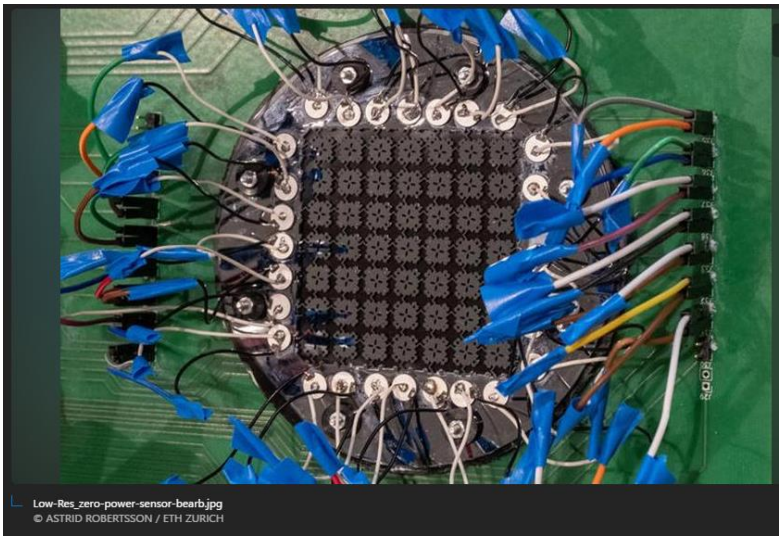
Show Notes 1 March 2024

Story 1: New invention could get rid of millions of batteries, scientists say.

Source: The Independent Story by Andrew Griffin

Link: https://www.independent.co.uk/tech/batteries-invention-power-sound-energy-b2488170.html



- A new sensor has the potential to get rid of millions of batteries, its creators say.

- At the moment, sensors are used across the world in a variety of critical contexts: those that monitor buildings for dangerous sounds, for instance, or others that help people who are deaf. But they require constant power and tend to rely on disposable batteries that must be regularly changed and generate vast amounts of rubbish. *[my comment, don't forget battery operated fire/smoke alarms].*

- One EU study has suggested that by 2025, 78 million batteries will be binned each day. Every one of those batteries relies on materials that can be difficult to gather and unsustainable to get rid of.

    - **My side research** - 3 billion dry-cell batteries are purchased by Americans every year to power radios, toys, cell phones, watches, laptop computers and portable power tools.

- Now researchers at ETH Zurich say they have built a mechanical sensor that requires no power at all and could help prevent some of that battery waste.

- According to Johan Robertson, from ETH Zurich, one of the leaders of the new work, *"It simply utilizes the vibrational energy contained in sound waves."*

- And this technology is able to respond to a particular sound: a certain word being spoken, or a particular noise being generated. Only that specific set of sound waves will cause the sensor to vibrate, which generates an electrical pulse that switches on an electronic device, showing that the sensor has been triggered.

- The sound-based mechanical system is even able to distinguish between words. It can tell the difference between the words "three" and "four" purely by the sound energy, its creators say.

- The ETH Zurich team wants to be able to create even more complex abilities in the future. That could include the option to distinguish between as many as 12 different words – they could be commands such as "on" and "off", which could prove useful for controlling machines.

- For example, the sensors could be used for monitoring earthquakes or buildings listening for when a building cracks in a way that might be dangerous. It could also be used for oil wells, being used to listen for escaping gas that might pose a danger.

- Researchers also suggest the system could be useful for health devices [such as hearing aids] – or it could lead to entirely new sensors that might be smaller since they do not need a battery, such as systems to measure eye pressure.

- The development of the sensor is described in a new paper, '*In-Sensor Passive Speech Classification with Phononic Metamaterials'*, published in the journal

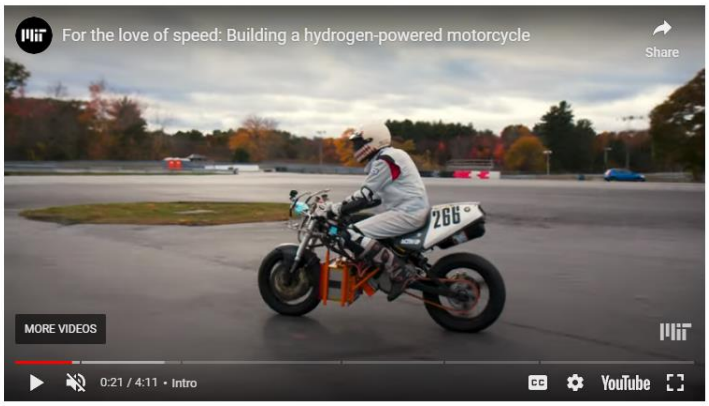
Advanced Functional Materials. See: https://onlinelibrary.wiley.com/doi/full/10.1002/adfm.202311877

