Weekly Discovery
We SHARE to inspire and ignite ideas!

15 - 19 May 2023

ACCOUSTICS
A Cocktail Party of 3D-Printed Robot Heads #ASA184

"Human simulators that talk and listen to each other facilitate research on the head's acoustic properties for better designed audio devices.

Algorithms used to improve human hearing must consider the acoustic properties of the human head. For example, hearing aids adjust the sound received at each ear to create a more realistic listening experience. For the adjustment to succeed, an algorithm must realistically assess the difference between the arrival time at each ear and amplitude of the sound.

It is important to study human listening in natural environments, like cocktail parties, where many conversations occur at once.

"Simulating realistic scenarios for conversation enhancement often requires hours of recording with human subjects. The entire process can be exhausting for the subjects, and it is extremely hard for a subject to remain perfectly still in between and during recordings, which affects the measured acoustic pressures," said Austin Lu, a student member of the team. "Acoustic head simulators can overcome both drawbacks. They can be used to create large data sets with continuous recording and are guaranteed to remain still."

Source: ASA (10 May 2023)

ARTIFICIAL INTELLIGENCE
The Influence of AI On Trust in Human Interaction

"As AI becomes increasingly realistic, our trust in those with whom we communicate may be compromised. Researchers at the University of Gothenburg have examined how advanced AI systems impact our trust in the individuals we interact with.

In one scenario, a would-be scammer, believing he is calling an elderly man, is instead connected to a computer system that communicates through pre-recorded loops. The scammer spends considerable time attempting the fraud, patiently listening to the "man's" somewhat confusing and repetitive stories. Oskar Lindwall, a professor of communication at the University of Gothenburg, observes that it often takes a long time for people to realize they are interacting with a technical system.

He has, in collaboration with Professor of informatics Jonas Ivarsson, written an article titled Suspicious Minds: The Problem of Trust and Conversational Agents, exploring how individuals interpret and relate to situations where one of the parties might be an AI agent. The article highlights the negative consequences of harbouring suspicion toward others, such as the damage it can cause to relationships..."

Source: UG (8 May 2023)

ARTIFICIAL INTELLIGENCE
The open-source AI boom is built on Big Tech's handouts. How long will it last?


"New open-source large language models—alternatives to Google's Bard or OpenAI's ChatGPT that researchers and app developers can study, build on, and modify—are dropping like candy from a piñata. These are smaller, cheaper versions of the best-in-class AI models created by the big firms that (almost) match them in performance—and they're shared for free.

Companies like Google—which revealed at its annual product showcase this week that it is throwing generative AI at everything it has, from Gmail to Photos to Maps—were too busy looking over their shoulders to see the real competition coming, writes Sernau: "While we've been squabbling, a third faction has been quietly eating our lunch.""

Source: MIT Tech Review (12 May 2023)


FUEL CELLS
Nickel-Based Anode Catalysts for Efficient and Affordable Anion-Exchange Membrane Fuel Cells
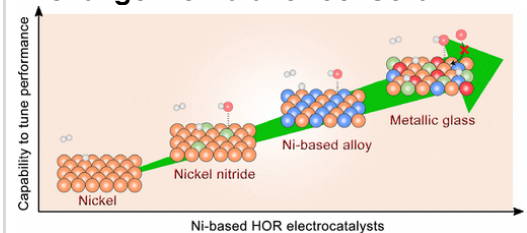
"The term "hydrogen economy" was coined by John Bockris in the 1970s and describes a scenario in which green hydrogen can be produced from water using renewable sources (e.g., solar and wind) and transported via pipeline to buildings, homes, and fuelling stations, where it would be used to power on-site fuel cells to meet energy demands. (5) Low-temperature ion-exchange membrane hydrogen fuel cells, which include proton-exchange membrane fuel cells (PEMFCs; Figure 1a) and anion-exchange membrane fuel cells (AEMFCs; Figure 1b), are at the forefront of hydrogen utilization techniques…"

Source: ACS (11 May 2023)

