Show Notes 9 February 2024

Story 1: Watch a robot with living muscles walk through water

Source: NewScientist.com Story by James Woodford

Link: https://www.newscientist.com/article/2414165-watch-a-robot-with-living-muscles-walk-through-water/

See video here: https://www.youtube.com/watch?v=IesRn6ca-ws

See related news: Experts craft waterproof, low-voltage artificial muscles for bot motion.


The biohybrid robot containing muscle tissue, standing in a tank of water
Shoji Takeuchi research group, University of Tokyo (CC-BY SA)

- A tiny, bipedal robot created by researchers at the University of Tokyo combines muscle tissue [grown from rat cells in a laboratory] with artificial materials to be able to walk and turn by contracting its muscles.

- **<u>Upfront Reality check</u> -** The robot, which is only 3 centimeters tall, cannot support itself in the air [i.e. outside of the water tank used for the experiment] and has a foam buoy to help it stand up in the water tank.

    - *My comment, this is very, very early research, but is a good example of a key trend to watch – i.e.* **<u>biohybrid robots</u>**.

- While biohybrid robots that crawl and swim have been built before with lab-grown muscle, <u>this is the first such bipedal robot that can pivot and make sharp turns</u>.

- It does this by applying electricity to one of its legs to make the muscle contract, while the other leg remains anchored. The muscle acts as a biological actuator – a component that converts electrical energy into mechanical force.

- *"This is still basic research,"* says a team member at the University of Tokyo. *"We are not at the stage where this robot itself can be used anywhere. To make it work in the air, many more related issues would need to be solved, but we believe it can be done by increasing the muscular strength."*

- The robot is still extraordinarily slow by human standards, moving just 5.4 millimeters [0.213 inches] per minute. It also takes over a minute to turn 90 degrees, with electric stimulation every 5 seconds.

- The research team hopes they can make the robot faster by optimizing the pattern of electrical stimulation and improving the design.

- According to the University of Tokyo scientists, "*The next step for the biohybrid robot would be to develop a version with joints and additional muscle tissues for more sophisticated walking capabilities. Thick muscles would also need to be built to increase strength."*

- To walk in air rather than water, the robot would also need a nutrient supply system to keep the muscle tissue alive.

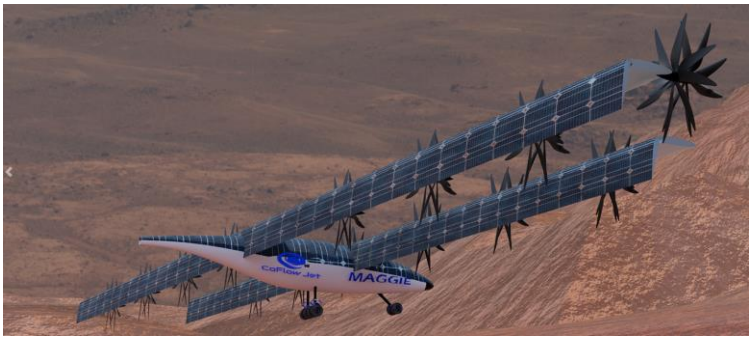
Story 2: NASA plans massive solar-powered electric plane for Mars mission.

Source: Interesting Engineering Story by Mrigakshi Dixit

Link: https://interestingengineering.com/innovation/maggie-nasa-solar-powered-electric-plane-mars

See also: https://www.nasa.gov/general/mars-aerial-and-ground-global-intelligent-explorer/

See also: https://mashable.com/article/nasa-mars-plane



- After successfully testing the functioning of the Ingenuity helicopter on Mars, NASA is aiming for something big and bold.

- NASA has unveiled a one-of-a-kind futuristic concept for flying a “fixed-wing aircraft” above the Martian surface.

- This concept, dubbed Mars Aerial and Ground Intelligent Explorer (MAGGIE), was recently announced under the NASA Innovative Advanced Concepts Program.

- According to a NASA blog post, *“MAGGIE is a compact fixed-wing aircraft with ultra-high productivity efficiency powered by solar energy to fly in the Martian atmosphere.”*

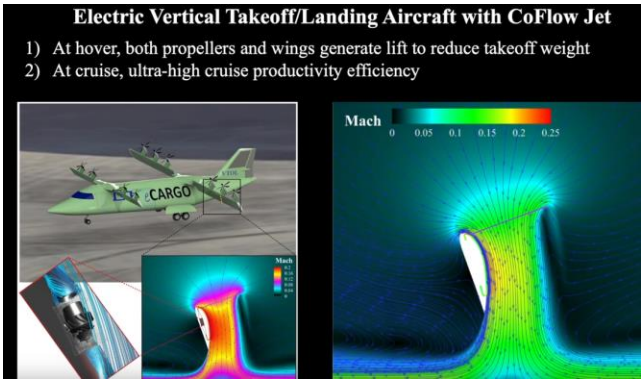
- It has a wingspan of approximately 26 feet [7.85 meters]. And its power source is solar energy.