Story 2: MIT team creates open-source hydrogen fuel cell motorcycle - *The Electric Vehicle Team has designed a motorcycle powered by H2 that can be built by riders.*

Source: Hydrogen Fuel News Story by Bret Williams

Link: https://www.hydrogenfuelnews.com/hydrogen-fuel-cell-mit-motorcycle/8562427/

See also: https://evt.mit.edu/blog/2022-12-10-hydrogen-powered-bike-intro/



See video here: https://www.bing.com/videos/riverview/relatedvideo

- MIT's hydrogen fuel cell motorcycle is designed to use an engine and body parts that can be easily swapped out, so it will be simpler to repair, maintain, and even experiment on than a comparable vehicle built with its own unique parts.

- The MIT team will be publishing its plan online so that riders will be able to build their own versions of the motorcycle. The vehicle built by the team has already undergone its own full test-track demonstration, which took place in October 2023.

- According to the team, the H2 motorcycle wasn't designed with competitions or races in mind but was instead created as a machine to be presented at conferences and other similar events.

- The team first started its work on the vehicle in January 2023 and unveiled it for the first time in October 2023 at the Hydrogen Americas Summit. More recently, the team placed it in the spotlight at CES 2024. In May, the H2 motorcycle will travel to the Netherlands where it will be shown off at the World Hydrogen Summit.

- Many of the components used by the team when creating their hydrogen fuel cell motorcycle were donated by industry sponsors. This included the fuel cell itself. The first few tests the vehicle underwent were on a dynamometer (a device like a treadmill for small vehicles) instead of a real road.

- Per the MIT team, *"The open-source community has solved many of the world's challenges in the past by sharing knowledge and collaborating on difficult problems—we believe this is necessary right now for the realization of Fuel Cell Electric Vehicles".*

Story 3: A climate-friendly way to capture carbon dioxide in the air [using geothermal energy]

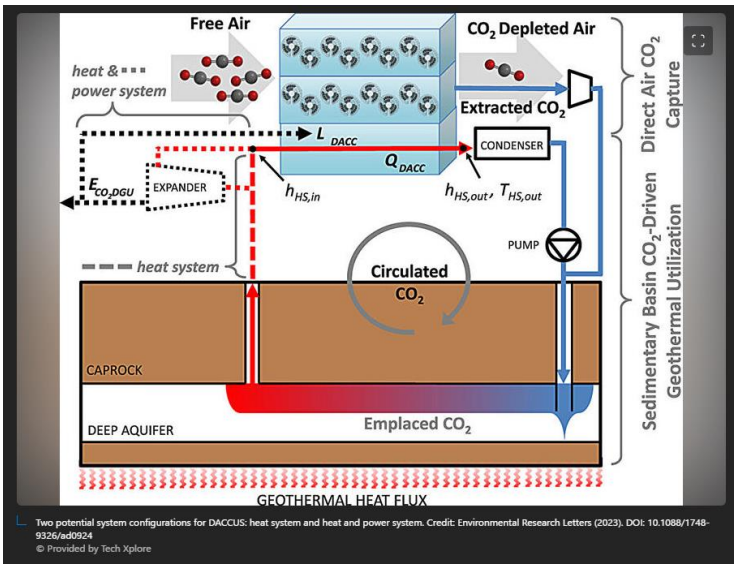
Source: Technology.org

Link: https://www.technology.org/2024/02/21/a-climate-friendly-way-to-capture-carbon-dioxide-in-the-air/

Source: TechXplore Story by Tatyana Woodall

Link: https://www.msn.com/en-us/weather/topstories/a-geothermal-powered-climate-friendly-way-to-capture-carbon-dioxide-in-the-air/ar-BB1ioYYa

More information: Martina Leveni et al, A potential for climate benign direct air CO2 capture with CO2-driven geothermal utilization and storage (DACCUS), Environmental Research Letters (2023). DOI: 10.1088/1748-9326/ad0924



- Researchers at Ohio State University have developed a method for capturing atmospheric carbon dioxide powered by clean and relatively inexpensive geothermal energy.

