

3D PRINTING  
**Reverse Engineering Jackson Pollock**



"Can a machine be trained to paint like Jackson Pollock? More specifically, can 3D-printing harness the Pollock's distinctive techniques to quickly and accurately print complex shapes?"

"I wanted to know, can one replicate Jackson Pollock, and reverse engineer what he did," said L. Mahadevan, the Lola England de Valpine Professor of Applied Mathematics at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), and Professor of Organismic and Evolutionary Biology, and of Physics in the Faculty of Arts and Sciences (FAS).

Mahadevan and his team combined physics and machine learning to develop a new 3D-printing technique that can quickly create complex physical patterns — including replicating a segment of a Pollock painting — by leveraging the same natural fluid instability that Pollock used in his work.

The research is published in *Soft Matter*."

Source: [Harvard](#) (30 Oct 2023)

3D PRINTING  
**Honoka 3D-Prints Furniture That "Re-Weaves Tatami into Modern Life"**



"At Designart Tokyo, Japanese design collective Honoka exhibited furniture and lighting made by 3D printing a material made from discarded Tatami mats.

The exhibition – titled Tatami Refab Project – displayed lampshades, lighting fixtures, tables, stools, basins and plant holders that appeared to glow thanks to the translucency of the material, which was made from grass and resin.

"Honoka has developed a unique material by mixing biodegradable resin with Igusa grass, which is extracted from Japanese discarded Tatami mats," said Honoka.

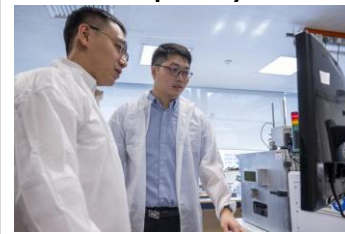
"Using ExtraBold's large 3D printer, the project proposes furniture that re-weaves Tatami into modern life."

The Igusa grass is cut from the mats and ground up, before being mixed with biodegradable resin.

The resulting pellets were fed through a large-format 3D printer and assembled to create a range of functional homewares and products."

Source: [Dezeen](#) (3 Nov 2023)

3D PRINTING  
**3D-Printed Metals with Contrasting Properties Made Using New Method Co-Developed by NTU Singapore**



"Scientists have developed a new method that can make customised 3D-printed metal parts containing different properties – such as having some regions of the metal stronger than others.

The new technique from the researchers – led by Nanyang Technological University, Singapore (NTU Singapore) and University of Cambridge – uses 3D-printing steps. Unlike traditional metal manufacturing processes, it does not require additional raw materials, mechanical treatment or drastic machining processes to achieve a similar effect, such as coating the metal with a different material, thus potentially helping to reduce manufacturing costs.

Besides designing a 3D-printed metal part with different strength levels, the new process should theoretically also allow manufacturers to design a part with other features, such as differing levels of electrical conductivity or corrosion resistance in the same metal."

Source: [EurekaAlert!](#) (30 Oct 2023)

AI  
**Learning To Forget – A Weapon in The Arsenal Against Harmful AI**



"With the AI summit well underway, researchers are keen to raise the very real problem associated with the technology – teaching it how to forget.

Society is now abuzz with modern AI and its exceptional capabilities; we are constantly reminded its potential benefits, across so many areas, permeating practically all facets of our lives – but also its dangers.

In an emerging field of research, scientists are highlighting an important weapon in our arsenal towards mitigating the risks of AI – 'machine unlearning'. They are helping to figure out new ways of making AI models known as Deep Neural Networks (DNNs) forget data which poses a risk to society.

The problem is re-training AI programmes to 'forget' data is a very expensive and an arduous task. Modern DNNs such as those based on 'Large Language Models' (like ChatGPT, Bard, etc.) require massive resources to be trained – and take weeks or months to do so. They also require tens of Gigawatt-hours of energy for every training programme, some research estimating as much energy as to power thousands on households for one year."

Source: [WARWICK](#) (2 Nov 2023)

ARCHITECTURE  
**Creating Energy-Efficient Buildings: The Role of Human Interaction and Sensory Technology**

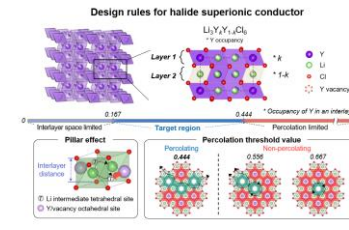


"How do we create buildings that use energy efficiently? Traditionally, efforts to green the built environment have centered on the physical infrastructure, often overlooking the relationships between people and space. The emergence of the technological era has ushered in "Smart Buildings." that employ machine learning and automation. These innovative structures are designed to operate with impressive energy efficiency, however, they are largely disconnected from their occupants. What if buildings could be made smarter and more sustainable by engaging with their occupants?"

