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MONTHLY NEWSLETTER

Navigating the World of Science and Innovation

V:Kommunicate



Swiss Innovation Boosts Heat Pump Efficiency by 25% with Novel Refrigerant Blend

Swiss researchers have developed an innovative heat pump prototype that utilizes a blend of refrigerants, improving performance by up to 25%. This new system, designed by teams from Eastern Switzerland University of Applied Sciences and ETH Zurich, can use different heat sources and generate various temperature profiles. The mixture of two refrigerant components allows for temperatures up to 392°F, suitable for industrial applications like the food, chemical, and pharmaceutical industries. This breakthrough could significantly reduce reliance on fossil fuels, enhancing both costeffectiveness and environmental sustainability.

The development involved a computer analysis of 200 million molecules to determine the optimal refrigerant blend. This technology not only simplifies the heat pump design but also offers flexibility by allowing the refrigerant mix to be adjusted based on specific job requirements. The researchers aim to build a pilot plant for further testing and hope to partner with manufacturers to explore more applications needing sub-400°F heat. Heat pumps, as reported by Cell Press, can potentially reduce air pollution for homes by 36-64%, making this advancement a promising step towards greener industrial processes. The U.S. Department of Energy offers tax credits to help with their purchase, making this improved design potentially even more attractive to consumers.

In this newsletter you can expect updates from:

Emerging Technologies

Industry trends

Food and Agriculture

Environmental Science

Health and Medicine

Space Exploration



Breakthrough in Laser Nanofabrication Enhances Electronics and Photonics

Researchers at the University of Technology Sydney have achieved a breakthrough in laser nanofabrication bv transforming silicon, а material integral to modern electronics. into a more functional form. Usina femtosecond laser pulses, they modified silicon's properties at the nanoscale, significantly enhancing its optical capabilities. This advancement, published in "Nature Photonics." could revolutionize the semiconductor industry by enabling the development of more efficient and powerful electronic and photonic devices.

The technique allows for precise control over silicon's structure and properties, paving the way for innovations in computing, telecommunications, and medical devices. By improving the performance and efficiency of silicon-based technologies, this breakthrough holds promise for substantial public and industry benefits, including more efficient faster. advanced electronics and medical diagnostic tools.



Innovation in Lithium Metal Batteries Double Energy Density

Researchers at the University of California San Diego have developed a new type of lithium metal battery that offers twice the energy the density and half environmental impact conventional compared to lithium-ion batteries. Detailed in a recent study published in "Nature." these batteries utilize a novel anode material and a unique electrolyte, which together enhance battery performance and longevity.

This innovation addresses key limitations of current batteries, such as enerav capacity and sustainability, making them more efficient and eco-friendly. The new lithium metal batteries have the potential to revolutionize benefitina energy storage, electric vehicles and renewable energy systems by longer-lasting providing with reduced power footprints. This ecological advancement supports public and industry goals for cleaner energy solutions and greater environmental sustainability



Bill Gates-backed startup is making butter from 'air'

A California startup called Savor, Bill backed by Gates. has developed a butter alternative made from CO2 instead of cow's milk. Using a thermochemical process, they create fat molecules from carbon dioxide, hydrogen, and oxygen. The company claims their product tastes like real butter and has a significantly lower carbon footprint, potentially 0.8g CO2 equivalent per calorie compared to 2.4g for traditional butter. Savor is working on regulatory approval and aims to start sales by 2025.

This innovation could help reduce the environmental impact of the livestock industry, which accounts for 14.5% of global greenhouse gas emissions according to the UN FAO. While the product shows promise in informal taste tests, the challenge remains in convincing consumers to adopt such synthetic alternatives. If successful, this technology could benefit both the environment and the food industry providing а sustainable bv alternative to traditional dairv products.



