Show Notes 17 October 2025

Story 1: Tiny lab-grown brains could help build the next generation of computers
- *Biocomputing has left the realm of science fiction and entered the laboratory*

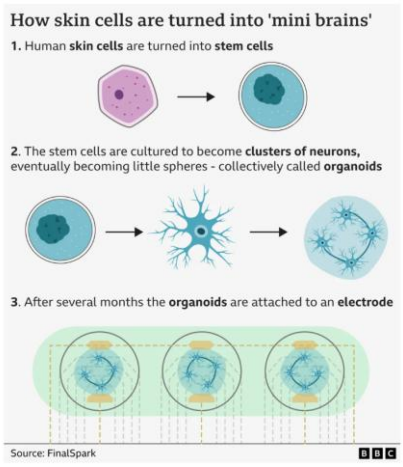
Note – you'll learn these are not full "brains", but brain-like organoids

Source: Techspot.com Story by Skye Jacobs

Link: https://www.techspot.com/news/109753-tiny-lab-grown-brains-could-help-build-next.html

See also BBC article: https://www.bbc.com/news/articles/cy7p1lzvxjro

See also: https://finalspark.com/



- Swiss researchers are exploring the frontier of computing by creating processors from living cells, a field known as biocomputing. Their work, though inspired by concepts often seen in science fiction, relies on precise laboratory techniques and targets practical, real-world applications.

- At the FinalSpark laboratory in Switzerland scientists are developing what they call "wetware" – computers built from networks of lab-grown neurons.

    - **Side note** - FinalSpark's laboratory is located in Vevey, Switzerland. This Swiss company is pioneering biocomputing by cultivating living neurons in vitro and using them for experimental computing systems. Their lab supports both on-site research and remote access via a Python-based interface, allowing scientists and developers to interact with biological neural networks from anywhere.

- The team starts with stem cells derived from human skin.

- Researchers culture the stem cells into clusters of neurons and supporting cells, called organoids. These miniature brain-like structures, visible as small white spheres in a lab dish, share the same cellular building blocks as the human brain but lack its complexity.

- Over several months, the organoids mature until researchers can connect them to electrodes. At that point, they attempt to send and receive electrical signals between the living neural tissue and a conventional computer system.

- When researchers send a signal from a keyboard, the responsive organoids generate activity that appears on a moving graph, similar to an EEG readout. Sometimes the signals stop unexpectedly, followed by short bursts of activity.

- This electrical stimulation represents an early step toward the ultimate goal: training the neurons to process input and produce output in ways that parallel *machine learning*.

Story 2: US firm's new EV battery design could add 50% more range, targets 1,000 miles

Source: InterestingEngineering.com Story by Aman Tripathi

Link: https://interestingengineering.com/energy/us-ev-battery-design-more-range

See the company's post on this here: https://24-m.com/press-releases/24m-unlocks-new-u.s.-battery-manufacturing-opportunities-with-groundbreaking-energy-dense-24m-etop-electrode-to-pack-technology

The ETOP system streamlines this process by stacking sealed anode and cathode pairs directly into the battery pack. (Representational image) zhihao/GettyImages

- A new battery design could allow electric vehicles to travel up to 50% farther on a single charge, without increasing the battery pack's size, according to its developer, *24M Technologies*.
    - **Side note** – more about 24M Technologies - 24M Technologies is a spin-off from MIT. It was co-founded in 2010 by Dr. Yet-Ming Chiang, a professor of materials science and engineering at MIT, along with Dr. Throop Wilder. The company emerged from research conducted at MIT focused on improving lithium-ion battery design and manufacturing.
    - Their core innovation—the SemiSolid™ lithium-ion battery architecture—was developed to reduce cost, increase energy density, and simplify production compared to traditional battery technologies.
- The Cambridge, Massachusetts-based company recently unveiled its "cell-less" Electrode-to-Pack (ETOP) technology as a way for manufacturers to produce more powerful, cost-effective batteries domestically for EVs, eVTOL aircraft, and energy storage systems
- The 24M technology *focuses on removing materials that do not store energy*. Traditional battery manufacturing encases electrodes in individual cell casings,

which are then bundled into modules. This process adds weight and volume caused by inactive components.

