Show Notes 18 July 2025

Story 1: Bill Gates-backed rectangular turbine pilot could upend wind power

Source: Electrek.com Story by Michelle Lewis

Link: https://electrek.co/2025/06/26/bill-gates-backed-rectangular-turbine-pilot-could-upend-wind-power/

See video here: https://www.youtube.com/watch?v=CTWhGSdZh1o

See company website here https://www.youtube.com/watch?v=CTWhGSdZh1o

- The U.S. grid is under pressure: Half the country could face energy shortfalls by 2035, and AI/data centers are driving up demand.

- A new wind energy pilot project in Wyoming could reshape how wind power is deployed in the U.S. Airloom Energy, backed by Bill Gates' Breakthrough Energy Ventures, has begun testing a **rectangular wind turbine system** that promises to be cheaper, faster to install, and more land-efficient than traditional three-blade turbines.

- **Key Features of the Airloom Turbine:**

    - Unlike circular-sweeping turbines, this rectangular "sweep" design captures more wind in less space.

    - Stands only ~60–82 feet tall, making it suitable for areas with height restrictions like airports or military bases.

    - Built with small, U.S.-made mass-produced components that are easier to ship and install.

    - Can be operational in under a year, compared to the 5-year timeline for conventional *[gigantic propeller-type]* turbines.

- Airloom's system could offer a **faster, more flexible solution** for clean energy deployment, especially in constrained or remote locations.

- The pilot aims to validate performance and cost savings ahead of commercial rollout in 2027.

- The project has received $13.75 million in funding, including support from the Department of Defense and the State of Wyoming.

Story 2: Owls' silent flight inspires new noise reduction technology

Source: American Chemical Society website

Link: https://www.acs.org/pressroom/presspacs/2025/june/owls-silent-flight-inspires-new-noise-reduction-technology.html

See also: https://hearingreview.com/hearing-loss/hearing-loss-prevention/industrial-military/new-noise-reduction-tech-inspired-by-owls-silent-flight

A new soundproofing material that mimics the structure of owl skin and feathers could be used to reduce traffic and industrial noise.
Wirestock Creators/Shutterstock.com

Summary:
Inspired by the silent flight of owls, researchers have developed a lightweight, two-layer aerogel that effectively absorbs both high- and low-frequency noise, offering a powerful new solution to combat noise pollution in vehicles and industrial settings.

- Researchers at China's *Tiangong University* have developed a **lightweight, two-layer aerogel** that mimics the silent flight of owls to combat noise pollution in urban and industrial settings.

    - Owls are masters of stealth, and their feathers are a big reason why. Their ability to fly almost silently is due to a trio of specialized adaptations in their wing and feather structure:

        - **Serrated Leading Edges**
          The front edge of an owl's wing has tiny comb-like structures called *serrations*. These break up the air that hits the wing into smaller, less turbulent streams, reducing the "whoosh" sound typical of flapping wings.

        - **Velvety Feather Surface**
          The upper surface of owl feathers is covered in a soft, velvety texture. This acts like acoustic foam, absorbing sound frequencies—especially those above 2,000 Hz that many prey animals can hear.

        - **Soft, Fringed Trailing Edges**
          The back edge of the wing has a ragged, fringe-like structure that further disrupts airflow and smooths out the wake behind the wing.

This minimizes the noise created by air turbulence as the owl glides or flaps.

- **Bonus: Big Wings, Slow Flight**
  Owls have large wings relative to their body size, allowing them to glide slowly with fewer flaps. Less flapping = less noise.

- These adaptations serve two purposes: they help owls sneak up on prey (*stealth hunting hypothesis*) and allow them to hear faint sounds from their prey without interference from their own wingbeats (*prey detection hypothesis*).

- **Nature-Inspired Design**
  - **Bottom layer**: A honeycomb-like porous structure created using frozen hexane droplets absorbs **low-frequency sounds** (like engine rumbles).

    - **Side note**: Hexane droplets are **tiny liquid spheres of n-hexane**, a volatile hydrocarbon commonly used as a solvent or fuel component. These droplets are often studied in scientific and engineering contexts—especially in combustion, aerosol science, and fluid dynamics—because of their interesting evaporation and dispersion behaviors.

  - **Top layer**: Made of **silicon nanofibers**, this fluffy surface dampens **high-frequency noise** (like squealing brakes).

- Notably, the researchers found that their owl-inspired aerogels can:
  - Absorb 58% of soundwaves that strike it, surpassing the threshold for effective noise control materials.
  - Reduce 87.5 decibels of automobile engine noise to a safe level of 78.6 decibels, which is a better reduction than existing high-end noise absorbers.
  - Maintain structural integrity through 100 compression cycles, with only 5% deformation.