Solar Roofing Revolution: Integrating Energy Efficiency with Home Design

Solar shingles and Tesla's Solar Roof represent innovative alternatives to traditional solar panels, offering aesthetic integration with roofs while harnessing solar energy efficiently. These solutions can reduce energy bills by 40% to 70%, with Tesla's system potentially saving homeowners up to US\$1,500 annually. While initial costs are higher— US\$15,000 to US\$20,000 for solar shingles and around US\$64,000 for Tesla's Solar Roof on an average 2,000-square-foot home—they come with significant tax incentives. Tesla's system, featuring glass solar tiles and the Powerwall battery, transforms homes into virtual power plants, particularly beneficial in areas with high electricity costs.

Despite installation challenges for solar shingles and the substantial upfront investment for Tesla's solution, both options offer compelling long-term savings and environmental benefits, making them attractive investments for homeowners seeking to reduce their carbon footprint and reliance on grid electricity.



Midi-SOV: Eco-Friendly Vessel Enhancing Offshore Wind Farm Support

North Star, Chartwell Marine, and Vard have developed the 180-foot Midi Service Operation Vessel (SOV) to support offshore wind farms by transporting crews and equipment. Designed for stability and cost-efficiency amid rising sector costs, the Midi-SOV features 56 cabins, a gym, an auditorium, and meeting rooms, all while being environmentally responsible.

The ship will enter the U.S. and European markets this year. Powered by methanol-diesel dual-fuel engines and electric propulsion, it offers extended operational hours in adverse weather, enhancing service reliability.

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Taco Bell and TerraCycle Spice Up Recycling: Nationwide Program Tackles Fast-Food Packaging Waste

Taco Bell and TerraCycle have expanded their recycling partnership, which began in 2021 as a pilot program for recycling sauce packets. Initially offering reward points for mailed-in Taco Bell sauce packets, the program now accepts sauce packets from any brand, as well as saucedipping cups, souffle cups and lids, and coffee creamer pods. The initiative, which went nationwide in 2022 following a successful test in New Jersey, allows consumers to easily recycle these typically hard-torecycle items through the Taco Bell Sauce Packet Free Recycling Program.

This collaboration represents a significant step in addressing the environmental impact of single-use plastics in the fastfood industry, which can take hundreds of years to decompose and contribute to greenhouse gas emissions during production. The program's expansion reflects the arowina need for sustainable solutions in an industry struggling to reduce its single-use waste footprint



IIT Jodhpur Innovates Solar-Powered Adapter for EV Charging, Promoting Sustainable Mobility

IIT Jodhpur has developed an innovative adapter that enables electric vehicles (EVs) to be charged directly from solar panels. This adapter, developed by researchers at the Electrical Engineering Department, integrates solar photovoltaic technology with ΕV charging infrastructure, allowing for sustainable and grid-independent vehicle charging. The adaptor, anticipated to be affordably priced at below Rs 1.000. It retrofitted can he onto existing charging stations, utilizing solar power to charge EV batteries during daylight hours.

This development not only promotes renewable energy integration into transportation but also supports India's goal of reducing carbon emissions and dependency on fossil fuels. It addresses both public and industry welfare by enhancing accessibility to clean transportation solutions and contributing to India's renewable energy targets.



Revolutionary Soil-Powered Bacteria Battery Could Transform Agriculture

Researchers from the University of Bath-affiliated startup Bacterv have developed a device that uses bacteria in soil to produce electricity. Tested in Brazil in 2019, it powered a water cleaning system. Now, this technology is being refined to power sensors in agriculture. These sensors collect crucial data to help farmers grow crops more efficiently, making farming more sustainable and less dependent on fossil fuels.

This innovation could greatly improve agricultural practices in the face of climate change.

CRISPR Breakthrough in Sugarcane: Boosting Biofuel and Sugar Production for Global Energy and Food Security

Researchers from the University of Florida, working with the Center for Advanced Bioenergy and Bioproducts Innovation (CABBI), have successfully used CRISPR/Cas9 gene editing to improve sugarcane's biomass yield. Their study, published in Plant Biotechnology Journal, focused on editing the LIGULELESS1 (LG1) gene, which controls leaf angle. By fine-tuning the number of LG1 gene copies edited in sugarcane's complex genome (which contains 40 copies of LG1), the team optimized leaf architecture for increased light capture. Field trials showed that upright leaf phenotypes allowed more light penetration, resulting in increased biomass yield. One sugarcane line with edits in ~12% of LG1 copies demonstrated a 56% decrease in leaf inclination angle and an 18% increase in dry biomass yield. This breakthrough is significant for sugarcane, the world's largest crop by biomass yield, which provides 80% of global sugar and 40% of biofuel production.

