SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Weekly Discovery

We SHARE to inspire and ignite ideas!

29 May – 2 Jun 2023

AI

Using AI To Create Better, More Potent Medicines

"While it can take years for the pharmaceutical industry to create medicines capable of treating or curing human disease, a new study suggests that using generative artificial intelligence could vastly accelerate the drug-development process.

This study builds on previous research of Ning's where her team developed a method named Modof that was able to generate molecule structures that exhibited desired properties better than any existing molecules. "Now the question becomes how to make such generated molecules, and that is where this new study shines," said Ning, also an associate professor of biomedical informatics in the College of Medicine."

Source: OSU (30 May 2023)

ARCHITECTURE

Mesmerizing Zigzags: Exploring the Herringbone Pattern in Architecture

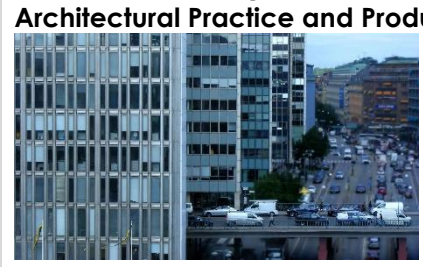
"Created by a series of angled parallel lines that form a mesmerizing zigzag, the herringbone pattern has withstood the test of time and remains present in diverse design styles. Named after the resemblance to a fish's bones –a herring, for instance–, this classic V-shaped pattern arranges rectangular blocks in different proportions. With varying block edge length ratios, such as 2:1 or sometimes 3:1, the versatile design adapts to a wide range of uses, dimensions and materials.

The arrangement of the blocks, even when used in single colours, creates a subtle texture, and adds visual interest. While the herringbone arrangement may seem simple, the strong directional quality of the typically 45-degree angle lines requires a careful design process for a seamless and consistent look. The pattern can be found in walls and floors, from fabrics to wood and tiles. By playing with geometric shapes, it continues to be a trend that infuses style and structure into interior design while complementing a space's overall aesthetic."

Source: ArchDaily (30 May 2023)

ARCHITECTURE

Creative Commoning: Design Experiments Exploring Ways for Platform Technology to Democratise Architectural Practice and Production



"Digital platforms are rapidly and surreptitiously transforming the built environment. This paper begins by revealing the ways that platform capitalism is amplifying the financialisaton of housing and economic asymmetries in global cities. However, it argues that with creativity, the same tools could be reformulated around the commons to develop an effective 'counter-power' against these practices and to work towards a future city that is fairer and more sustainable. Through a series of creative works by contemporary architects including Dogma, Open Systems Lab, and Alexander & Sheridan Architecture, this paper seeks to demonstrate Vasilis Kostakis and Michel Bauwens' assertion that 'the commons' is not an abstract concept, but a logical extension of practices and technologies that have become the everyday conditions of society from working to living. It exposes the potential for platform technologies to redistribute land and housing infrastructure, transform architectural, construction labour, and development practices, and redefine a role for the architect within the post-digital city. I argue that the politics of the platform is a matter of design. Through an expanded approach to architectural practice — which confronts the digital forces at play in the contemporary city — there is potential for architects to re-politicise the term 'disruption' towards housing equity and systemic change."

Source: Taylor&Francis (22 May 2023)

CLIMATE

Reduced Emissions During the Pandemic Led to Increased Climate Warming

The Covid pandemic shutdowns in South Asia reduced the concentration of short-lived cooling particles in the air, while the concentration of long-lived greenhouse gases was barely affected. Researchers were thus able to see how reduced emissions of air pollution leads to cleaner air but also stronger climate warming.

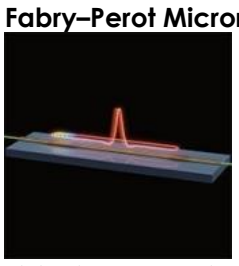
It is well known that emissions of sulphur and nitrogen oxides and other air pollutants lead to the formation of aerosols (particles) in the air that can offset, or mask, the full climate warming caused by greenhouse gases such as carbon dioxide and methane. But there has been a lack of knowledge about this 'masking effect.' In order to determine the size, large-scale experiments involving huge regions would be required – this is infeasible.

