

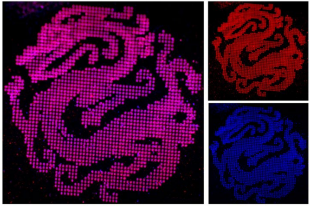
# Weekly Discovery

We SHARE to inspire and ignite ideas!

23 Oct – 27 Oct 2023

## 3D PRINTING

### 3D Printing Tackles Tricky Materials with Help from Tiny Crystals



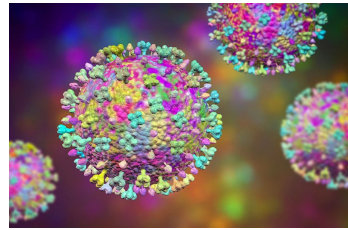
"A new 3D-printing technique can build minuscule objects with materials that were off-limits to the manufacturing method until now."

3D printing has been transformative, allowing manufacturers and amateurs alike to custom-make small, intricate structures and large objects quickly and easily. But the method only works well with metals and plastics, because atoms in those materials effortlessly form chemical bonds with each other. To expand the repertoire of 3D-printed materials, Fu Li at Tsinghua University in Beijing and her colleagues used nanometre-scale crystals of various semiconductors, metal oxides and metals to make liquid inks. The inks also contained a chemical additive. When the researchers fired short laser pulses at the mixtures, the additive formed reactive atoms. These behaved like a glue, binding together molecules found on the surfaces of the nanocrystals and causing the liquid ink to solidify wherever the laser beam was focused."

Source: [Nature](#) (6 Oct 2023)

## AI

### How AlphaFold and Other AI Tools Could Help Us Prepare for The Next Pandemic



"In the third year of the COVID-19 pandemic, researchers reported another worrying virus. Identified in 35 people in eastern China since 2018, Langya henipavirus causes breathing problems, fever and other troubling symptoms."

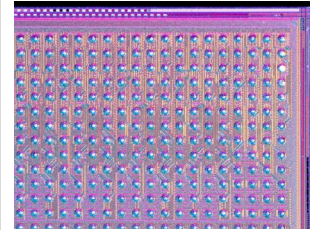
Langya hasn't been linked to any deaths yet. But it is related to some deadly viruses, so researchers were keen to develop vaccines. There was just one problem: a viral protein that could form the basis of a jab seemed impossible to make in the lab.

"If we can't even study the protein, how are we going to understand how it works, and how are we going to make a vaccine?" says David Veester, a structural virologist at the University of Washington (UW) in Seattle."

Source: [Nature](#) (11 Oct 2023)

## AI

### IBM Debuts Brain-Inspired Chip for Speedy, Efficient AI



"A brain-inspired chip from IBM, dubbed NorthPole, is more than 20 times as fast as—and roughly 25 times as energy efficient as—any microchip currently on the market when it comes to artificial intelligence tasks. According to a study from IBM, applications for the new silicon chip may include autonomous vehicles and robotics."

Brain-inspired computer hardware aims to mimic a human brain's exceptional ability to rapidly perform computations in an extraordinarily energy-efficient manner. These machines are often used to implement neural networks, which similarly imitate the way a brain learns and operates."

Source: [IEEE Spectrum](#) (23 Oct 2023)

## ARCHITECTURE

### Why Cities Must Embrace Getting Smaller



"The phrase "Demography is destiny" is repeated more than once in *Smaller Cities in a Shrinking World* (Island Press). This new book by noted urban researcher Alan Mallach tackles, in meticulous and fascinating detail, the "wicked problem" of shrinking cities in the U.S. and across the globe. But it's not only our cities that are shrinking—the countries that contain them are, too. I spoke with Mallach about the imperative of planning for this new demographic reality."

Kristin Palm: We both live the concept of the shrinking city in our daily lives. You are speaking to me from Roosevelt, New Jersey, not far from Trenton, where you worked in housing and economic development. And I am at my home in what is perhaps the poster child for shrinking cities, Detroit, which you have studied extensively. Still, I'm curious to know in more detail how you came to be interested in the topic of shrinking cities."