- This next-generation aircraft would be capable of doing global-scale atmospheric measurements on Mars, ushering in a new age of space technology.

- What's more, this airborne mission would leverage the rapidly evolving vertical take-off/landing (VTOL) technology. VTOL refers to an aircraft's ability to ascend into the air and descend back to the ground vertically without the need for a runway.

- The concept has been proposed by US-based aerospace company Coflow Jet, LLC.

    - Side note, see 2021 video from Coflow Jet that explains their VTOL technology, https://www.youtube.com/watch?v=8XvNts_Hb4M



- MAGGIE's mission involves a comprehensive exploration strategy, aiming to unravel mysteries related to Martian geophysics, atmospheric chemistry, and the planet's potential for supporting past or present life.

- The data collected will be instrumental in advancing our knowledge of Mars and expanding the possibilities for future exploration and research.

- MAGGIE would be developed in such a way that it could travel 179 kilometers at 1,000 meters altitude on a fully charged battery in 7.6 Martian days.

- MAGGIE's entire range is estimated to be an impressive 16,048 kilometers [9,972 miles] during a Martian year.

- MAGGIE would perform at least three extensive atmospheric and geophysical studies during its mission, according to current preliminary plans. Among the set science goals, NASA aims to study the origin and timing of the Martian core dynamo, investigate the source of methane signals in Gale Crater, and map subsurface water ice in the mid-latitudes.

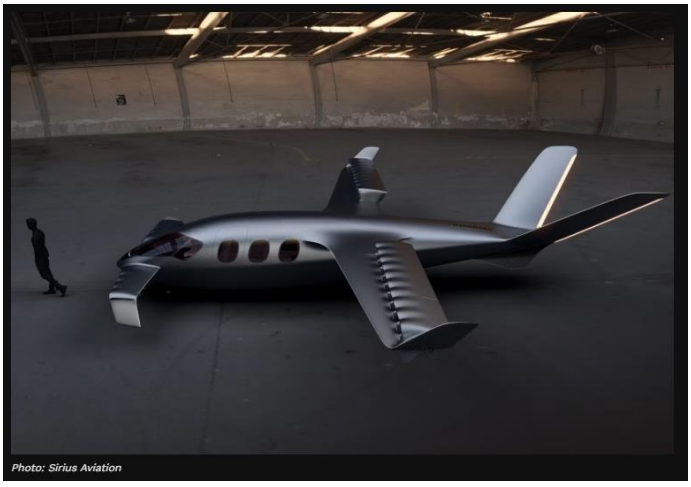
    - **Time out, what is the Martian core dynamo?** Mars had a global magnetic field much earlier—and much later—in the planet's history than scientists have previously known. A planet's global magnetic field arises from what scientists call a dynamo: a flow of molten metal within the planet's core that produces an electrical current. Source: https://scitechdaily.com/scientists-were-way-off-on-the-martian-dynamo-very-different-from-what-we-thought/

- NASA highlights that the successful demonstration of this aircraft technology on Mars could serve as a pioneering step, paving the way for similar aerial missions on other planets within our solar system.

Story 3: Meet The Sirius Jet: The World's First Hydrogen-Powered VTOL

Source: Simple Flying Story by Vyte Klisauskaite

Link: https://simpleflying.com/sirius-jet-hydrogen-powered-evtol/



- Swiss startup Sirius Aviation recently unveiled the world's first hydrogen-powered vertical takeoff and landing (VTOL) aircraft, the Sirius Jet. The company claims that this new zero-emissions jet will make its first test flight in 2025.

- Created in collaboration with BMW, the advanced hydrogen-powered Sirius VTOL promises to offer enhanced power and capabilities, surpassing battery-powered competitors like Germany's Lilium eVTOL [see photo below].

- The startup company claims that the Sirius VTOL will achieve a maximum range of 1,850 kilometers (1,150 miles) at speeds reaching up to 520 kilometers (323 miles) per hour.