- The Electrode-to-Pack system bypasses this by creating sealed anode and cathode pairs that are stacked directly into the final battery pack, removing the need for individual cells and modules.

- According to 24M, its technology simplifies the manufacturing process, allowing companies to begin production with relatively low capital expenditures. The process—sealing electrodes, stacking them, wiring, and closing the pack—can be integrated into an assembly line from a single machine.

Story 3: Can glass replace bone? Scientists 3D print bio-glass that mimics skeletal strength

Source: Thetimesofinnovation.com Story by Arman Kuyran

Link: https://timesofinnovation.com/additive-manufacturing/can-glass-replace-bone-scientists-3d-print-bio-glass-that-mimics-skeletal-strength/

- This article explores a breakthrough in additive manufacturing where scientists have developed a 3D-printable bio-glass that mimics the strength and structure of human bone. This material could revolutionize bone repair and replacement.

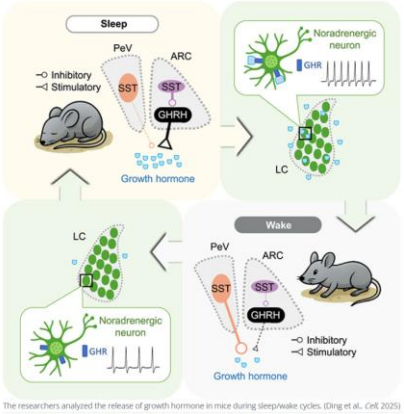
- Key highlights:
    - Researchers at the Chinese Academy of Sciences and Jiangsu University engineered a porous bio-glass that closely resembles the mechanical properties of skeletal tissue.
    - The material is biocompatible, meaning it can integrate with living tissue without causing rejection.
    - It's designed to support bone regeneration, offering a scaffold for cells to grow and heal damaged areas.
    - The 3D printing process allows for customized implants, tailored to individual patients' anatomy.
- This innovation could lead to safer, more effective treatments for fractures, bone loss, and orthopedic surgeries—potentially replacing metal implants with something more natural and regenerative.

Story 4: Study Reveals Brain System That Repairs Your Body While You Sleep

Source: ScienceAlert.com Story by David Nield

Link: https://www.sciencealert.com/study-reveals-brain-system-that-repairs-your-body-while-you-sleep

See research paper here: https://www.cell.com/cell/fulltext/S0092-8674(25)00626-9



The researchers analyzed the release of growth hormone in mice during sleep/wake cycles. (Ding et al., *Cell*, 2025)

- This article discusses a groundbreaking study revealing a brain system that actively repairs the body during sleep.

- When we sleep, the body releases its 'growth hormone', building up and repairing muscles and bones – but the details of how and why have been something of a mystery, until now.

- Through a close analysis of brain circuitry in mice, researchers led by a team from the University of California, Berkeley have found special mechanisms and feedback loops that regulate growth hormone release while we sleep.

- The researchers discovered that the brain's meningeal lymphatic vessels—a network previously known for waste clearance—also play a crucial role in distributing immune cells and healing signals throughout the body while we sleep.

- Key findings:

    - During sleep, these vessels ramp up activity, helping transport immune cells and repair molecules from the brain to the rest of the body.

    - This system may explain why sleep is so vital for recovery from illness, injury, and inflammation.

    - The study suggests that disrupted sleep could impair this healing process, potentially linking poor sleep to chronic conditions.

- The findings could help us better treat conditions that come with sleep problems, including type 2 diabetes and Alzheimer's disease. Understanding sleep is the key to understanding a whole host of aspects of our health.

Honorable Mentions

Story: “One Molecule Defies Physics”: Cambridge Scientists Unveil P3TTM Solar Breakthrough with Near-Perfect Efficiency, Threatening Conventional Energy Industry Order

Source: Energy-reporters.com Story by Rosemary Potter

Link: https://www.energy-reporters.com/news/one-molecule-defies-physics-cambridge-scientists-unveil-p3ttm-solar-breakthrough-with-near-perfect-efficiency-threatening-conventional-energy-industry-order/

See research paper here: https://www.nature.com/articles/s41563-025-02362-z

Illustration of a novel organic semiconductor molecule, P3TTM, capable of efficiently harvesting light and generating electricity.