Source: [Archdaily](#) (20 Oct 2023)

## CLIMATE TECH

### Hydrogen Electrolysis Can Give Nuclear Power a Boost



"Nuclear power plants produced 18 percent of the electricity generated in the United States in 2022—but even after decades, the technology still has drawbacks in terms of efficiency. Nuclear power plants are expensive to build. Even more importantly, they have trouble quickly ramping up and down electricity production in response to fluctuations in the grid's energy prices. Combined, these factors make it difficult for nuclear power to achieve profitability."

Raghav Khanna, an associate professor of power systems at the University of Toledo, in Ohio, was motivated to "salvage" nuclear power plants that are operational but not price competitive. "When the demand on the grid is low, selling nuclear-derived power to the grid is not very economical," Khanna said. "So the energy providers for the nuclear power plant are not going to make a lot of bang for their buck."

Source: [IEEE Spectrum](#) (19 Oct 2023)

## DEEP TECH

### Exploring Sydney's Deep Tech Ecosystem



"The power of deep tech"

The tech industry in Australia is a powerhouse, employing one in 16 Australians and ranking as the country's third-largest industry. In 2021, it accounted for 8.5 percent of the GDP, an undeniably significant contribution to the nation's economy.

For nearly two decades, Sydney has also nurtured a thriving community of resilient problem solvers, quietly pushing the boundaries of scientific discovery. While consumer-focused tech giants often steal the spotlight, it is imperative to recognize the profound impact of deep tech solutions that operate behind the scenes.

From eco-friendly fabric manufacturing and hydrogen storage to molecular diagnostics and sustainable alternatives to plastics, Sydney's brightest minds are tackling some of the world's most pressing challenges."

Source: [IEEE Spectrum](#) (22 Oct 2023)

## DESIGN

### Australian Student Invents Affordable Electric Car Conversion Kit



"Australian design student Alexander Burton has developed a prototype kit for cheaply converting petrol or diesel cars to hybrid electric, winning the country's national James Dyson Award in the process."

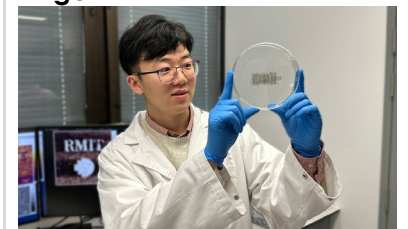
Titled REVR (Rapid Electric Vehicle Retrofits), the kit is meant to provide a cheaper, easier alternative to current electric car conversion services, which Burton estimates cost AU\$50,000 (£26,400) on average and so are often reserved for valuable, classic vehicles.

Usually, the process would involve removing the internal combustion engine and all its associated hardware, like the gearbox and hydraulic brakes, to replace them with batteries and electric motors."

Source: [IEEE Spectrum](#) (23 Oct 2023)

## DESIGN

### Wearable Device Makes Memories and Powers Up with The Flex of a Finger



"Researchers have invented an experimental wearable device that generates power from a user's bending finger and can create and store memories, in a promising step towards health monitoring and other technologies."

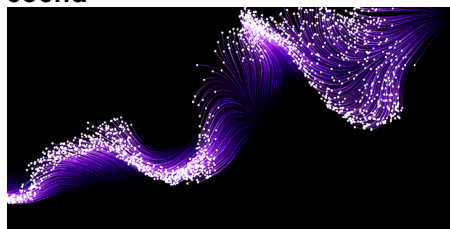
The innovation features a single nanomaterial incorporated into a stretchable casing fitted to a person's finger. The nanomaterial enabled the device to generate power with the user bending their finger. The super-thin material also allows the device to perform memory tasks, as outlined below.

Multifunctional devices normally require several materials in layers, which involves the time-consuming challenge of stacking nanomaterials with high precision. The team, led by RMIT University and the University of Melbourne in collaboration with other Australian and international institutions, made the proof-of-concept device with the rust of a low-temperature liquid metal called bismuth, which is safe and well suited for wearable applications."

Source: [RMIT](#) (19 Oct 2023)

## QUANTUM TECH

### How Quantum Light Sees Quantum Sound



"Researchers at the University of East Anglia have proposed a new way of using quantum light to 'see' quantum sound."