- **Real-World Applications**
  - Automotive and industrial soundproofing
  - Urban noise barriers

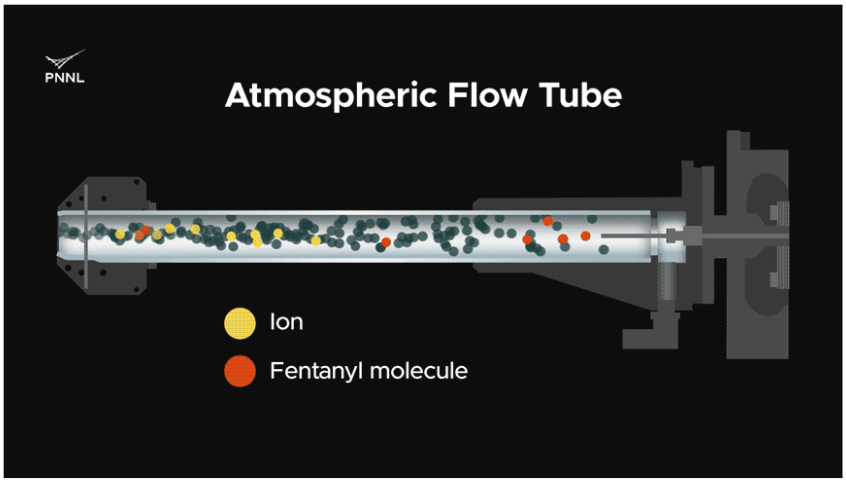
    - Potential health benefits by reducing risks linked to chronic noise exposure (e.g., cardiovascular disease, hearing loss)

- This innovation offers a **durable, and scalable** solution for quieter environments—proof that sometimes the best tech starts with a bird in flight.

Story 3: Contactless system to detect fentanyl and other drugs

Source: Department of Energy's Pacific Northwest National Laboratory Story by Tom Rickey

Link: https://www.pnnl.gov/news-media/chemists-develop-contactless-system-detect-fentanyl-other-drugs



- A system that detects trace levels of fentanyl, cocaine, explosives and other harmful substances through the air has been created by researchers at the Department of Energy's Pacific Northwest National Laboratory.

- BaySpec Inc., a Silicon Valley company that is commercializing the technology, has created a portable device equipped with the PNNL technology. At the 2025 American Society for Mass Spectrometry meeting, the company presented results of a test conducted late last year at the U.S. border crossing between Mexico and the United States at Nogales, Ariz.

- Currently, fentanyl is detected directly either by swiping a surface for chemical analysis, known as contact sampling, or by using dogs trained to sniff out the substance. Border personnel who are attuned to behavioral cues and other factors play a critical role as well.

- The new system directly samples the ambient air in a method known as noncontact detection and collects molecules of interest to be analyzed by a miniature mass spectrometer. An instrument previously developed at PNNL that detects trace vapors of substances is the size of a small refrigerator and weighs a few hundred pounds; the product tested at Nogales comes in a portable box about the size of a microwave oven and weighs less than 40 pounds.

Continuity™ Portable Mass Spectrometer

Higher sensitivity portable mass spectrometer

Product Overview:

Continuity™ - the most sensitive portable mass spectrometer designed to provide quality and reliable mass spectrometer analysis outside of the laboratory. Continuity™ was created to provide even higher sensitivity, greater specificity with built-in MS/MS, and larger mass range coverage than its ground-breaking counterpart Portability™. Like its counterpart, Continuity™ requires no sample preparation and is compatible with almost any ambient ionization source including ESI, APCI, TD-ESI, TD-APCI, and DBDI. It allows for a broad range of applications from clinical to drug to chemical and biological threats analysis. The user-friendly interface, rapid deployment, and real-time results make Continuity™ a great solution for fast, dependable, and highly sensitive field analysis for any user in any location. This potable mass spectrometer is the excellent solution for various challenging applications, including vapors/liquids/solids, CWAs/TICs, biological/biomedical, forensic, agriculture, food safety, security, and explosives.

- The system developed at PNNL is remarkably sensitive. In the laboratory, the system can detect fentanyl and other substances—including cocaine, methamphetamine, and explosives like TNT, PETN and nitroglycerin—at levels of just 10 parts per quadrillion.
    - That's the equivalent of identifying a single pine needle from all the pine trees in the state of Washington, or being able to pluck out a single coin from a stack of pennies more than 17 million times higher than the height of Mount Everest.