- A groundbreaking discovery by researchers at the University of Cambridge may revolutionize the solar energy industry. …scientists believed that solar panels could not be made from a single organic material. However, the introduction of a new organic semiconductor molecule challenges this notion.

- This innovative material, known as P3TTM, showcases a remarkable ability to harvest light and generate electricity efficiently. Cambridge's findings could pave the way for lighter, simpler solar panels, potentially transforming renewable energy technologies and marking a significant milestone in physics and engineering.

    - **Side note**, more on P3TTM:

        - P3TTM is a newly discovered organic semiconductor molecule developed by researchers at the University of Cambridge. It's making waves in the solar energy world because of its near-perfect efficiency in converting sunlight into electricity, something previously thought impossible for organic materials.

        - Here's what makes P3TTM special:

- It behaves like a Mott-Hubbard insulator, a quantum phenomenon previously seen only in inorganic metal oxides.
    - Side note - A Mott-Hubbard insulator is a type of material that behaves as an electrical insulator due to strong electron-electron interactions, even though conventional band theory predicts it should conduct electricity.

- It can harvest light and generate electricity with unprecedented efficiency, potentially rivaling or surpassing traditional silicon-based solar cells.

- Its organic nature means it could lead to lighter, cheaper, and more sustainable solar technologies.

    - This molecule could reshape how we think about solar panels and energy systems, especially if it scales well for commercial use.

- The potential to fabricate solar cells from a single material could significantly reduce costs and simplify manufacturing processes. Traditional solar cells rely on multiple materials to generate and separate charges.

Story: Microbes Unlock Copper as AI Demand Soars

Source: DigitrendZ blog Story

Link: https://digitrendz.blog/newswire/artificial-intelligence/61106/microbes-unlock-copper-as-ai-demand-soars/

- Copper scarcity poses the next major threat to internet infrastructure, surpassing concerns about disinformation or deepfakes.

- AI data centers are accelerating copper demand, with single facilities requiring thousands of tons for electrical systems and transmission lines.
- Traditional copper mining struggles with 70% of global reserves locked in complex ores, leaving billions of tons in waste piles untapped.
- Endolith uses AI-guided microbes to extract copper from low-grade ores through bioleaching, offering a cleaner and more efficient alternative to smelting.
- The physical limitations of copper supply are already causing AI infrastructure delays, highlighting the disconnect between technological ambition and material constraints.

Story: Scientists develop incredible leaf-inspired material that could replace plastic: 'Very strong'

Source: TheCoolDown.com Story by Ren Venkatesh

Link: https://www.thecooldown.com/green-tech/leaf-inspired-bioplastic-washington-university/

See research paper here: https://www.nature.com/articles/s41467-025-61693-2

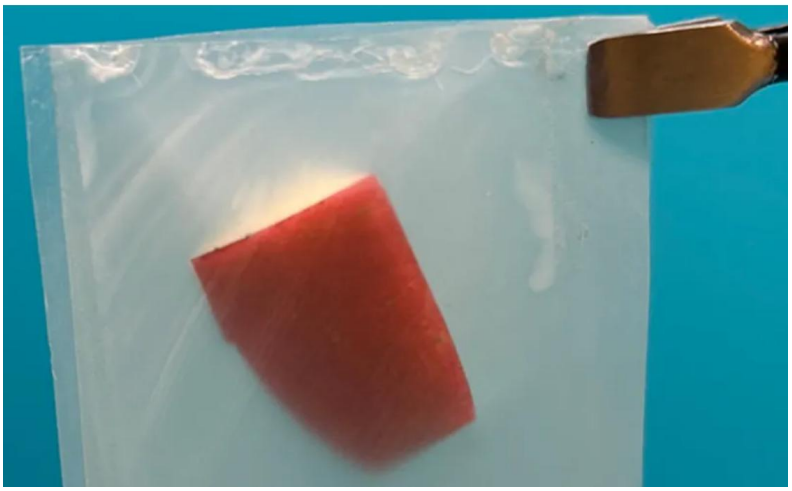
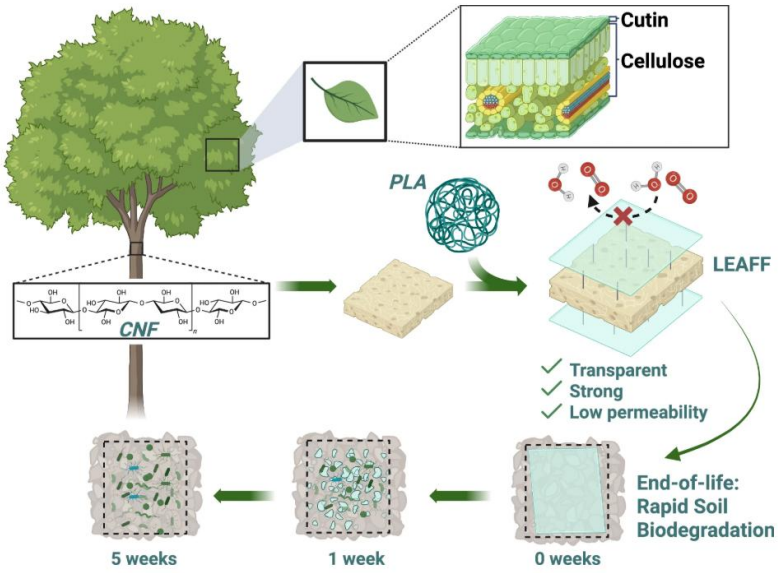


