Show Notes 19 September 2025

Story 1: Researchers building RoboBalls to explore other planets

Source: The Purdue Exponent, a student-run newspaper serving the Purdue community in West Lafayette, Indiana Story by Dean Murray

Link: https://www.purdueexponent.org/news/national/researchers-building-roboballs-to-explore-other-planets/article_2c06a5ae-3b24-5834-bfc8-9f7df72e299c.html

See the school's website for the project: https://rad.engr.tamu.edu/roboball-i/

See the school's video here: https://www.youtube.com/watch?v=tKRN0EEJ5VE

See video here: https://www.facebook.com/reel/637417789106125

And see video posted on this article from MSN: https://www.msn.com/en-gb/video/news/researchers-working-on-swarm-of-roboballs-to-send-to-other-planets/vi-AA1LSgsN?t=72


(Texas A&M Engineering via SWNS)


Rishi Jangale and Derek Pravecek with RoboBall III. (Pix via Texas A&M Engineering / SWNS)

- Researchers [at Texas A&M University] are working on a swarm of RoboBalls to send to other planets.

- The spherical robots would be deployed to map alien landscapes by rolling around challenging terrain.

- The concept was first conceived by Dr. Robert Ambrose while working at NASA in 2003.

- After joining Texas A&M University in 2021, Dr. Ambrose reignited the idea and now a small team is working to make RoboBall fit for outer space use.

- Graduate students Rishi Jangale and Derek Pravecek, both from Texas A&M's mechanical engineering department, are the primary researchers who are driving the project forward.

- Two versions exist: the smaller RoboBall II prototype with a diameter of 2 feet, and the RoboBall III, which is 6 feet across and built with plans to carry payloads such as sensors, cameras or sampling tools for real-world missions.

- **Details on the mechanics** *[input I inserted and not covered in the article]*

    - RoboBall II uses a two-degree-of-freedom pendulum system inside the sphere to generate forward motion and steering. This internal pendulum shifts weight to roll the ball in the desired direction.

    - Soft Inflated Shell: The RoboBall II is encased in a 2-foot diameter soft shell that can be inflated or deflated using an onboard compressor and pneumatic tank. This lets it adjust stiffness depending on terrain. *[Same applies to RoboBall III]*

- *Back to the article:* Long-term goals include autonomous navigation and remote deployment.

- The Texas A&M University team hopes to see RoboBall dispatched from a lunar lander to chart steep crater walls or launched from an unmanned drone to survey post-disaster landscapes on Earth.

- Each ball could map terrain, transmit data back to operators, and even deploy instruments in hard-to-reach spots.

- **Other possibilities** - Rishi Jangale said, *"Imagine a swarm of these balls deployed after a hurricane. They could map flooded areas, find survivors and bring back essential data — all without risking human lives."*

- Upcoming tests will continue to take RoboBall into outdoor environments, with the Texas A&M University Robotics and Automation Design Lab researchers planning field trials on Texas beaches to demonstrate a water-to-land transition and test the robot's buoyancy and terrain adaptability in a real-world setting.

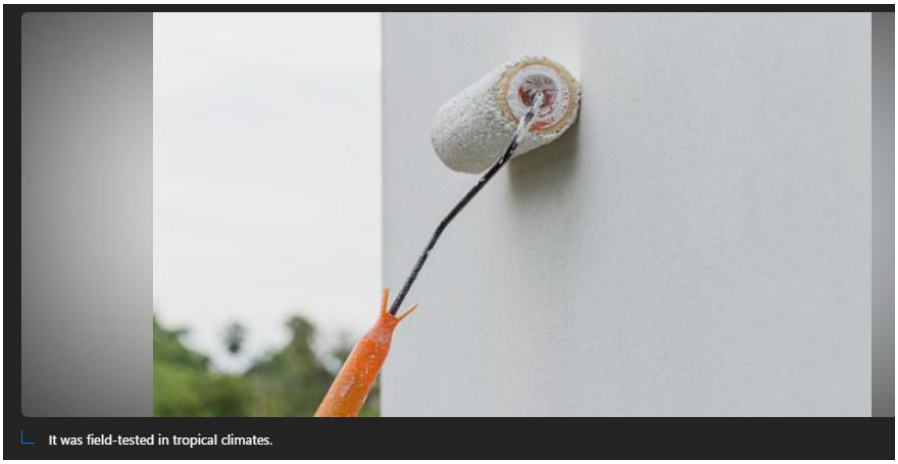
Story 2: This paint sweats to cool off buildings. No energy required.