- The use of liquid hydrogen propulsion is key to achieving these feats. Liquid hydrogen's superior energy density allows vehicles to travel longer distances compared to gaseous hydrogen or batteries, all without adding extra weight.

- Notably, the aircraft will offer near-silent operations by generating approximately 95% less noise than a helicopter, allowing it to operate near communities with minimal noise impact.

- In terms of safety features, in the event of a critical emergency, the Sirius Jet's Emergency Parachute System is programmed to deploy automatically, providing an additional layer of safety assurance.

- Sirius Aviation's cadre of more than 100 engineers pursued a two-year research and development initiative for their latest jet, according to the company. The plane maker also said that they have initiated the certification process with the US Federal Aviation Administration (FAA).

- After obtaining full certification (which is hoped to take place by 2026), Sirius plans to commence commercial deliveries and shuttle flights by 2028.

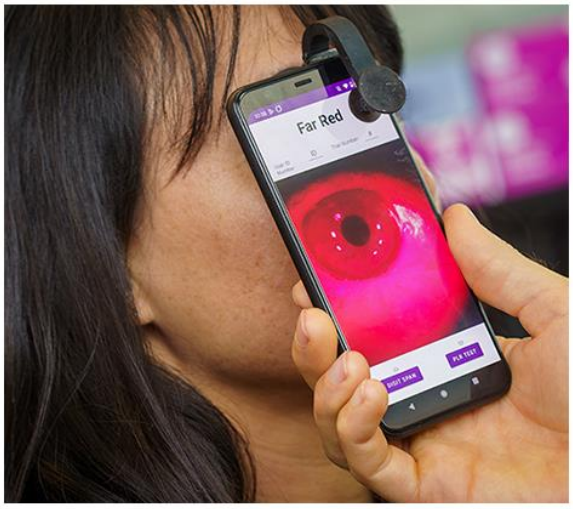
- **Reality check** - the Sirius Aviation team stated: "*While hydrogen is a promising path toward achieving clean short-range and regional aviation, many challenges remain to overcome before it can be widely adopted. The use of liquid hydrogen, in particular, poses significant logistical and technological hurdles due to the need to keep it at extremely low temperatures throughout the distribution and flight process.*"

Story 4: Phone Attachment for Pupil Measurements with Any Skin Tone

Source: Medgadget.com Story by Conn Hastings

Link: https://www.medgadget.com/2023/11/phone-attachment-for-pupil-measurements-with-any-skin-tone.html

See also: Study in Scientific Reports: Racially fair pupillometry measurements for RGB smartphone cameras using the far-red spectrum



- A research team at the University of California San Diego has developed a smartphone attachment that can provide information on changes in pupil size, which can be used to assess neurological phenomena, such as traumatic brain injury and Alzheimer's disease.

- **Here's the problem**, **and why what we're going to highlight is so important** - our natural [racial] diversity in terms of skin tone and melanin content in the iris has meant that for those with dark eyes and dark skin, it can be difficult to get an accurate measurement in pupil size changes. And it can be challenging to distinguish between the iris and the pupil.

- Engineers within ophthalmology have known for some time that conventional cameras are not suitable for pupil size measurements in those with dark eyes.
    - To date, one answer has been to use infrared cameras, but such cameras are typically only present on high-end smartphones, which limits the pool of people who could use such technology.

- Here's what the University of California San Diego team did to overcome this problem:

    - This latest smartphone attachment fits over the camera of a smartphone and uses a filter to restrict the light entering the camera to far-red light.
        - **Side note** - Far-red light is a range of light at the extreme red end of the visible spectrum, just before infrared light.

    - It is placed over the camera and then placed over the eye, where the camera flashes the eye with bright light and records video of the pupil movement. In tests so far, the device could assess pupil responses in a group of volunteers with different eye colors.

    - This solution makes the iris appear lighter in the resulting images and helps the technology to distinguish between iris and pupil, providing more robust diagnostics for those with dark eyes.

    - This latest device works with a conventional smartphone camera, and instead uses far-red light, which is still within the visible spectrum and therefore detectable with a regular camera.