Fig. 1: Representation of LEAFF life cycle.

From: Biomimetic layered, ecological, advanced, multi-functional film for sustainable packaging



Depicted is the synthetic route of LEAFF synthesis from sustainably derived cellulose fibers coated with the biopolymer polylactic acid. The LEAFF film shows exceptional barrier properties to oxygen and water along with high transparency and a high tensile strength. At the end of its life, LEAFF can rapidly biodegrade due to microbial digestion in less than 5 weeks. Created in BioRender. Dhatt, P. (https://BioRender.com/gvyekxr).

- A research team from Washington University, St. Louis, recently developed a leaf-inspired bioplastic that holds up well in comparison to standard petroleum-based plastics in terms of resilience but far exceeds them on the sustainability front.

- While convincing to a certain degree, most modern-day bioplastics — that is, biodegradable "plastic" alternatives — tend to disappoint when it comes to durability, reducing the average consumer's incentive to choose the more eco-friendly option. What's worse, the actual breakdown of most common bioplastics requires high-heat industrial composters to take effect, making their biodegradability expensive and complicated, according to Interesting Engineering.

- Fortunately, WashU's latest bioplastic design — known as Layered, Ecological, Advanced, and multi-Functional Film, or LEAFF — surpasses not only other bioplastics in strength and flexibility, but also petroleum-based plastics, which are the current plastic norm.

- As published in a Nature Communications study, the researchers interposed cellulose nanofibers amid the dual-layered bioplastic, reinforcing the structure with the polymer found in fortified plant cells and minimizing the ability of air and

water to permeate the final product, making it ideal for food storage, among other needs.

Story: Scientists crack the mystery of hidden atomic order inside microchips for the first time - *Using advanced microscopy and AI, scientists revealed short-range atomic order that changes how semiconductors conduct electricity*

Source: InterestingEngineering.com Story by Rupendra Brahambhatt

Link: https://interestingengineering.com/science/scientists-observe-short-range-order-semiconductors

Arrangement of germanium (grey), tin (blue), and silicon (red) atoms in the material studied by the researchers. *Minor et al/Berkeley Lab*

- Scientists from Lawrence Berkeley National Lab and George Washington University have, for the first time, directly observed short-range atomic order (SRO) in semiconductors—a hidden pattern in how atoms arrange themselves inside microchips.

- Why It Matters:

  - SRO affects the band gap, which controls how semiconductors conduct electricity.

  - Understanding these atomic motifs could lead to custom-designed materials for quantum computing, neuromorphic chips, and advanced sensors.

- How They Did It:
    - Used 4D-STEM electron microscopy with energy filtering to enhance contrast.
    - Applied AI and machine learning to simulate and match atomic arrangements.
    - They identified six recurring atomic motifs involving germanium, tin, and silicon.
- Implications: This discovery opens the door to atomic-scale engineering of semiconductors, potentially transforming how future devices are built—from faster processors to brain-like computing systems.