Source: Anthropocene Magazine

Link: https://www.anthropocenemagazine.org/2025/06/new-paint-sweats-to-cool-off-buildings/

See research paper here: https://www.science.org/doi/10.1126/science.adt3372

See also: https://www.msn.com/en-us/lifestyle/lifestyle-buzz/researchers-develop-extraordinary-paint-that-can-sweat-to-keep-buildings-cool-a-practical-and-long-term-solution/ar-AA1L7zL9



- Ultra-bright white paints are the go-to when it comes to cooling buildings. Those paints work by reflecting as much of the sun as they can. An international team of researchers [from China, Singapore, Saudi Arabia, the UK and US] have now made a [new] cement-based cooling paint that out performs those white cooling paints.

- The new paint reflects sunrays and emits heat as infrared radiation, which passes through the atmosphere straight into space in a phenomenon called passive radiative cooling. But what makes the [new] paint unique is that it also releases water to achieve cooling via evaporation, much like human skin does.

    - **Note** – *back in August we covered a news item about "sweating data centers" using water evaporation for cooling.*

- This combination of multiple cooling mechanisms gives the paint super-cooling powers.

- In a pilot test in Singapore, one of the most humid cities in the world, the paint achieved up to 10 times higher cooling power than commercial cooling paints. This amounted to electricity [for air conditioning] savings of 30 to 40% compared with radiative cooling.

- Radiative cooling done via paints, textiles and other materials has become a popular passive cooling technology. But it does not work well in humid places. That's because water vapor in the air traps heat near the surface and prevents it from escaping into the atmosphere.

- The researchers created a cement paste-like paint composed of a porous calcium silicate hydrate network. The paint replenishes its water supply by absorbing rain and water vapor. And its interconnected porous structure holds water and slowly releases it much like sweat.

- The paint reflects 88–92% of sunlight, emits 95% of heat as infrared, and holds about 30% of its weight in water.

Story 3: Biochar from Human Waste Offers a Circular Solution to Fertilizer Shortages - *Excrement contains nutrients needed for crop growth and a new source of them could cut farming's huge CO2 output*

Source: The Guardian

Link: https://www.theguardian.com/science/2025/aug/11/biochar-from-human-waste-could-solve-global-fertiliser-shortages-study-finds

See research paper here: https://www.pnas.org/doi/abs/10.1073/pnas.2503668122

image source: https://biochartoday.com/news/biochar-from-human-waste-offers-a-circular-solution-to-fertilizer-shortages/

- Charcoal [i.e. biochar] made from human waste could help solve fertilizer shortages as well as reduce pollution and energy use, a study [from Cornell University] has found.

- Biochar is a form of charcoal made from organic matter treated at high heat, which is often used on farming soil as a fertilizer.

- The Cornell University study estimated that biochar made from solid human excrement could provide up to 7% of the phosphorus used around the world each year.

- Although the biochar process converts only solids, nutrients taken from urine could be added to it, and the researchers found this could provide 15% of annual phosphorus application, 17% of nitrogen, and up to 25% of potassium.

- Treated sewage sludge is already spread on farmland, but its use is controversial as it often contains microplastics, heavy metals, “Pfas” a.k.a. forever chemicals, pathogens, and pharmaceuticals. The researchers say biochar can avoid this problem by separating the waste at source.

- The study estimated that the biochar process could decrease both the weight and volume of solid excrement by up to 90%, which represents a significant gain in efficiency when compared with transporting sewage sludge *[for use as fertilizer for farm fields]*, due to the latter’s high-water content.

- The biochar production process also allows nutrient proportions to be adjusted according to the needs of individual crops. This can address problems associated with fertilizer use such as weed growth and when excess nutrients leach into groundwater, causing rapid growth of algae which depletes oxygen availability and reduces the sunlight available for underwater ecosystems.