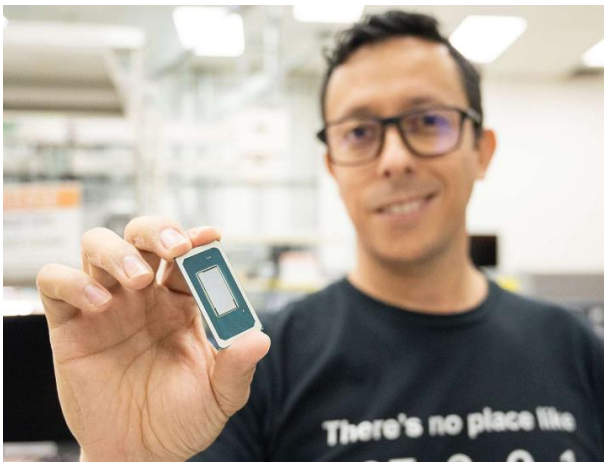
- *“The issue with relying on specialized sensors like an infrared camera is that not all phones have it,”* said Colin Barry, another researcher involved in the project. *“We created an inexpensive and fair solution to provide these kinds of emerging neurological screenings regardless of the smartphone price, make or model.”*

Honorable Mentions:

Story: What is an AI PC? ('Look, Ma! No Cloud!')

Source: Intel Newsroom Story by Jane McEntegart

Link: https://www.intel.com/content/www/us/en/newsroom/news/what-is-an-ai-pc.html



- An AI PC has a CPU, a GPU and an NPU, each with specific AI acceleration capabilities. An NPU, or neural processing unit, is a specialized accelerator that handles artificial intelligence (AI) and machine learning (ML) tasks right on your PC instead of sending data to be processed in the cloud. The GPU and CPU can also process these workloads, but the NPU is especially good at low-power AI calculations. The AI PC represents a fundamental shift in how our computers operate. It is not a solution for a problem that didn’t exist before. Instead, it promises to be a huge improvement for everyday PC usages.

- So how does it work? Compared to generative AI and the massive, large language models (LLMs) trained on tons of public data, the AI that will happen on your PC is more accessible on pretty much every level. The concept is easier to

digest, and because it's trained on your data, without needing to access the cloud, the benefits are more immediately appealing to a broader population.

- In the near-term, the AI PC world involves personal assistants and smaller AI models running directly on your PC, using your data to offer personal, private, more secure AI enhancements for things you already do every day – taking meeting minutes, organizing a fantasy football league, automating enhancements for photo and video editing, or laying out the perfect itinerary for a family reunion based on everyone's arrival and departure times.

Story: The ShAPE of Buildings to Come: Scrap Aluminum Transforms Recycling Life Cycle

Source: Pacific Northwest National Laboratory Story by Karyn Hede

Link: https://www.pnnl.gov/news-media/shape-buildings-come-scrap-aluminum-transforms-recycling-life-cycle

See video here: https://www.youtube.com/watch?v=Gg7QBhvmp3c

- The circular economy just closed the loop on scrap aluminum, thanks to a new patent-pending technology developed at the Department of Energy's Pacific Northwest National Laboratory. That twisted aluminum mesh, those banged up bicycle frames, and the used car parts now languishing in junk yards could gain new life as building structures such as door and window frames, facades, lighting, decorative features, and a myriad of other uses—all while conserving nearly all the energy required to manufacture new aluminum products.

- It’s no secret that strong, yet light-weight aluminum parts are being deployed more often as building materials. But there’s a high energy and greenhouse gas emissions cost to mining and refining aluminum. According to the International Aluminum Institute, the production of 1 ton of primary aluminum emits an average of 17 tons of carbon dioxide into the atmosphere.

- Now, rather than processing mined aluminum, rigorous laboratory testing has shown that PNNL’s Shear Assisted Processing and Extrusion Process (ShAPE™) can transform 100 percent post-consumer scrap aluminum into usable extrusions that meet or exceed stringent ASTM standards for strength and flexibility for common building-grade alloys 6061 and 6063. The ShAPE technology unlocks the possibility of creating circularity in aluminum scrap markets, thus reducing dependency on imported primary aluminum and the massive amounts of energy associated with its production.

Story: World’s first cabin-less electric skid steer debuts with remote power
****looks like a mini bulldozer****

Source: Interesting Engineering Story by Can Emir

Link: https://interestingengineering.com/transportation/firm-debuts-first-ever-cab-less-electric-skid-steer-prioritizing-safety

- In a bold move towards innovation, Firstgreen Industries, previously known as Kovaco Electric, has introduced the "world’s first cabinless remotely operated electric skid steer" – the Elise CBL.

- This revolutionary machinery is designed to redefine safety and efficiency standards in high-risk environments, providing a fully remote-controlled, full-sized skid steer with zero emissions.