Story 4: Controversial World-First Project to Create Human DNA From Scratch Takes First Steps - *The massive project will likely take decades to complete, but it has significant oversight built into it to ensure it remains ethical.*

Source: IFLScience.com Story by Dr. Russell Moul

Link: https://www.iflscience.com/controversial-world-first-project-to-create-human-dna-from-scratch-takes-first-steps-79797

See also: https://wellcome.org/news/researchers-take-first-steps-creating-synthetic-human-genomes

- A groundbreaking and controversial scientific initiative has begun in the UK: the **Synthetic Human Genome Project**. Funded with £10 million (about $13.7 million US) by the WellcomeTrust, this project aims to **create human DNA from scratch**—a world first.

- **What the Project Involves:**
  - Scientists plan to chemically synthesize an entire human genome, starting with a fully synthetic human chromosome.
  - This goes beyond gene editing—it's about "writing" DNA, not just tweaking existing sequences.

- The project will span decades, with the first five years focused on developing the tools and methods needed.

- **Potential Benefits**
  - This could lead to new treatments for diseases, including cell therapy and organ regeneration.
  - Offers a deeper understanding of how DNA functions and how it shapes human biology.
  - Beyond human body - May help create climate-resilient crops and improve food security.

- **Ethical Concerns**

    - Critics fear it could pave the way for designer babies or eugenics-like practices.
        - Side note: Eugenics is the study or practice of selectively breeding humans to promote traits considered desirable and reduce those deemed undesirable.

    - There are worries about unintended consequences for future generations due to unknown gene-environment interactions.

    - The project includes ethical oversight and aims to be transparent about its goals and implications.

Honorable Mentions

Story: Scientists rewind heart ageing using lab-grown scaffold that mimics young tissue

Source: Interesting Engineering Story by Neetika Walter

Link: https://interestingengineering.com/health/reverse-heart-ageing-ecm-decipher

The DECIPHER sample consists of heart tissue (centre) embedded within a stiffness-tuneable hydrogel. *Credit* – NUS

- Researchers at the National University of Singapore, led by Assistant Professor Jennifer Young, have developed a lab-grown biomaterial called DECIPHER (DECellularized In Situ Polyacrylamide Hydrogel- extracellular matrix hybrid).

- Instead of targeting heart cells directly, they focused on the extracellular matrix (ECM) - protein-rich scaffold that supports and instructs heart cells.

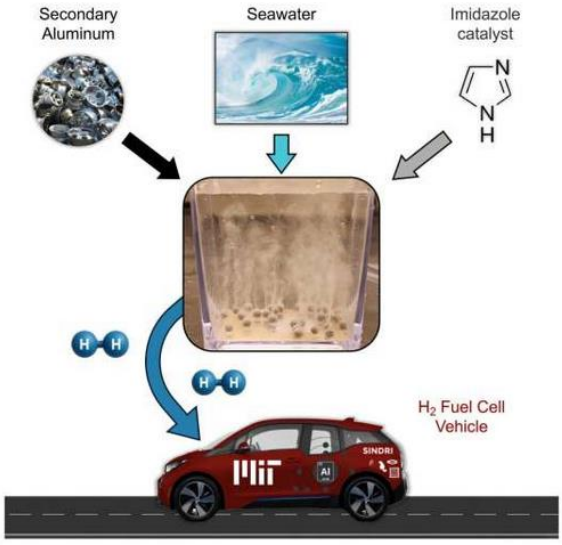
- As we age, the extracellular matrix stiffens and sends faulty signals, contributing to heart scarring and reduced function. By mimicking the properties of youthful extracellular matrix, DECIPHER helps reprogram aged heart cells, restoring some of their youthful behavior without altering the cells themselves.

- How It Works - DECIPHER combines natural heart tissue with a synthetic gel, creating a hybrid scaffold that can "coach" old cells into behaving more like young ones. This approach could pave the way for non-invasive therapies to rejuvenate aging hearts.

Story: Study shows making hydrogen with soda cans and seawater is scalable and sustainable

Source: TechXplore.com Story by Jennifer Chu, MIT

Link: https://techxplore.com/news/2025-06-hydrogen-soda-cans-seawater-scalable.html



- MIT engineers have developed a **low-emission method for producing hydrogen** using recycled soda cans, seawater, and a gallium-indium alloy catalyst.

- The process involves treating aluminum to remove its oxide layer, allowing it to react with seawater and release hydrogen gas.