"Buildings could be a lot smarter if we leverage the brains of the people inside of it", shares Paul Chávez, Associate, User Experience and Technology Design at Arup, a global sustainable development company. Spearheading the project BREO (Building Resource Expression and Optimization), Chávez highlights the untapped potential of engaging occupants in actively conserving energy in buildings. Buildings consume a significant portion of the world's energy and resources, and yet its occupants often remain detached from the consequences of their energy consumption. BREO is a novel approach to tackling this problem, using sensory technology to create a more intuitive and interactive relationship between buildings and their inhabitants."

Source: [Archdaily](#) (30 Oct 2023)

BATTERY  
**New Designs for Solid-State Electrolytes May Soon Revolutionize the Battery Industry**



"Researchers led by Professor KANG Kisuk of the Center for Nanoparticle Research within the Institute for Basic Science (IBS), have announced a major breakthrough in the field of next-generation solid-state batteries. It is believed that their new findings will enable the creation of batteries based on a novel chloride-based solid electrolyte that exhibits exceptional ionic conductivity..."

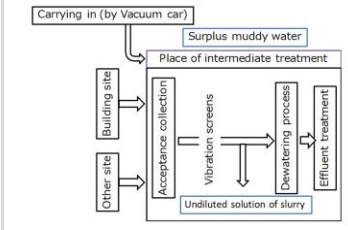
This research brings to light the often-overlooked role of metal ion distribution in the ionic conductivity of chloride-based solid electrolytes. It is expected that the IBS Center's research will pave the way for the development of various chloride-based solid electrolytes and further drive the commercialization of solid-state batteries, promising improved affordability and safety in energy storage.

Corresponding author KANG Kisuk states, "This newly discovered chloride-based solid electrolyte is poised to transcend the limitations of conventional sulfide and oxide-based solid electrolytes, bringing us one step closer to the widespread adoption of solid-state batteries."

This research was published on November 3, 2023, in *Science*, which is one of the world's most prestigious scientific journals."

Source: [IBS](#) (3 Nov 2023)

CONSTRUCTION  
**Toward Sustainable Construction: Preparing Liquefied Stabilized Soil from Construction Sludge**

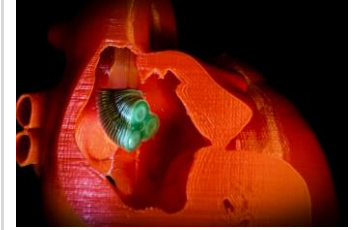


"Scientists from Japan have developed high-flowability liquefied stabilized soil from construction sludge that could revolutionize the sustainability of the construction industry.

Liquefied stabilized soil (LSS) is made with construction waste and used for filling and backfilling long, confined spaces where traditional compaction is difficult. Using LSS helps speed up construction processes while reducing costs, wastage, and environmental impact. Now, researchers from Shiba Institute of Technology, Japan have developed a superior, high-flowability LSS from construction sludge with better mechanical properties and fluidity than conventional LSS, which could make the construction industry more sustainable."

Source: [SHIBAURA](#) (1 Nov 2023)

ENGINEERING  
**A Robot Performs Heart Surgery with A Strong but Delicate Touch**



"A soft robot can perform intricate surgical procedures inside a beating heart.

The motion of a pulsating heart, coupled with the narrow and delicate nature of blood vessels, makes minimally-invasive cardiac surgery challenging. To address this, Jacob Rogatinsky at Boston University in Massachusetts and his colleagues engineered a millimetre-scale robot that can enter the heart's chambers, and a stabilizing device that sits at the heart's entrance, in the large vein called the superior vena cava.

The stabilizer collapses to 8 millimetres in diameter for insertion into the body. Once it is threaded through the superior vena cava, it can expand to 32 millimetres. The robot, made of small balloon-like structures, can brace itself against the stabilizer and guide existing robotic surgical tools into the moving heart. A Nintendo Wii game controller is used to direct the machine.

The team tested the device on a pig's vena cava, 3D models of the heart's chambers and a pig's heart. They hope that future tests on live animals will confirm that the robot performs well and reveal any complications."