The research supports CABBI's (The Center for Advanced Bioenergy and Bioproducts Innovation) "plants as factories" approach, aiming to synthesize biofuels and high-value molecules directly in plant stems. The improved sugarcane yield could lead to more efficient and sustainable production of both sugar and biofuels, benefiting consumers and industries worldwide while contributing to renewable energy goals and agricultural productivity.





New Super Wheat Variety Boosts Yields and Nutrition

The DBW 327 (Karan Shivani) wheat variety, developed by ICAR-Indian Institute of Wheat and Barley Research in Karnal, has achieved record-breaking yields in Punjab and Haryana. This climate-resilient and biofortified variety has a yield potential of 87.7 quintals per hectare, with farmers reporting yields of up to 84 quintals per hectare. It was released for cultivation in the North Western Plain Zone and later in the Central Zone, and was recognized as one of the best crop science technologies by ICAR. Two farmers, Davinder Singh from Punjab and Suresh Kumar from Haryana, reported exceptionally high yields of 84 and 81 quintals per hectare, respectively.

This success highlights the importance of agricultural research in improving food security and farmer prosperity. The high-yielding, nutritious wheat variety benefits both farmers by increasing their income and the public by ensuring a stable food supply with enhanced nutritional value.



CRISPR Technology Shields Rice from Yellow Mottle Virus, Boosting African Farmers' Resilience

Scientists from Heinrich Heine University Düsseldorf and Universitv Montpellier are using CRISPR genome-editing technology to develop rice varieties resistant to the devastating rice yellow mottle virus (RYMV). This virus, spread by beetles, has been wiping out rice yields for small-scale farmers in Africa. The researchers have successfully edited Asian rice varieties to insert a resistance gene against RYMV. potentially plants making the invulnerable to the virus. Their work, published in Plant Biotechnology Journal, offers a solution to a previously unpreventable problem.

This research is part of a broader effort to address challenges faced by farmers due to climate change, including rising temperatures and shiftina insect populations. Scientists are using gene editing to create more durable, faster-growing crops with higher yields, such as wheat, rice, and corn, to farmers help adapt to conditions changing and continue feedina their communities.



Brookhaven National Laboratory Develops High-Yield Camelina Sativa for Enhanced Biofuel Production

Scientists Brookhaven at Laboratory National have created a new variety of Camelina sativa, an oilseed produces 21.4% crop, that more oil than regular camelina. They did this by gene-editing using technology called CRISPR/Cas9 to turn off a gene called TT8 in all six copies the plant's of chromosomes. This gene normally gives seeds their brown color and limits oil production. By removing it, the seeds turned yellow and produced more oil without affecting protein or starch levels.

This breakthrough could significantly increase oil production for biofuels and other bioproducts, which is important for sustainable energy and reducing carbon emissions. The new variety's traits are stable and can be passed down to future generations. This research could benefit farmers by increasing crop yields and profits, while also helping the biofuel industry and contributing to efforts to combat climate change.



New Cotton Quality Predictor: Boosting Farmer Profits and Climate Resilience

Scientists at Mississippi State University have developed a new tool to help cotton farmers predict and monitor the quality of their crops under changing environmental conditions. This "cotton quality module" works with an existing computer program called GOSSYM, which simulates cotton plant growth. The new module considers factors like temperature, rainfall, and soil nutrients to predict how these will affect cotton fiber quality. This is important because cotton quality directly impacts farmers' income. The tool, developed after more than a decade of research, can be used across 74 million acres of cotton fields worldwide and is freely accessible to farmers and researchers.