IMAGING
Researchers Publish Findings from 'Super-Resolution' Imaging Technology
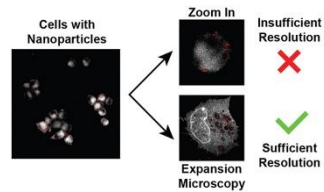
""To see nanomedicines in biological samples, researchers either use electron microscopy, which provides excellent spatial resolution but lacks 3-D imaging capabilities, or optical microscopy, which achieves excellent 3-D imaging, but exhibits relatively low spatial resolution," Wilhelm said. "We demonstrate that we can perform 3-D imaging of biological samples with electron microscopy-like resolution. This technique, called super-resolution imaging, allows us to see nanomedicines inside individual cells. Using this new super-resolution imaging method, we can now start to track and monitor nanoparticles inside cells, which is a prerequisite for designing nanomedicines that are safer and more efficient in reaching certain areas within cells."

Source: OU (9 May 2023)

IOT
### Tracing Interior Space / Ambientdesigns

"Tracing - Interior design for a complex consisting of a 'gallery' for exhibitions of pop art, fashion, and commercials, a 'store' for sales of exhibition-related goods, and a 'studio' for filming and recording. The floor plan takes into account the fact that the site is a street-level tenant on Omotesando and the deep plan shape and is arranged in the following order from the front: store, gallery, and studios for use by related parties only.

The image of the facility presented by the client was that of a 'kiosk' on the street or at a station. Therefore, we aimed to create a kiosk-like atmosphere by designing the walls of the store space facing the street by 'tracing' the scale and proportions of the elements that make up a typical 'kiosk'. This thinking was extended to VMD and sign design. For example, in VMD, industrial products similar in size to those generally displayed in kiosks were displayed. And in the sign design, the No Trespassing sign fitting to separate the store from the gallery was made of transparent natural stone and vinyl rope in the form of 'Tomeishi' which is used in Japanese gardens, to match the interior design. In a highly commercial site, the project focused on visually communicating the client's activities and used the tracing method to set up the space."

Source: ArchDaily (14 May 2023)


MATERIALS
Unveiling The Structural Transformation and Activity Origin of Heteroatom-Doped Carbons for Hydrogen Evolution

Allotropes of carbon

Graphite Structure   Diamond Structure
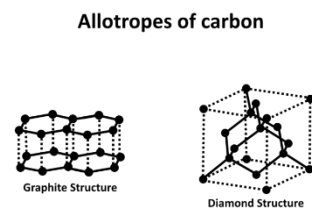
"Heteroatom-doped carbon materials are important electrocatalysts for the hydrogen evolution reaction (HER). The C atoms adjacent to the dopants are usually considered the origin of the high activity of the HER based on the assumption that these doped carbon materials remain stable during the HER. The experiments and theoretical calculations reveal that the dopants are removed during the HER, while the neighbouring C atoms are hydrogenated by the intermediate (H*) of the HER and reconstitute to form active 5,7-topological rings (G5-7). This work not only provides insight into understanding heteroatom-doped carbon materials as HER electrocatalysts but also inspires researchers to rethink the reaction mechanism when using heteroatom-doped carbon materials as electrodes for electrocatalytic oxygen reduction and CO_2 reduction reactions."

Source: PNAS (8 May 2023)

NATURAL SCIENCE
### Why Do We Love Thinking About Schrödinger's Cat?
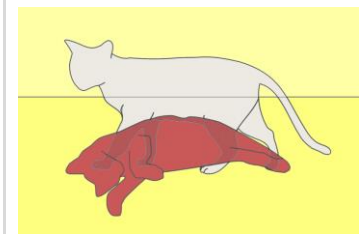
"In 1929, Austrian physicist Erwin Schrödinger came up with a ground-breaking equation that could accurately predict the behaviour of a system of subatomic particles. It also showed that at the tiny quantum scale things behaved much differently than in the big world we can see. It suggested that people might only be able to understand the behaviour of electrons as probabilities. Perhaps, some physicists argued, two incompatible states somehow existed simultaneously until an event known as "wave-function collapse," when they took one path or the other. Schrödinger found this idea unacceptable.