Source: [Nature](#) (2 Nov 2023)

FIBERS  
**Flexible Thermochromic Fabrics Enabling Dynamic Colored Display**



"Fibrous devices have attracted more and more research due to their unique one-dimensional morphological advantages such as flexibility, light weight and wearability. In the past decade, a variety of functional fibrous devices have been developed, including conductive, energy harvesting and memory devices, sensors, actuators and lighting devices. Among them, color-changing fibers provide a new direction for the research of new contemporary information display and human-computer interaction due to their extensibility and programmability. When the clothes people wear can change color and pattern instantly with the signal of external environment, it can not only enrich the aesthetics of the clothes itself, but also establish the bridge of natural interaction between users and environment, and realize the timely display

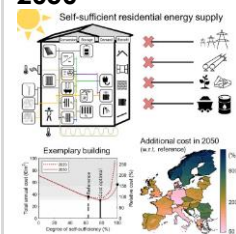
METaverse  
**Can AI Make Architects Better Storytellers?**



"This article is the sixth in a series focusing on the Architecture of the Metaverse. ArchDaily has collaborated with John Marx, AIA, the founding design principal and Chief Artistic Officer of Form4 Architecture, to bring you monthly articles that seek to define the Metaverse, convey the potential of this new realm as well as understand its constraints.

Artificial Intelligence is at the genesis of creating fundamental changes in the way we design and construct buildings and cities. Some of these changes will be abrupt and disruptive to normative practice. Others will take more time to feel the effect of this new technology, but the change will be pervasive. When combined with the Metaverse, AI will also offer vast opportunities for the profession to expand and grow. The kinds of spaces and environments we design in

SUSTAINABILITY  
**Two Million European Single-Family Homes Could Abandon the Grid By 2050**



"Rising energy procurement costs and declining capital costs for renewable technologies are provoking interest in self-sufficiency for individual buildings. In this study, we evaluate the potential of self-sufficient energy supply for 41 million freestanding single-family buildings under current and future (2050) conditions. We identify 4,000 representative buildings, calculate weather-robust cost-minimal energy systems, and transfer the optimization results to the entire European building stock. Our analyses show that buildings in regions with low seasonality and high electricity procurement costs have a high potential for self-sufficiency. Under current techno-economic conditions, 53% of the 41 million buildings are technically able to supply themselves independently from external infrastructures by only using local rooftop solar

VIRTUAL MEETINGS  
**Virtual Meetings Tire People Because We're Doing Them Wrong**



"New research suggests sleepiness during virtual meetings is caused by mental underload and boredom. Earlier studies suggested that fatigue from virtual meetings stems from mental overload, but new research from Aalto University shows that sleepiness during virtual meetings might actually be a result of mental underload and boredom.

"I expected to find that people get stressed in remote meetings. But the result was the opposite – especially those who were not engaged in their work quickly became drowsy during remote meetings," says Assistant Professor Niina Nurmi, who led the study.

The researchers measured heart rate variability during virtual meetings and face-to-face meetings, examining different types of fatigue experiences among 44 knowledge workers

and perception of environmental information.

Researchers led by Prof. Guangming Tao at Huazhong University of Science and Technology (HUST), China have been dedicated to research in the field of functional fibers. Prof. Tao's team has proposed a wet spinning process that can produce a variety of color reversible thermochromic fibers on a large scale, and its excellent mechanical properties and weaveability can be used to produce colorful fabric displays in everyday clothing."

Source: [Eurekalert!](#) (3 Nov 2023)

the Metaverse will be, in some aspects, very different from what we currently design in the physical world alone. AI evolves every day, and we are compelled to learn while we innovate. AI has proven it is a powerful tool to assist designers and offers the potential to challenge us to alter our design process. Combining AI with narrative design is one of those challenges."

Source: [Archdaily](#) (2 Nov 2023)

irradiation, and this proportion could increase to 75% by 2050. By paying a premium of up to 50% compared with grid-dependent systems with electrified heat supplies, building owners could make over two million buildings fully energy self-sufficient by 2050."

Source: [SCIENCE DIRECT](#) (2 Nov 2023)

across nearly 400 meetings. The team at Aalto collaborated with researchers at the Finnish Institute of Occupational Health, where stress and recovery are studied using heart rate monitors. The paper was published in the Journal of Occupational Health Psychology."

Source: [AALTO](#) (27 Oct 2023)

To view past Weekly Alerts [CLICK HERE](#)  
For more articles or in-depth research, contact us at [library@sutd.edu.sg](mailto:library@sutd.edu.sg)  
A SUTD Library Service©2023