

Weekly Discovery

We SHARE to inspire and ignite ideas!

19 Feb – 23 Feb 2024

AI
New Chip Opens Door to AI Computing at Light Speed

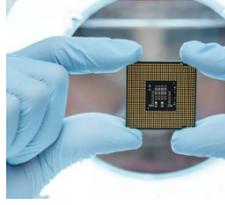


"Penn Engineers have developed a new chip that uses light waves, rather than electricity, to perform the complex math essential to training AI. The chip has the potential to radically accelerate the processing speed of computers while also reducing their energy consumption.

The silicon-photonics (SiPh) chip's design is the first to bring together Benjamin Franklin Medal Laureate and H. Nedwill Ramsey Professor Nader Engheta's pioneering research in manipulating materials at the nanoscale to perform mathematical computations using light — the fastest possible means of communication — with the SiPh platform, which uses silicon, the cheap, abundant element used to mass-produce computer chips."

Source: [UPENN](#) (16 Feb 2024)

AI
Artificial Intelligence: Aim Policies At 'Hardware' To Ensure AI Safety, Say Experts



"A global registry tracking the flow of chips destined for AI supercomputers is one of the policy options highlighted by a major new report calling for regulation of "compute" — the hardware that underpins all AI — to help prevent artificial intelligence misuse and disasters.

Other technical proposals floated by the report include "compute caps" — built-in limits to the number of chips each AI chip can connect with — and distributing a "start switch" for AI training across multiple parties to allow for a digital veto of risky AI before it feeds on data.

Researchers argue that AI chips and datacentres offer more effective targets for scrutiny and AI safety governance, as these assets have to be physically possessed, whereas the other elements of the "AI triad" — data and algorithms — can, in theory, be endlessly duplicated and disseminated."

Source: [University of Cambridge](#) (14 Feb 2024)

AI
What The EU's Tough AI Law Means for Research and ChatGPT



"European Union countries are poised to adopt the world's first comprehensive set of laws to regulate artificial intelligence (AI). The EU AI Act puts its toughest rules on the riskiest AI models, and is designed to ensure that AI systems are safe and respect fundamental rights and EU values.

"The act is enormously consequential, in terms of shaping how we think about AI regulation and setting a precedent," says Rishi Bommasani, who researches the societal impact of AI at Stanford University in California.

The legislation comes as AI develops apace. This year is expected to see the launch of new versions of generative AI models — such as GPT, which powers ChatGPT, developed by OpenAI in San Francisco, California — and existing systems are being used in scams and to propagate misinformation. China already uses a patchwork of laws to guide commercial use of AI, and US regulation is under way. Last October, President Joe Biden signed the nation's first AI executive order, requiring federal agencies to take action to manage the risks of AI."

Source: [Nature](#) (16 Feb 2024)

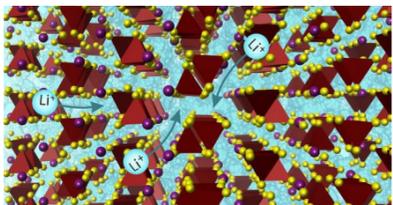
ARCHITECTURE
Immersive Spaces: Shaping Profound Experiences Through Architecture and Art



"Immersive spaces are heavily sensorial environments meant to create impactful experiences crafted through intentionally curated architecture, light, imagery, sound, and sometimes even smell. To "immerse" oneself is to be wholly enveloped in a world shaped solely by immediate sensory input. Using digital tools to craft these environments to showcase art, create compelling exhibitions, and feature performance events has become increasingly popular. Evocative experiences like these can offer a respite from the inundation of personalized digital content and foster shared, grounding encounters. The design of these can exist at the intersection of architecture, graphic design, visual art, lighting design, music, and performance. They underscore the power of interdisciplinary collaboration to craft memorable moments. So, what role does architecture play in shaping these?"

Source: [Archdaily](#) (18 Feb 2024)

BATTERIES
Discovery Of New Li Ion Conductor Unlocks New Direction for Sustainable Batteries



"One of the grand challenges for materials science is the design and discovery of new materials that address global priorities such as Net Zero.

In a paper published in the journal Science, researchers at the University of Liverpool have discovered a solid material that rapidly conducts lithium ions. Such lithium electrolytes are essential components in the rechargeable batteries that power electric vehicles and many electronic devices.

Consisting of non-toxic earth-abundant elements, the new material has high enough Li ion conductivity to replace the liquid electrolytes in current Li ion battery technology, improving safety and energy capacity.

Using a transformative scientific approach to design the material, the interdisciplinary research team from the University synthesised the material in the laboratory, determined its structure (the arrangement of the atoms in space) and demonstrated it in a battery cell."

Source: [EurekAlert!](#) (15 Feb 2024)

CLIMATE CHANGE
UC Irvine Researcher Authors 'Scientists' Warning' On Climate and Technology

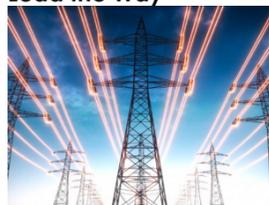


"Researchers have developed a spiral-shaped lens that maintains clear focus at different distances in varying light conditions. The new lens works much like progressive lenses used for vision correction but without the distortions typically seen with those lenses. It could help advance contact lens technologies, intraocular implants for cataracts and miniaturized imaging systems.

"Unlike existing multifocal lenses, our lens performs well under a wide range of light conditions and maintains multifocality regardless of the size of the pupil," said Bertrand Simon from Photonics, Numerical and Nanosciences Laboratory (LP2N), a joint research unit between the Institut d'Optique Graduate School, the University of Bordeaux and the CNRS in France. "For potential implant users or people with age-related farsightedness, it could provide consistently clear vision, potentially revolutionizing ophthalmology."