It can also help predict how climate change might affect cotton quality in the future, allowing farmers to adapt their practices and policymakers to make informed decisions. This significantly innovation could benefit the cotton industry by helping farmers maximize their crop quality and income, while also contributing to more sustainable farming practices in the face of climate change.



Whey to Gold: Swiss Scientists Pioneer Eco-Friendly E-Waste Recycling Technique

Scientists at ETH Zurich have developed an innovative method to extract gold from electronic waste using denatured whey proteins, a cheese-making byproduct. Their research, published in Advanced Materials, demonstrates how a whey protein sponge can recover gold ions from e-waste. In their experiment, the team extracted approximately 450 milligrams of 22-karat gold from 20 computer motherboards by placing the whey sponge in a metal ion solution and then heating it. This breakthrough offers a more sustainable approach to recycling e-waste, which the World Health Organization identifies as the fastest-growing waste stream globally, with over 59 million tons generated in 2019.

The new technique addresses the environmental and health concerns associated with improper ewaste disposal, which often releases toxic substances like lead and mercury into the environment, while also providing a solution to the challenge of balancing technological advancement with public health protection



New Catalyst discovered to overcomes Sulfur Contamination to Boost Carbon Capture Efficiency

Researchers have developed a new catalyst that significantly enhances carbon capture efficiency by overcoming the detrimental effects of sulfur, a common contaminant in industrial processes. Detailed in the journal "Nature Communications," the new catalyst maintains its activity and stability in the presence of sulfur, deactivates which typically conventional catalysts. This innovation enables more effective capture and conversion of carbon dioxide, contributing to efforts to reduce greenhouse gas emissions.

By improving the robustness and longevity of carbon capture systems, this advancement supports environmental sustainability and helps industries meet regulatory standards, offering substantial benefits for public health and the fight against climate change.



UIC Engineers Innovate Hydrogen Production from Solar Power and Agricultural Waste for Enhanced Efficiency and Sustainability

Researchers at the University of Illinois Chicago have developed a groundbreaking method for producing hydrogen gas from water using solar power and agricultural waste like manure and husks. Led by UIC engineer Meenesh Singh, the team's process significantly reduces the energy required for hydrogen extraction by up to 600%. By utilizing biochar—a carbon-rich substance derived from biomass—the method lowers the voltage needed for electrolysis to a mere fraction, about 0.2 volts with the best-performing biochar (cow dung). This innovation not only enhances hydrogen production efficiency, with up to 35% conversion efficiency.

This efficiency allows the process to be powered by a single silicon solar cell, potentially enabling widespread adoption in decentralized energy production. Beyond hydrogen production, the process can capture and utilize carbon dioxide emissions, offering environmental and economic benefits by diversifying waste utilization and supporting sustainable chemical production. This innovation not only promises to enhance energy self-sufficiency for farmers but also opens avenues for cleaner industrial practices, illustrating its potential for both public welfare and industry advancement.

Wireless Light Device Enhances Precision in Cancer Treatment

Researchers have developed a pioneering wireless device that uses light to treat cancer, offering a minimally invasive and highly targeted therapeutic approach. Detailed in "Nature Biomedical Engineering," this flexible, battery-free implant emits therapeutic light directly to tumor sites, activated and controlled wirelessly. The device significantly enhances the precision and effectiveness of photodynamic therapy (PDT), reducing damage to surrounding healthy tissues.

This breakthrough has the potential to improve cancer treatment outcomes, reduce side effects, and increase patient comfort by eliminating the need for cumbersome wires and external power sources. By advancing PDT technology, this innovation supports public health by providing a more efficient and patient-friendly cancer treatment option.





Cambridge Scientists Develop Comprehensive Protein Atlas to Unveil Disease Mechanisms and Enhance Targeted Therapies

Scientists at the University of Cambridge have created a comprehensive protein atlas that maps the intricate connections between proteins and health, uncovering how these interactions influence various diseases. Published in the journal "Nature," this atlas identifies thousands of protein interactions and their roles in conditions such as cancer, diabetes, and heart disease. By leveraging advanced computational methods and large-scale data analysis, the researchers have provided valuable insights into the molecular mechanisms underlying these diseases.