A new paper published today reveals the quantum-mechanical interplay between vibrations and particles of light, known as photons, in molecules.

It is hoped that the discovery may help scientists better understand the interactions between light and matter on molecular scales.

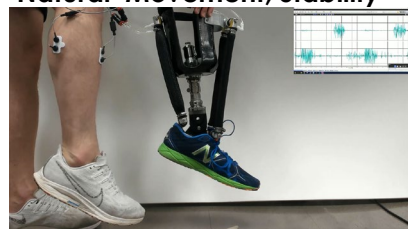
And it potentially paves the way for addressing fundamental questions about the importance of quantum effects in applications ranging from new quantum technologies to biological systems.

Dr Magnus Borgh from UEA's School of Physics said: "There is a long-standing controversy in chemical physics about the nature of processes where energy from particles of light is transferred within molecules."

Source: [UEA](#) (4 Oct 2023)

## ROBOTICS

### Robotic Prosthetic Ankles Improve 'Natural' Movement, Stability



"Robotic prosthetic ankles that are controlled by nerve impulses allow amputees to move more "naturally," improving their stability, according to a new study from North Carolina State University and the University of North Carolina at Chapel Hill."

"This work focused on 'postural control,' which is surprisingly complicated," says Helen Huang, corresponding author of the study and the Jackson Family Distinguished Professor in the Joint Department of Biomedical Engineering at NC State and UNC.

"Basically, when we are standing still, our bodies are constantly making adjustments in order to keep us stable. For example, if someone bumps into us when we are standing in line, our legs make a wide range of movements that we are not even necessarily aware of in order to keep us upright. We work with people who have lower limb amputations, and they tell us that achieving this sort of stability with prosthetic devices is a significant challenge. And this study demonstrates that robotic prosthetic ankles which are controlled using electromyographic (EMG) signals are exceptionally good at allowing users to achieve this natural stability."

Source: [NCSU](#) (18 Oct 2023)

## SOLAR

### World May Have Crossed Solar Power 'Tipping Point'



"The world may have crossed a "tipping point" that will inevitably make solar power our main source of energy, new research suggests."

The study, based on a data-driven model of technology and economics, finds that solar PV (photovoltaics) is likely to become the dominant power source before 2050 – even without support from more ambitious climate policies.

However, it warns four "barriers" could hamper this: creation of stable power grids, financing solar in developing economies, capacity of supply chains, and political resistance from regions that lose jobs.

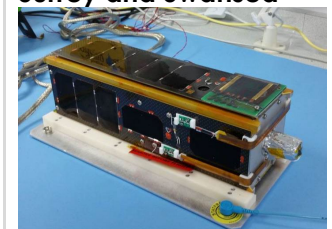
The researchers say policies resolving these barriers may be more effective than price instruments such as carbon taxes in accelerating the clean energy transition.

The study, led by the University of Exeter and University College London, is part of the Economics of Energy Innovation and System Transition (EEIST) project, funded by the UK Government's Department for Energy Security and Net Zero and the Children's Investment Fund Foundation (CIFF)."

Source: [Exeter](#) (18 Oct 2023)

## SOLAR ENERGY

### Solar Farms in Space Are Possible, Say Surrey and Swansea



"It's viable to produce low-cost, lightweight solar panels that can generate energy in space, according to new research from the Universities of Surrey and Swansea."

The first study of its kind followed a satellite over six years, observing how the panels generated power and weathered solar radiation over 30,000 orbits.

The findings could pave the way for commercially viable solar farms in space.

Professor Craig Underwood, Emeritus Professor of Spacecraft Engineering at the Surrey Space Centre at the University of Surrey, said:

"We are very pleased that a mission designed to last one year is still working after six. These detailed data show the panels have resisted radiation and their thin-film structure has not deteriorated in the harsh thermal and vacuum conditions of space."

"This ultra-low mass solar cell technology could lead to large, low-cost solar power stations deployed in space, bringing clean energy back to Earth – and now we have the first evidence that the technology works reliably in orbit."

Source: [EurekAlert!](#) (24 Oct 2023)