- Their findings, published in the journal *Environmental Research Letters*, reveal that by combining direct air carbon dioxide capture technologies and geothermal energy, large-scale carbon dioxide removal systems could potentially be supplied with enough energy to remove carbon dioxide from the atmosphere and safely store it underground.

- Called Direct Air CO2 Capture with CO2 Utilization and Storage (DACCUS), Martina Leveni, lead author of the study, proposed method uses the natural heat stored beneath the Earth's surface within deep saline aquifers – underground geologic formations containing sedimentary rock and saltwater – to continuously produce renewable energy for a system they call, once again, "Direct Air CO2 Capture with CO2 Utilization and Storage".

- The carbon dioxide captured from the air is isolated in these geologic formations, and part of it can be circulated to extract the geothermal heat. This circulation brings the heat to the surface, where it can either be used directly or converted to electricity to power the system.

- To demonstrate the potential of their system, the researchers developed a case study of how it might work in the U.S. Gulf Coast region. They determined that Direct Air CO2 Capture with CO2 Utilization and Storage systems could be

deployed there to great success, due to the Gulf Coast region being well-known for having ample geothermal resources.

- Assuming their system could be operational by 2025, the Ohio State University study suggests its method could start removing carbon by 2030. The researchers estimate there could be as many as 25 Direct Air CO2 Capture with CO2 Utilization and Storage systems set up in just one of the 27 geologic formations in the Gulf Coast by 2050.

Story 4: Plant-Based Soft Medical Robots

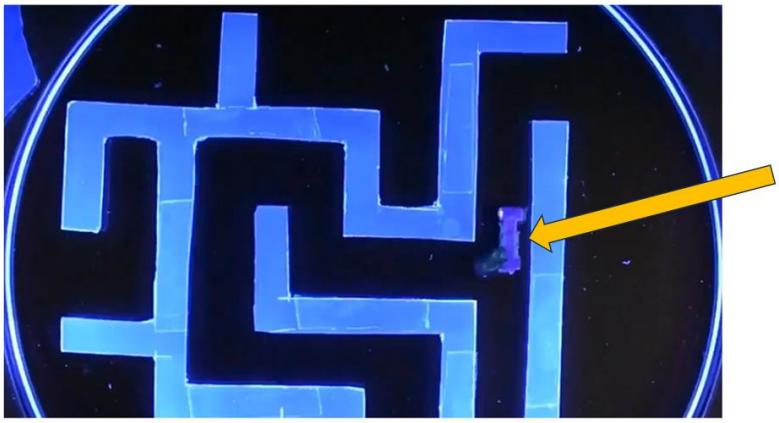
Source: Medgadet.com Story by Conn Hastings

Link: WARNING – the story below comes from Medgadget.com, but when I try the link I now get a warning, very weird, may be temporary.
https://www.medgadget.com/2023/12/plant-based-soft-medical-robots.html

So here is an alternative source: ScienceDaily.com
https://www.sciencedaily.com/releases/2023/10/231023124412.htm

See video here: https://www.youtube.com/watch?v=9G3K5SaTGDE

Soft, plant-based medical robot being guided through a maze!



- Researchers at the University of Waterloo in Canada have developed plant-based microrobots that are intended to pave the way for medical robots that can

enter the body and perform tasks, such as obtaining tissue for a biopsy or performing a surgical procedure.

- The robots [which are a maximum of one centimeter in length] consist of a hydrogel material that is biocompatible, and the composite contains cellulose nanoparticles derived from plants.

- The researchers can tune the orientation of the cellulose nanoparticles such that they respond in predictable ways when exposed to certain chemical cues such as changes in pH.

    - This includes changing the shape of the tiny robots so that they are better adapted to their immediate environment.

    - And by incorporating magnetic elements the robots can be moved using external magnetic fields to deliver cargoes, such as drugs, to different areas of the body.

- The soft material also has self-healing properties, meaning that it can be cut and stuck back together without any adhesive, potentially allowing clinicians to easily customize it for different applications depending on the required size and shape.

- In tests so far, the researchers have been able to manipulate the robots to travel through a maze, suggesting that they may be able to navigate our tortuous vasculature.

