SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

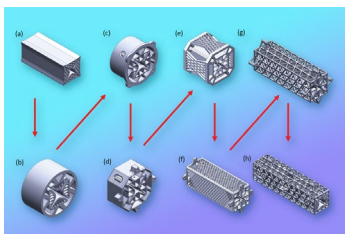
Weekly Discovery

We SHARE to inspire and ignite ideas!

8 Jan – 12 Jan 2024

3D PRINTING

Researchers 3D Print Components For A Portable Mass Spectrometer



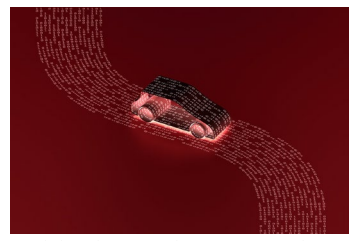
"Mass spectrometers, devices that identify chemical substances, are widely used in applications like crime scene analysis, toxicology testing, and geological surveying. But these machines are bulky, expensive, and easy to damage, which limits where they can be effectively deployed.

Using additive manufacturing, MIT researchers produced a mass filter, which is the core component of a mass spectrometer, that is far lighter and cheaper than the same type of filter made with traditional techniques and materials. Their miniaturized filter, known as a quadrupole, can be completely fabricated in a matter of hours for a few dollars. The 3D-printed device is as precise as some commercial-grade mass filters that can cost more than $100,000 and take weeks to manufacturer."

Source: MIT (4 Jan 2024)

AI

Neural Reactions to Fear Make AI Drive More Safely



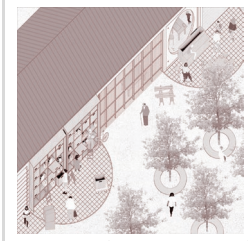
"Driving in the winter, say, or in stormy conditions can induce feelings of fear—and inspire more caution. So could some of the same hallmarks of fear and defensive driving be somehow programmed into a self-driving car? New research suggests that, yes, AI systems can be made more safe and cautious drivers by being assigned neural traits similar to what humans experience when they feel fear.

In fact, the researchers find, this trick can help a self-driving AI system perform more safely than other leading autonomous vehicle systems."

Source: IEEE Spectrum (20 Dec 2023)

ARCHITECTURE

How Can Buildings Work for Everyone? The Future of Inclusivity and Accessibility in Architecture



"One of the most important challenges in architecture, when it comes to creating spaces that work for everyone, is the diversity that exists in people, their needs, and how to integrate them into a design. Disabilities are more than a condition; they are a way of living according to human diversity that requires architectural solutions of equivalent multiplicity.

According to data from the World Bank, it is estimated that 1 billion people –equivalent to 15% of the world's population– live with some type of disability. In the future, this percentage could increase considerably, given the global trend of aging populations. To face this growing challenge, architecture will have to adapt quickly, due to the role that built environments have in constituting a barrier or a path for the inclusion of people with different types of disabilities, seniors, as well as diverse groups who make up the human plurality."

Source: Archdaily (4 Jan 2024)

ARTS

Arts Education Linked to Wide-Ranging Improved Academic Outcomes, According To UNESCO-Backed Concordia Study

"According to a new paper published by the United Nations Educational, Scientific and Cultural Organization (UNESCO), teaching the arts in schools impacts cognition, knowledge acquisition and broader educational attainment in other subject areas. Arts education also positively contributes to nurturing well-rounded, capable and empathetic individuals.

"Arts Education: An investment in quality learning," is a policy-oriented research review publication led by Vivek Venkatesh, Concordia professor of inclusive practices in visual arts and chair of the university's Department of Art Education, alongside his UNESCO colleagues Lydia Ruprecht and Martha K. Ferede.

Manasvini Narayana, PhD 19, and Marie-Pierre Labrie, two of Venkatesh's long-time collaborators, assisted with the research.

The researchers conducted an extensive literature review from educational contexts across the world. They found that arts education is linked to improved cognitive abilities and academic outcomes across various subjects, including math, writing and reading."

Source: Concordia (21 Dec 2023)

BATTERY

Solid State Battery Design Charges in Minutes, Lasts for Thousands of Cycles

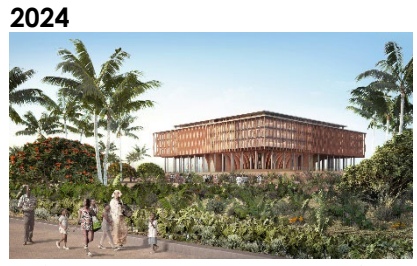
"Researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) have developed a new lithium metal battery that can be charged and discharged at least 6,000 times — more than any other pouch battery cell — and can be recharged in a matter of minutes.

The research not only describes a new way to make solid state batteries with a lithium metal anode but also offers new understanding into the materials used for these potentially revolutionary batteries."

Source: Harvard (8 Jan 2024)

DESIGN

This Week We Looked Forward to The Architecture and Design Trends Of 2024



"This week on Dezeen, we looked forward to the buildings set to be completed in 2024 and the architecture, design and interiors trends that will impact the upcoming year.

We rounded up 12 key buildings that will be completing over the next year – these include projects by Kéré Architecture, Sou Fujimoto, Zaha Hadid Architects and Foster + Partners."