Story 4: Wi-Fi signals can measure heart rate — no wearables needed

Source: University of California, Santa Cruz

Link: https://www.universityofcalifornia.edu/news/wifi-signals-can-measure-heart-rate-no-wearables-needed

See research paper here: https://ieeexplore.ieee.org/abstract/document/11096342

Professor of Computer Science and Engineering Katia Obraczka and Ph.D. student Nayan Bhatia in the lab. Photo: Erika Cardema/UC Santa Cruz

- Traditionally, measuring heart rate requires some sort of wearable device, whether that be a smart watch or hospital-grade machinery. But new research from engineers at the University of California, Santa Cruz, shows how the signal from a household Wi-Fi device can be used for this crucial health monitoring with state-of-the-art accuracy—without the need for a wearable [device].

    - **Note** - *on our August 15 show we talked about how new AI-powered Wi-Fi tech can ID and track individuals without using cameras - key trend to watch - increased use of Wi-Fi beyond original intent.*

- Their proof-of-concept work demonstrates that one day, anyone could take advantage of this non-intrusive Wi-Fi-based health monitoring technology in their homes. The team proved their technique works with low-cost Wi-Fi devices, demonstrating its usefulness for low resource settings.

- How it works:

    - The UC Santa Cruze team designed a system [*which they call Pulse-Fi*] for accurately measuring heart rate that combines low-cost Wi-Fi devices with a machine learning algorithm.

    - Wi-Fi devices push out radio frequency waves into physical space around them and toward a receiving device, typically a computer or phone. As the waves pass through objects in space, some of the waves are absorbed into those objects, causing mathematically detectable changes in the wave.

    - Pulse-Fi uses a Wi-Fi transmitter and receiver, which runs Pulse-Fi's signal processing and machine learning algorithm. They trained the algorithm to distinguish even the faintest variations in signal caused by a human heartbeat by filtering out all other changes to the signal in the environment or caused by activity like movement.

- The team ran experiments with 118 participants and found that after only five seconds of signal processing, they could measure heart rate with clinical-level accuracy. At five seconds of monitoring, they saw only half a beat-per-minute of error, with longer periods of monitoring time increasing accuracy.

Honorable Mentions

Story: California's first solar-covered canal is now fully online

Source: Canary Media [Clean energy journalism for a cooler tomorrow] Story by Maria Gallucci

Link: https://www.canarymedia.com/articles/solar/california-first-canal-array-project-nexus

The roughly 110-foot-wide portion of the canal-top solar project near Hickman, California. (Turlock Irrigation District)

The 20-foot-wide section of Project Nexus came online in March 2025. (Turlock Irrigation District)

- The article from Canary Media covers California's innovative solar initiative called Project Nexus, which is the first solar-over-canal project in the United States. Here's a concise breakdown:

- **What is Project Nexus?**
  - A pilot project installing solar panels over irrigation canals in California's Central Valley.
  - Located in Stanislaus County, it covers about 1 mile of canal.
  - Aims to test the dual benefits of clean energy generation and water conservation.

- **Why canals?**
  - Covering canals with solar panels can reduce water evaporation — a critical issue in drought-prone California.
  - The shade from panels also helps cool the water, potentially improving delivery efficiency.

- **Energy & Environmental Impact**
  - The pilot is expected to generate 1.5 megawatts of electricity.
  - If scaled statewide, similar installations could save 63 billion gallons of water annually and generate 13 gigawatts of solar power — enough to power millions of homes.

- **Who's behind it?**
  - Led by the Turlock Irrigation District, in partnership with Solar AquaGrid and funded by the California Department of Water Resources.

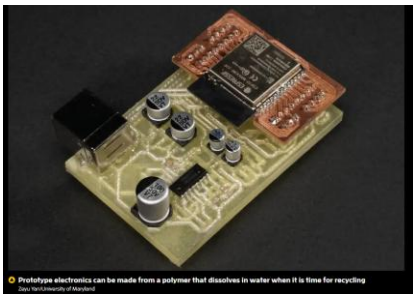
- **What's next?**
  - The pilot will run for two years to assess feasibility, cost-effectiveness, and scalability.
  - Success could pave the way for broader adoption across California's 4,000 miles of canals.

- It's a compelling blend of climate resilience, infrastructure innovation, and resource efficiency.