"He is known to have said that he hated his equation for its consequences for the nature of reality," Ryan writes."

It's in this spirit that he created his famous thought experiment, which was only a short paragraph in a 1935 paper. The idea is that the cat's fate depends on the behaviour of a subatomic particle, so it remains both alive and dead until the collapse of the wave function. The point, Schrödinger wrote, was that this "ridiculous" scenario should discourage us from "naively accepting as valid a 'blurred model'" of reality."

Source: JSTOR (14 May 2023)

QUANTUM COMPUTING
Chip Charts Course for Quantum-Computer Scaling
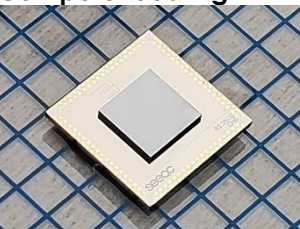
"Quantum computers can, in theory, find answers to problems that classical computers would take eons to solve, but researchers currently face great challenges scaling them up for practical use. Recently, a quantum-computing startup unveiled the first digital superconducting microchip to control quantum processors, which the company suggests might help qubits reach their ultrafast and high-efficiency potential.

The more qubits that are quantum mechanically linked together via entanglement, the more computations that can be performed in an exponential fashion. Google, IBM, and other tech giants are developing quantum computers using superconducting circuits as qubits because such hardware appears to be scalable to thousands of qubits in the near future."

Source: IEEE (12 May 2023)

ROBOTICS
Intrinsic's Flowstate Seeks to Simplify Industrial Robotics

Intrinsic's Flowstate developer environment is intended to take diverse robotic hardware and make it all programmable through one single accessible software system. If that sounds kind of like what Open Robotics' Robot Operating System (ROS) does, well, that shouldn't be much of a surprise. Here are some highlights from the press release:

- Includes a graphical process builder that removes the need for extensive programming experience.

- Behaviour trees make it easy to orchestrate complex process flows, authored through a flowchart-inspired graphical representation.

- Lay out a workcell and design a process in the same virtual environment, in the cloud or on-premises.

- Simulate and validate solutions in real time (using Gazebo) without touching a single piece of hardware.

- Encode domain knowledge in custom skills that can be used and reused, with basic skills like pose estimation, manipulation, force-based insertion, and path planning available at launch.

Fully configured development environment provides clear APIs to contribute new skills to the platform

Source: IEEE (15 May 2023)

ROBOTS
### Can't find your phone? There's a robot for that

"Engineers at the University of Waterloo have discovered a new way to program robots to help people with dementia locate medicine, glasses, phones, and other objects they need but have lost.

And while the initial focus is on assisting a specific group of people, the technology could someday be used by anyone who has searched high and low for something they've misplaced."

Source: UWaterloo (15 May 2023)

SUPERCONDUCTIVITY
Absence of near-ambient superconductivity in LuH2±xNy
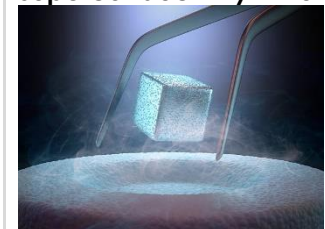
"Recently near-ambient superconductivity was claimed in nitrogen-doped lutetium hydride1. This stimulates a worldwide interest about exploring room temperature superconductivity under low pressures. By using a high pressure and high temperature synthesis technique, we have successfully obtained the nitrogen doped lutetium hydride (LuH2±xNy) with a dark-blue colour and a structure with the space group of Fm3̄m evidenced by x-ray diffraction. This structure is the same as that reported in ref. 1, with a slight difference in lattice constant. The Raman spectroscopy also shows similar patterns between our samples and that in ref. 1. The energy dispersive X-ray spectroscopy (EDS) confirmed the existence of nitrogen in the samples."

Source: Nature (11 May 2023)