Source: Dezeen (6 Jan 2024)

HEALTH

This Next Generation Blue Light Could Potentially Promote or Hinder Sleep on Command

"Blue light from LED lamps and consumer electronics can mess with your sleep because it disrupts production of the natural sleep hormone melatonin. Tinted glasses or displays in night mode can mask, but don't remove, a portion of the disruptive wavelengths. But now, researchers report in ACS Omega that they have designed more "human-centric" LEDs that could potentially enhance drowsiness or alertness on command.

Humans have evolved over millennia to be active during the day and to rest at night; we've depended on the sun to regulate our sleep/wake cycle. But many people today spend a majority of their time indoors, shielded from the sun, so it's harder for them to maintain that optimal 24-hour circadian rhythm. Exposure to artificial light can worsen this problem because it can decrease secretion of melatonin. And nighttime exposure to blue light, specifically, is notorious for interfering with melatonin production and therefore sleep. However, blue light is emitted by LEDs in lamps, computers, TVs, phones and other handheld electronics that people often use at night."

Source: ACS (14 Dec 2023)

MEDICAL RESEARCH

Potent Psychedelic Drug Banishes PTSD, Small Study Finds

"Psychedelic drugs such as MDMA and psilocybin, the hallucinogenic compound found in magic mushrooms, have promised to revolutionize psychiatric treatments. Now, a small trial in military veterans suggests that a lesser-known, potent psychedelic drug called ibogaine could be used to treat traumatic brain injury (TBI). One month after ibogaine treatment, the veterans reported that TBI symptoms such as post-traumatic stress disorder (PTSD) and depression had decreased by more than 80%, on average.

"The drug seems to have a broad, dramatic and consistent effect," says Nolan Williams, a neuroscientist at Stanford University in California and a co-author of the study. The results of the trial, which did not include a control group, are published today in Nature Medicine."

Source: Nature (5 Jan 2024)

ROBOTICS

Multiple AI Models Help Robots Execute Complex Plans More Transparently

"Your daily to-do list is likely pretty straightforward: wash the dishes, buy groceries, and other minutiae. It's unlikely you wrote out "pick up the first dirty dish," or "wash that plate with a sponge," because each of these miniature steps within the chore feels intuitive. While we can routinely complete each step without much thought, a robot requires a complex plan that involves more detailed outlines.

MIT's Improbable AI Lab, a group within the Computer Science and Artificial Intelligence Laboratory (CSAIL), has offered these machines a helping hand with a new multimodal framework: Compositional Foundation Models for Hierarchical Planning (HiP), which develops detailed, feasible plans with the expertise of three different foundation models. Like OpenAI's GPT-4, the foundation model that ChatGPT and Bing Chat were built upon, these foundation models are trained on massive quantities of data for applications like generating images, translating text, and robotics."

Source: MIT (3 Jan 2024)

ROBOTICS

Soft Robotic, Wearable Device Improves Walking for Individual with Parkinson's Disease

"Freezing is one of the most common and debilitating symptoms of Parkinson's disease, a neurodegenerative disorder that affects more than 9 million people worldwide. When individuals with Parkinson's disease freeze, they suddenly lose the ability to move their feet, often mid-stride, resulting in a series of staccato stutter steps that get shorter until the person stops altogether. These episodes are one of the biggest contributors to falls among people living with Parkinson's disease.

Today, freezing is treated with a range of pharmacological, surgical or behavioral therapies, none of which are particularly effective.

What if there was a way to stop freezing altogether?"

Source: IEEE Spectrum (3 Jan 2024)

SEMICONDUCTORS

Silk-Based Transistors for Hybrid Applications

"Silk woven into transistors can result in highly sensitive, ultra-fast sensors, new findings that could open doors to many other applications for the hybrid devices.

Transistors are typically made of inorganic materials, such as minerals and metals. However, adding organic materials to transistors could grant them new abilities, such as the ability to respond directly to the environment or the body.

In a new study, researchers experimented with using silk within a transistor. "It's extremely versatile, capable of being embedded with many different molecules to open up a lot of functions," says study senior author Fiorenzo Omenetto, an applied physicist at Tufts University in Medford, Massachusetts. "We can also very exquisitely control its deposition to start integrating biology with technology, and it has shown really incredible surface properties, like atomic smoothness. And the solvent of its precursor material is water, which makes it biocompatible and sustainable."

Source: Nature (3 Jan 2024)

VR

Experience Digs Virtually: Archaeology and Digital Humanities at the University of Bonn join forces in international project

"The use of digital documentation methods in research and teaching is growing ever more important in the field of archaeology. Just as they have elsewhere in Europe, local initiatives have also been springing up at the University of Bonn that harness the new digital possibilities three-dimensional (3D) technology and virtual reality (VR) offer research and teaching in the archaeological subjects. "Up until now, however, these various initiatives haven't been linked together, preventing synergy effects from being leveraged," explains Professor Stefan Feuser, Heisenberg Professor for Classical Archaeology at the University of Bonn. "Yet the ability to digitize tangible cultural heritage using 3D and VR visualization methods and incorporate it into teaching in a meaningful way is key to bringing about the digital transformation at universities." This will require giving students appropriate training, devising standards for sharing and exchanging virtual worlds and developing learning scenarios at university level, he says."

Source: Bonn (3 Jan 2024)