Honorable Mentions:

Story: 'Flying over water': Why this electric car-boat vehicle will move like a plane

Source: USA Today Story by Anthony Robledo

Link: https://www.msn.com/en-us/travel/news/flying-over-water-why-this-electric-car-boat-vehicle-will-move-like-a-plane/ar-BB1it2Hz

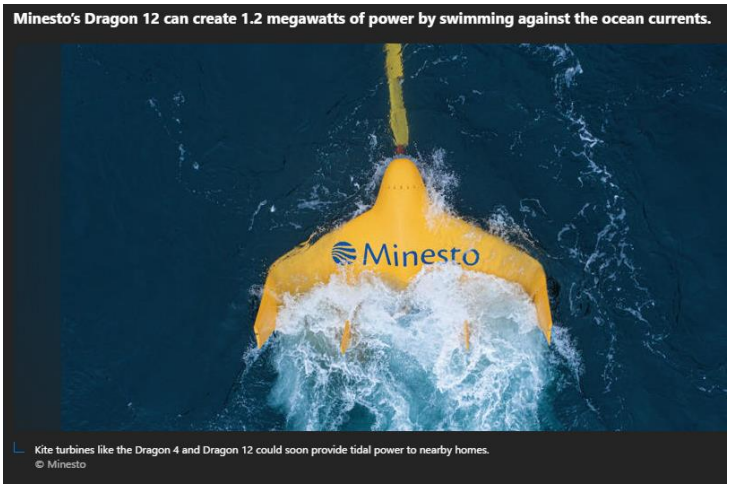
- Flying cars are no longer a thing of the future, and neither is the need to choose between commuting on land or sea, at least for those who live by the water.

- Poseidon AmphibWorks, a company based in San Diego and Miami, plans to revolutionize the car-boat vehicle by delivering a what it says will be a tranquil experience, whether you're on a busy freeway or in a bustling bay. Since most existing amphibious vehicles move over water as bumpy as a jet ski, CEO and founder Steve Tice said he sought to create a vehicle for the day-to-day commute.

Story: Huge underwater 'kite' turbine powered 1,000 homes in the Faroe Islands

Source: Popular Science Story by Andrew Paul

Link: https://www.msn.com/en-us/news/technology/huge-underwater-kite-turbine-powered-1-000-homes-in-the-faroe-islands/ar-BB1ie45n



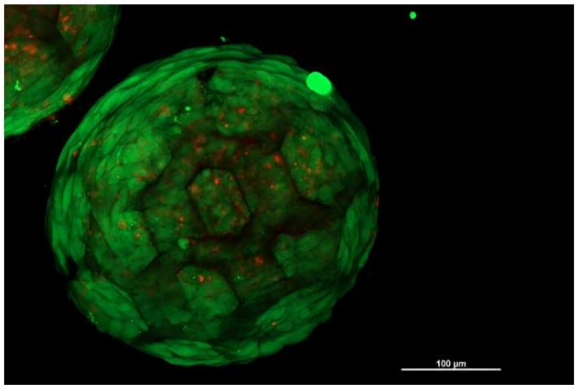
- It's been over a decade since PopSci last checked in on Minesto's underwater "kite" turbine technology. Since then, the Swedish green energy startup has made some big strides in their creative approach to generating clean electricity from swimming against the ocean currents.

- On February 9, Minesto announced a major moment for their largest creation. A nearly 40-foot-wide, 30-ton, highlighter yellow Dragon 12 "tidal power plant" delivered its first 1.2 megawatts (MW) of energy to the Faroe Islands' national grid. That's enough power to sustain a small town of 1,000 homes.

Story: A new approach to producing artificial cartilage with the help of 3D printing

Source: Phys.org Story by Aleksandr Ovsianikov

Link: https://phys.org/news/2024-02-approach-artificial-cartilage-3d.html



One of the spheroids. Credit: Vienna University of Technology

- Is it possible to grow tissue in the laboratory, for example to replace injured cartilage? At TU Wien (Vienna), an important step has now been taken toward creating replacement tissue in the lab—using a technique that differs significantly from other methods used around the world. The study is published in Acta Biomaterialia.

- A special high-resolution 3D printing process is used to create tiny, porous spheres made of biocompatible and degradable plastic, which are then colonized with cells. These spheroids can then be arranged in any geometry, and the cells of the different units combine seamlessly to form a uniform, living tissue. Cartilage tissue, with which the concept has now been demonstrated at TU Wien, was previously considered particularly challenging in this respect.