The Covid pandemic became such a 'natural' experiment. In the spring of 2020, the activity of many industries and transportation worldwide decreased due to pandemic restrictions. This created a unique opportunity to study what happens to the climate if emissions of gases and aerosols are rapidly reduced.

Source: EUREKALERT (31 May 2023)

LASER SOLITONS

Dissipative Kerr Solitons in Integrated Fabry–Perot Microresonators



Dissipative Kerr solitons (DKSs) in integrated microresonators have enabled breakthroughs in sensing, communication, and signal processing. So far, integrated DKS sources have relied exclusively on ring-type resonators where the resonator's dispersion is defined by its waveguide. Means of engineering the dispersion that go beyond modifying the waveguide's cross section are needed for accessing new wavelength and operating regimes. Here, we demonstrate DKS generation from a continuous-wave driving-laser in an integrated Fabry–Perot microresonator. In this topology, the dispersion is not dominated by the waveguide but by nanostructured photonic crystal mirrors. Leveraging wafer-level fabrication, high intrinsic Q-factors of four million are achieved and unintentional avoided mode crossings that can prevent DKS formation are absent. This establishes an integrated resonator topology for DKS generation and creates opportunities for alternative wavelength domains and approaches such as dispersion managed solitons or Nyquist solitons.

Source: Optica (23 May 2023)

LEARNING TO LOOK

Metadata for Image Search and Discovery

"How do you use a search engine to find images? What keywords will you use to improve your search results?

It can be difficult to translate what we want to see in an image into words. Humans can identify thousands of intertwined visual components of an image that aren't easily described by search terms. We can even imagine what an image might look like without knowing whether it even exists. A search engine lacks that creativity.

The power of the average human brain, at least at the moment, far outstrips the ability of any computer-based technology. While the brain is technically millions of times slower at performing basic computational steps than a computer, Liqun Luo at Stanford University reminds us that "humans triumph over computers in numerous real-world tasks—ranging from identifying a bicycle or a particular pedestrian on a crowded city street to reaching for a cup of tea and moving it smoothly to one's lips—let alone conceptualization and creativity."

Source: JSTOR (6 May 2023)

MEDTECH

Wearable Ultrasound Sees Deep Tissue on The Move

"Researchers have made the first wireless wearable ultrasound device that images tissue deep below the skin while patients move around freely. The system could allow doctors to monitor blood pressure, heart health, and lung capacity in real time while the wearer goes about their daily activities, including during workouts or other physical exertion.

"Clinicians want to know how those parameters change, say, with exercise, and they can't do that now," says Muyang Lin, a doctoral candidate in neuroengineering at the University of California, San Diego. "This kind of system has always been a dream for a lot of companies making ultrasound probes. But this is the first demonstration of such a system."

The credit-card-size ultrasound patch can monitor signals from tissues as deep as sixteen centimetres under the skin. It can continuously measure blood pressure, heart output, respiratory health, and other physiological signals for up to 12 hours on a single charge...'

Source: IEEE (26 May 2023)

METAVERSE

The Metaverse Can Lead to Better Science

"Along with co-authors Peter Schiffer (Department of Applied Physics and Department of Physics, Yale University) and Dashun Wang (McCormick School of Engineering, Northwestern University), Gómez-Zará defines the metaverse as a virtual space where users can interact in a three-dimensional environment and take actions that affect the world outside.

The researchers say the metaverse stands to benefit science in four main ways.

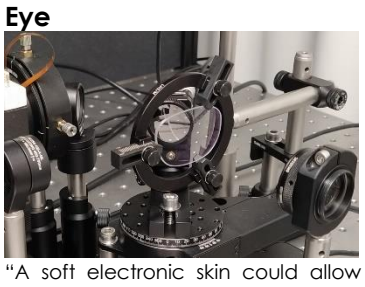
First, it could remove barriers and make science more accessible. To understand these opportunities, Gómez-Zará says, we need not speculate about the distant future. Instead, we can point to ways researchers have already begun using virtual environments in their work.

At the University College London School of Pharmacy, for example, scientists have made a digital replica of their lab that can be visited in virtual reality. This digital replica allows scientists at various points around the world to meet, collaborate and make decisions together about how to move a research project forward..."