Source: [UCI](#) (15 Feb 2024)

CLIMATE TECH
Grid-Scale, Predictive Maintenance Can Be Done Better and One Component—The Switchgear—Could Lead the Way



"Energy grids are about to get a lot more complex as renewable energy is integrated into the system. To support these more dynamic grids, researchers have proposed a novel, predictive maintenance system that anticipates when critical components—in this case switchgears—may fail and need to be replaced.

Currently, distribution grid operators wait until a component of the grid fails before replacing it. Or, they may replace components at set intervals, when the lifespan of the technology is estimated to be at its end. However, this approach can lead to unnecessary replacements of still-functional components as well as components operating beyond their ideal "expiration dates"—and, in either extreme, unnecessary difficulties and higher costs.

The researchers' prototype system, called DigiGrid, analyzes data capturing the general operations of the grid. For example, it tracks when a switchgear is installed, and then DigiGrid follows geographic information systems (GIS) data on the location of the equipment. As well, DigiGrid can analyze data from a range of sensors, including those to determine the flow of electricity, thermal sensors to identify overheating, air quality sensors to determine contamination levels (e.g., from dust or soot), and camera sensors to identify animal intruders that may have damaged equipment."

Source: [IEEE Spectrum](#) (18 Feb 2024)

HEALTHCARE
Newly Discovered Genetic Markers Help Pinpoint Diabetes Risks, Complications



"In the largest genome-wide association study to date on Type 2 diabetes, a team of international researchers, co-led by a University of Massachusetts Amherst genetic epidemiologist, has located 1,289 genetic markers associated with Type 2 diabetes (145 of which are newly identified) and generated risk scores for diabetes complications.

In research published Monday, Feb. 19 in the journal Nature that advances understanding into the inheritability of Type 2 diabetes, the scientists used cutting-edge computational approaches to identify eight distinct mechanistic clusters of genetic variants linked to the disease. They also discovered associations between individual clusters and diabetes complications."

Source: [UMASS](#) (20 Feb 2024)

SENSORS
Fresh Meat: New Biosensor Accurately and Efficiently Determines Meat Freshness



"The freshness of animal meat is an essential property determining its quality and safety. With advanced technology capable of preserving food for extended periods of time, meat can be shipped around the globe and consumed long after an animal dies. As global meat consumption rates increase, so too does the demand for effective measures for its age.

Despite the technological advances keeping meat fresh for as long as possible, certain aging processes are unavoidable. Adenosine triphosphate (ATP) is a molecule produced by breathing and responsible for providing energy to cells. When an animal stops breathing, ATP synthesis also stops, and the existing molecules decompose into acid, diminishing first flavor and then safety. Hypoxanthine (HXA) and xanthine are intermediate steps in this transition. Assessing their prevalence in meat indicates its freshness."

SILICON
HKUST Researchers Develop New Integration Technique for Efficient Coupling Of III-V And Silicon



"Researchers at the Hong Kong University of Science and Technology (HKUST) have developed a new integration technique for efficient integration of III-V compound semiconductor devices and silicon, paving the way for photonic integration at low cost, large volume, and high speed and throughput that could revolutionize data communications.

Unlike conventional integrated circuits, or microchips, that use electrons, photonic integrated circuits use photons, or particles of light. Photonic integration combines light and electronics to speed up data transfer. Silicon photonics (Si-photonics), in particular, is at the forefront of this revolution as it enables the creation of high-speed, low-cost connections that can handle massive amounts of data at once."

SUSTAINABLE DESIGN
'The Allure of the 'Bio' Prefix Must Be Taken with Some Healthy Scrutiny'



"Biomaterials have the potential to significantly cut carbon emissions but designers should approach them with caution to avoid creating a whole new set of problems, warns Sioban Imms.

The vision of a civilisation based on biomaterials is compelling: products, clothes and buildings made from materials that have been "grown", rather than derived from polluting, extractive fossil industries. The promise is not only lower emissions, but products that are more in tune with the environment — manufactured objects that are part of the natural cycle of life. And consumers are willing to pay a premium for such ostensibly "sustainable" products — 12 per cent more, according to a recent study by Bain.

However, in a bid to gain competitive advantage, marketing narratives surrounding biomaterials are regularly inflated or gloss over important details. Prefixing "bio" to a material name conjures a sense of being natural,

TRANSPORT
Improving Traffic Signal Timing with A Handful of Connected Vehicles



"You can mend a broken heart this Valentine's Day now that researchers invented a new hydrogel that can be used to heal damaged heart tissue and improve cancer treatments.

University of Waterloo chemical engineering researcher Dr. Elisabeth Prince teamed up with researchers from the University of Toronto and Duke University to design the synthetic material made using cellulose nanocrystals, which are derived from wood pulp. The material is engineered to replicate the fibrous nanostructures and properties of human tissues, thereby recreating its unique biomechanical properties.

"Cancer is a diverse disease and two patients with the same type of cancer will often respond to the same treatment in very different ways," Prince said. "Tumour organoids are essentially a miniaturized

compostable, and better all round for personal and environmental health."

version of an individual patient's tumour that can be used for drug testing, which could allow researchers to develop personalized therapies for a specific patient."

As director of the Prince Polymer Materials Lab, Prince designs synthetic biomimetic hydrogels for biomedical applications. The hydrogels have a nanofibrous architecture with large pores for nutrient and waste transport, which affect mechanical properties and cell interaction."

Source: [AIP](#) (20 Feb 2024)

Source: [EurekaAlert!](#) (13 Feb 2024)

Source: [Dezeen](#) (15 Feb 2024)

Source: [UMICH](#) (20 Feb 2024)

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