Weekly Discovery

We SHARE to inspire and ignite ideas!

13 - 17 February 2023

AVIATION

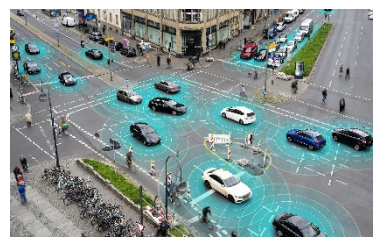
3 Ways to Help NASA's All-Electric Aircraft Take Off The N3-X, slated for 2040, would carry as many as 300 passengers

"The race for all-electric planes is underway, and some early designs are making headlines. This past September, a prototype of the Eviation Alice completed an 8-minute maiden flight, and more models, such as Heart Aerospace's ES-30, are anticipated to debut in the next few years. However, so far all these models have been designed to carry only 30 passengers or less, and to fly short distances... plans are underway to make the industry more sustainable, including a proposal from one research team to create an all-electric version of NASA's N3-X aircraft, which can carry 297 to 330 passengers. The researchers describe their three possible electric-power system (EPS) designs for the all-electric model in a study published in the December print issue of IEEE Transactions on Transportation Electrification."

Source: IEEE (12 February 2023)

AUTONOMOUS DRIVING

Autonomous driving: New algorithm distributes risk fairly



"Researchers at the Technical University of Munich (TUM) have developed autonomous driving software which distributes risk on the street in a fair manner. The algorithm contained in the software is considered to be the first to incorporate the 20 ethics recommendations of the EU Commission expert group, thus making significantly more differentiated decisions than previous algorithms. Operation of automated vehicles is to be made significantly safer by assessing the varying degrees of risk to pedestrians and motorists. The code is available to the general public as Open Source software."

Source: TUM (3 February 2023)

DIGITAL TWIN

A faster, more accurate 3D modelling tool recreates a landscape's digital twin down to the pixel level

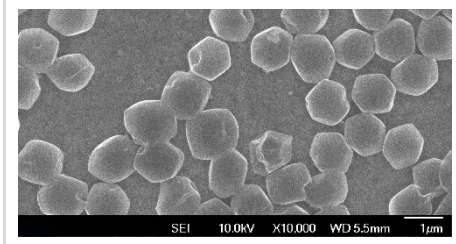
"Concordia researchers have developed a new technique that can help create high-quality, accurate 3D models of large-scale landscapes — essentially, digital replicas of the real world.

While more work is required before the researchers achieve their goal, they recently outlined their new automated method in the Nature journal Scientific Reports. The framework reconstructs the geometry, structure and appearance of an area using highly detailed images taken by aircraft typically flying higher than 30,000 feet. These large-scale aerial images — usually more than 200 megapixels each — are then processed to produce precise 3D models of cityscapes, landscapes or mixed areas. They can model their appearance right down to the structures' colours..."

Source: Concordia (7 February 2023)

BATTERIES

Progress Toward Fast-charging Lithium-metal Batteries

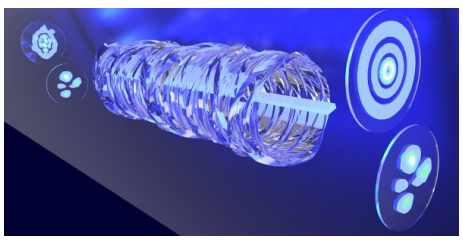


"In a new Nature Energy paper, engineers report progress toward lithium-metal batteries that charge fast – as fast as an hour. This fast charging is thanks to lithium metal crystals that can be seeded and grown – quickly and uniformly – on a surprising surface. The trick is to use a crystal growing surface that lithium officially doesn't "like." From these seed crystals grow dense layers of uniform lithium metal. Uniform layers of lithium metal are of great interest to battery researchers because they lack battery-performance-degrading spikes called dendrites. The formation of these dendrites in battery anodes is a longstanding roadblock to fast-charging ultra-energy-dense lithium-metal batteries."

Source: USCD! (9 February 2023)

OPTICS

Researchers find distortion-free forms of structured light



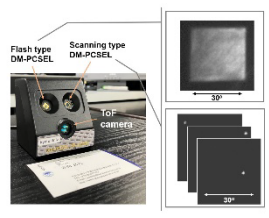
"Research offers a new approach to studying complex light in complex systems, such as transporting classical and quantum light through optical fiber.

An exciting prospect in modern optics is to exploit "patterns of light", how the light looks in its many degrees of freedom, often referred to as structured light."

Source: WITS (8 February 2023)

OPTICS

Compact, non-mechanical 3D lidar system could make autonomous driving safer



"Recyclers already use near-infrared sorting systems that identify different materials according to their naturally occurring optical signatures—the PET plastic in a water bottle, for example, looks different under near-infrared light than the HDPE plastic in a milk jug. Different fabrics also have different optical signatures, but Brian Iezzi, a postdoctoral researcher in Shtein's lab and lead author of the study, explains that those signatures are of limited use to recyclers because of the prevalence of blended fabrics."