Source: ND (25 May 2023)

OPTICS

Researchers Recreate a Near-sighted Eye



"A soft electronic skin could allow people with prosthetics to sense pressure and temperature, helping them to interact with their surroundings more easily.

Thin and stretchable like regular skin, the electronic skin sticks to surfaces like a Band-Aid. It contains sensors to measure external temperature and pressure, which it sends to an implanted electrode in the brain in the form of electrical signals. These signals vary in frequency to help the brain tell the difference between sensations like a softer touch and a firm handshake, a strawberry, and an apple, or hot and cold.

It was created by a team of researchers from Stanford University, who implanted soft e-skin electrodes in the brains of rats and recorded electrical signals from the animals' motor cortex, the region of the brain responsible for conducting voluntary movements. The animals twitched their legs in response to different levels of pressure recorded by the brain, depending on the strength of the stimulation frequency, demonstrating that the e-skin was able to detect differing levels of pressure in the same way that animals and humans can do ordinarily."

Source: APS (23 May 2023)

ROBOT

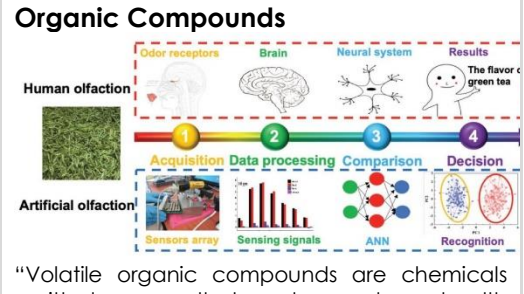
Should Robots Have Rights or Rites?

"BOSTON DYNAMICS RECENTLY released a video introducing Atlas, a six-foot bipedal humanoid robot capable of search and rescue missions. Part of the video contained employees abusing Atlas (for example, kicking, hitting it with a hockey stick, pushing it with a heavy ball). The video quickly raised a public and academic debate regarding how humans should treat robots. A robot, in some sense, is nothing more than software embedded in hardware, much like a laptop computer. If it is your property and kicking it harms no one nor infringes on anyone's rights, it's okay to kick it, although that would be a stupid thing to do. Likewise, there seems to be no significant reason that kicking a robot should be deemed as a moral or legal wrong. However, the question— "What do we owe to robots?"—is not that simple. Philosophers and legal scholars have seriously explored and defended some significant aspects of the moral and legal status of robots—and their rights.'

Source: ACM (24 May 2023)

SENSORS

Electronic Noses Sniff Out Volatile Organic Compounds



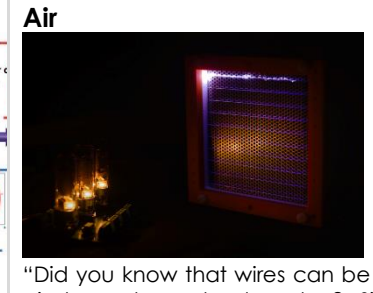
"Volatile organic compounds are chemicals emitted as gases that can have adverse health effects. They are often found in paints, pharmaceuticals, and refrigerants, among other common products, but they can also function as markers of explosives, insect infestation, food spoilage, and disease.

Tracing VOCs is important for public safety and all "smell" related issues. To this end, in Applied Physics Reviews, from AIP Publishing, Liu et al. introduced a fluid mechanics-based chamber design for an electronic nose (e-nose) that consistently detects VOCs at low concentrations. The strategy, which includes using a shuntlike device to control the behaviour of fluid flow, is a step forward in e-nose technology development."

Source: AIP (23 May 2023)

SOUND

Actively Reducing Noise by Ionizing Air



"Did you know that wires can be used to ionize air to make a loudspeaker? Simply put, it's possible to generate sound by creating an electric field in a set of parallel wires, aka a plasma transducer, strong enough to ionize the air particles. The charged ions are then accelerated along the magnetic field lines, pushing the residual non-ionized air in a way to produce sound.

If a loudspeaker can generate sound, it can also absorb it.

While this plasma loudspeaker concept is not new, EPFL scientists went ahead and built a demonstration of the plasma transducer, with the aim to study noise reduction. They produced a new concept, what they call the active "plasmacoustic metalayer" that can be controlled to cancel out noise. Their results are published in Nature Communications."

Source: EUREKALERT (11 April 2023)