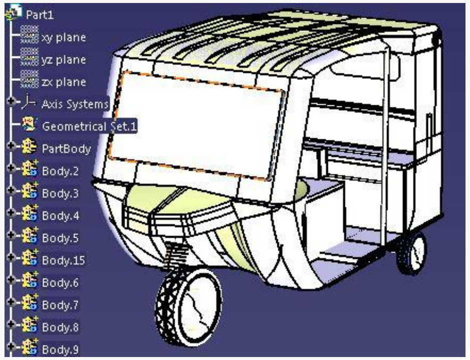
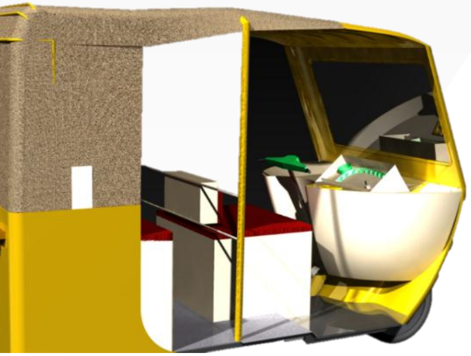
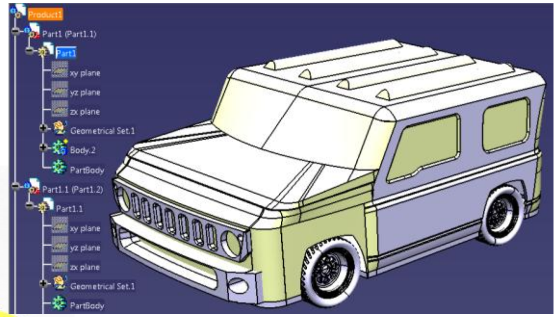
Student's Corner

DAuto Training Yield





By :
Raghvendra Singh
TIT, Bhopal
Design Tool : CATIA V5



By :
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Design Tool : CATIA V5

"Never be satisfied with inaction. Question and redefine your purpose to attain progress"

Jeffrey K. Liker, The Toyota Way

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