- A recent life cycle analysis shows that this method emits just **1.45 kg of CO_2 per kg of hydrogen**, compared to 11 kg from conventional fossil-fuel-based production.

- **Key features of the process**:

    - Uses **recycled aluminum**, reducing raw material emissions
    - Seawater helps recover the catalyst, making the cycle sustainable
    - Produces **boehmite** as a valuable byproduct for semiconductors and ceramics
    - Estimated cost: **$9 per kg of hydrogen**, competitive with solar and wind alternatives

- The team has already built a prototype hydrogen generator and tested it on electric bikes and small vehicles. They envision coastal fueling stations where aluminum pellets and seawater could generate hydrogen on demand, eliminating the need to transport volatile gas.

Story: Donut Lab reveals 845-hp electric motor weighing 88 pounds

Source: MotorAuthority.com Story by Viknesh Vijayenthiran

Link: https://www.motorauthority.com/news/1145467_donut-lab-reveals-845-hp-electric-motor-weighing-88-pounds

See company website here: https://www.donutlab.com/

****News from earlier this year, but I think it's well worth highlighting now!*

- Donut Lab, a startup showcased at CES 2025, has unveiled a groundbreaking in-wheel electric motor called the *Donut Motor* that delivers up to 845 horsepower while weighing just 88 pounds.

- Designed for a wide range of vehicles—from hypercars to drones—this motor is notable for its modular, compact design and potential to reduce vehicle complexity and cost.

- Key Features:
    - 845-hp flagship motor: 21-inch diameter, 88 lbs, designed for high-performance vehicles.
    - In-wheel design: Eliminates need for driveshafts and other components, reducing weight and improving efficiency.

- Scalable lineup:

    - 17-inch, 201-hp motor for motorcycles (used by Verge Motorcycles).
    - 12-inch, 20-hp version for scooters.
    - 4.7-inch, 4-hp version for drones.
    - 21-inch, 268-hp version for semi-trucks.

- The motors offer high torque and power density, with the 845-hp version producing up to 3,171 lb-ft of torque at the wheels.

- Side note:
    - Torque is a measure of force that causes rotation, like turning a wrench or spinning a wheel.
    - "*3,171 lb-ft of torque at the wheels*" refers to the rotational force that's actually delivered to the drive wheels of a vehicle—and it's impressive.

    - Pound-feet (lb-ft) is the unit—imagine trying to twist something with a one-foot-long wrench using 3,171 pounds of force!
    - At the wheels means this is the *real-world* torque making the car move. It factors in things like gear ratios and drivetrain losses.
    - What it implies:
        - That amount of torque can lead to extreme acceleration, especially in performance vehicles, off-road trucks, or EVs tuned for instant power.
        - It's usually much higher than the engine's raw output because gearing multiplies torque before it reaches the wheels.

- Verge Motorcycles, affiliated with Donut Lab, already uses the 17-inch version in its TS Ultra bike, achieving 0–60 mph in about 2.5 seconds.

- Other adopters include Latvian off-road EV maker Oruga and Australian aerospace firm Hyper Q.

- Donut Lab claims its motors can cut vehicle development resources by up to 95%, thanks to their simplicity and modularity. While no major automaker partnerships have been announced yet, the tech is already making waves in niche markets.

Story: AugWind Energy to Install First Commercial-Scale AirBattery in Germany

Source: CleanTechnica.com Story by Jake Richardson

Link: https://cleantechnica.com/2025/07/01/augwind-energy-to-install-first-commercial-scale-airbattery-in-germany/

Image Credit: AugWind

- Israeli company Augwind Energy is set to build the world’s first commercial-scale AirBattery system in Germany, marking a major step forward in long-duration energy storage.

- Here's what makes it groundbreaking:
  - Uses Hydraulic Compressed Air Energy Storage (CAES) technology.
  - Excess renewable electricity compresses air into underground salt caverns.
  - When needed, the compressed air is released to drive turbines and generate electricity.

- Key Specs
  - Each cavern can store 3–8 GWh of electricity.
  - Demonstration facility in Israel achieved 47% round-trip efficiency; commercial systems expected to exceed 60%.
  - Estimated cost: €7–15 million, depending on cavern pressure range.

- Why Germany?
  - Germany has over 400 suitable salt caverns.
  - The system is designed to address Dunkelflautes—periods of low solar and wind output.

- Commissioning is expected between 2027 and 2028.

- Strategic Impact
  - Offers multi-week energy storage, far beyond typical battery durations.
  - Aims to stabilize grids and reduce reliance on volatile energy markets.
  - Positions Augwind as a key player in Europe’s renewable energy transition.