Story: 3D-printed electronics can dissolve in water for quick recycling

Source: NewScientist.com Story by Jeremy Hsu

Link: https://www.newscientist.com/article/2493756-3d-printed-electronics-can-dissolve-in-water-for-quick-recycling/



Innovation Overview

- Researchers at the University of Maryland developed **3D-printed electronics** using **polyvinyl alcohol (PVA)**, a water-soluble polymer.

- These electronics can **dissolve in water within 36 hours**, allowing for easy recovery and recycling of components.

How It Works
- Circuit boards are printed with PVA.
- **Gallium-indium alloy** is injected as liquid metal wiring.
- Components are manually placed and sealed with polymer glue.
- Devices are dried at **60°C for one hour** to finalize.

Demonstrated Devices
- Working prototypes include:
  - A **Bluetooth speaker**
  - A **fidget toy**
  - An **electronic three-finger gripper**

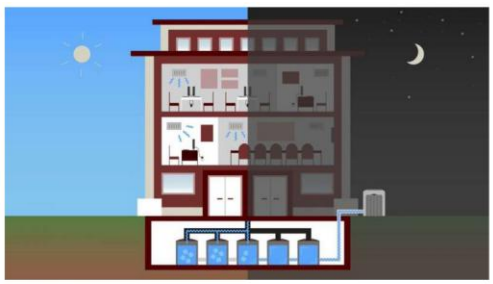
Recycling Benefits
- After water exposure:
  - Devices dissolve, leaving behind reusable components.
  - **99% of the PVA** can be recovered.
  - Liquid metal breaks into beads for easy collection.

Environmental Impact
- Offers a **sustainable alternative** to traditional electronics, which are often shredded for recycling.
- Could reduce e-waste and inspire **greener consumer tech**.

Story: Ice-cooled buildings could ease strain on power grid

Source: TechXplore.com Story by Lesley Henton

Link: https://techxplore.com/news/2025-08-ice-cooled-ease-strain-power.html



Credit: Texas A&M University

Researchers at Texas A&M University are improving **ice battery systems**—thermal energy storage that freezes water or salt hydrates at night (when electricity is cheaper) and uses that stored cold to cool buildings during the day.

What's New in the Research?

- Dr. Patrick Shamberger's team is developing **advanced materials** like salt hydrates that store and release thermal energy more efficiently.
- Their goal: make these systems **more stable, reversible, and long-lasting**—ideally with a 30-year lifespan.
- They're tackling issues like **phase segregation**, which degrades performance over time.

Why It Matters

- Reduces **peak daytime energy demand**, easing pressure on the grid.
- Supports integration with **heat pumps and HVAC systems**.
- Helps avoid building costly new power plants by shifting energy use to off-peak hours.

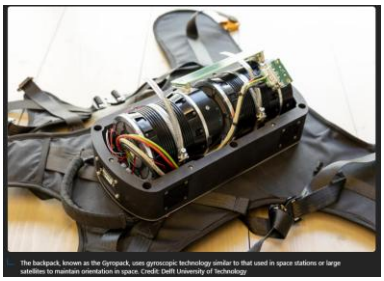
Real-World Use

- Ice battery systems are already in place, including **Eleven Madison**, a 30-story building in NYC.
- This tech could be a game-changer for grid resilience—especially as renewables like solar and wind introduce more variability in supply and demand.

Story: Novel backpack enhances stability for people with ataxia

Source: MedicalXpress.com Story from Radboud University

Link: https://medicalxpress.com/news/2025-08-backpack-stability-people-ataxia.html



What It Is

- A new device called the **Gyropack** is a backpack designed to help people with **ataxia**, a neurological condition that impairs balance and coordination.
- It uses **gyroscopic technology**, similar to what's used in satellites and space stations, to stabilize the wearer's posture.

Who Developed It

- The Gyropack was developed through a collaboration between:
    - **Radboud University Medical Center**
    - **Delft University of Technology (TU Delft)**
    - **Erasmus MC**

How It Helps

- The backpack improves **balance and stability** while walking or standing.
- It reduces reliance on traditional mobility aids like **walkers**, which can be heavy and stigmatizing.
- It contains **spinning wheels** that resist torso rotation, helping users maintain upright posture.

Medical Context

- Ataxia affects the **cerebellum**, the brain region responsible for coordination.
- The Gyropack offers a **non-invasive, wearable solution** for improving mobility and independence.