Source: OPTICA (9 February 2023)

ROBOTICS

Warehouse Robots to Automate Your Living Room

"A couple decades ago Kiva Systems had the brilliant and certainly very valuable realization that it was possible to make an entire environment (like a fulfillment warehouse) robotic without filling that entire environment with robots. Rather than making every shelf in a warehouse into a robot, you could instead leave every shelf as a shelf, and simply make a robot that could interface with shelves on-demand, giving them mobility when required.

So what if you take that philosophy out of the warehouse and into your living room? Well, it's probably not going to massively boost your productivity or increase your own personal fulfillment all that much, but it's an interesting idea that might make some things a little more convenient from time to time.."

Source: IEEE (11 February 2023)

SUSTAINABILITY

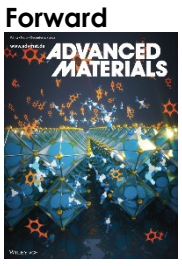
Carbon emissions from fertilizers could be reduced by as much as 80% by 2050

"A new biomaterial that can be injected intravenously, reduces inflammation in tissue and promotes cell and tissue repair. The biomaterial was tested and proven effective in treating tissue damage caused by heart attacks in both rodent and large animal models. Researchers also provided proof of concept in a rodent model that the biomaterial could be beneficial to patients with traumatic brain injury and pulmonary arterial hypertension."

Source: EUREKALERT (9 February 2023)

SOLAR

Research Reveals Thermal Instability of Solar Cells but Offers a Bright Path Forward



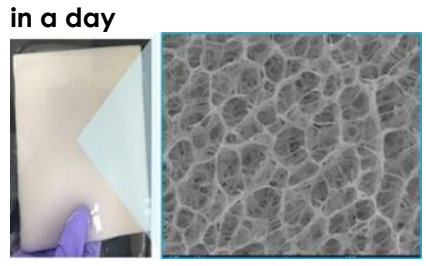
"A new type of solar technology has seemed promising in recent years. Halide perovskite solar cells are both high performing and low cost for producing electrical energy – two necessary ingredients for any successful solar technology of the future. But new solar cell materials should also match the stability of silicon-based solar cells, which boast more than 25 years of reliability.

…halide perovskite solar cells are less stable than previously thought. Their work reveals the thermal instability that happens within the cells' interface layers, but also offers a path forward towards reliability and efficiency for halide perovskite solar technology.

Source: GATECH! (9 February 2023)

WATER PURIFICATION

This loofah-inspired, sun-driven gel could purify all the water you'll need in a day

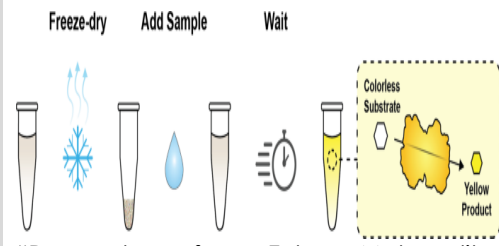


"Access to clean water is being strained as the human population increases and contamination impacts freshwater sources. Devices currently in development that clean up dirty water using sunlight can only produce up to a few gallons of water each day. But now, researchers in ACS Central Science report how loofah sponges inspired a sunlight-powered porous hydrogel that could potentially purify enough water to satisfy someone's daily needs — even when it's cloudy."

Source: ACS (8 February 2023)

WATER PURIFICATION

Biosensors change the way water contamination is detected

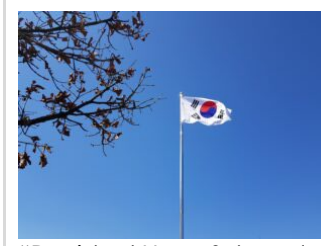


"Researchers from Tokyo Metropolitan University have developed a new calibration algorithm for technology that turns common materials into touch sensors. HumTouch detects the current that runs from our fingertips to any partially conductive surface and locates where it was touched. The new algorithm speeds up calibration for new users, solving a major drawback of existing versions of the technology. It also improves the accuracy, bringing HumTouch a step closer to practical application"

Source: Northwestern (8 February 2023)

CURRENT AFFAIR

Can ROK Nuclearize Without International Support?



"President Yoon Suk-yeol of the Republic of Korea (ROK) recently remarked that his country will consider developing nuclear weapons to counter the growing nuclear threat posed by the Democratic People's Republic of Korea (DPRK).

For close to 70 years, ROK has upheld its model image as the developed nation that had thrived while its northern neighbour had languished in poverty. However, the strategic landscape changed significantly in 2022 when DPRK declared that it had successfully developed nuclear weapons and that their delivery platforms, both tactical and strategic, were capable of striking ROK as well as distances across the Pacific Ocean."

Source: RSIS (9 February 2023)