This resource holds significant potential for developing targeted therapies and personalized medicine, enabling more precise and effective treatments. The protein atlas can guide future research and improve our understanding of disease progression, ultimately benefiting public health and advancing medical science.



AI-Powered Tool Achieves High Accuracy in Early Detection of Diabetic Retinopathy, Preventing Vision Loss

Researchers have developed a novel AI-powered tool to detect diabetic retinopathy with high accuracy, offering a significant advancement in preventing vision loss. This tool employs deep learning algorithms to analyze retinal images and identify signs of the disease at its early stages. The study, published in the journal "Ophthalmology Science," reports that the AI system achieved over 90% sensitivity and specificity, outperforming traditional diagnostic methods. This breakthrough has the potential to improve screening programs, especially in underserved areas, by providing a cost-effective and scalable solution.

By enabling early detection and timely treatment, the tool can help prevent blindness in millions of diabetic patients, enhancing public health and reducing healthcare costs.



UTEP Study discover That Toxic Compounds in Everyday Products Are Disrupting Vital Human Proteins

PFAS, or per- and polyfluoroalkyl substances, are man-made chemicals used in many everyday products like non-stick cookware, water-resistant clothing, food packaging, and firefighting foam. They're called "forever chemicals" because they don't break down easily in the environment. Researchers at the University of Texas at El Paso (UTEP) discovered that these PFAS, along with nano plastics, can change important proteins in breast milk, infant formula, and muscles. They studied three proteins: beta-lactoglobulin (in cow's milk), alpha-lactalbumin (in human breast milk), and myoglobin (in blood and muscles). The study found that these chemicals can make these proteins work differently, which could cause problems for babies' growth and health. For example, it might affect how babies absorb vitamins and oxygen. The researchers also saw that these chemicals can make worms move less, similar to a chemical that causes Parkinson's disease.

This research is important for public health because it shows we need to be careful about these widely used chemicals in our environment and products. It could lead to new rules about using plastics and PFAS, and might push companies to make safer alternatives for everyday items like cookware and clothing.



Karolinska Institutet Study Confirms No Increased Thyroid Cancer Risk from GLP-1 Analog Medications

A comprehensive study by Karolinska Institutet, published in The BMJ, has found no evidence linking GLP-1 analog medications to an increased risk of thyroid cancer. The research analyzed data from over 435,000 patients across Denmark, Norway, and Sweden, comparing 145,000 GLP-1 analog users (mainly liraglutide or semaglutide) with 290,000 patients on other diabetes treatments over an average follow-up period of nearly four years. The good news is they found no sign that GLP-1 drugs increase the risk of thyroid cancer. This is important because lots of people use these medicines for diabetes and obesity, and there were worries about cancer risk before.

The study helps show these drugs are safe, which is great for patients and doctors. It also helps drug companies know their products aren't causing this particular problem. Overall, this research makes everyone feel more confident about using these helpful medications.



ISRO's First Detailed Undersea Map of Ram Setu Unveils Historical and Geological Insights

ISRO scientists have successfully created the first detailed undersea map of Ram Setu, also known as Adam's Bridge, using advanced sonar technology and satellite data. This mapping project, which involved collaboration with various research institutions, reveals the submerged structure connecting India and Sri Lanka.

The findings provide insights into the geological and historical significance of Ram Setu, offering evidence that may contribute to ongoing debates about its origin and age. This undersea mapping not only aids in scientific research and heritage conservation but also has potential implications for coastal management and disaster mitigation, benefiting both public understanding and environmental planning.

Potential Lunar Base: Deep Moon Pit May Lead to Protective Cave for Astronauts

Researchers have developed a pioneering wireless device that uses light to treat cancer, offering a minimally invasive and highly targeted therapeutic approach. Detailed in "Nature Biomedical Engineering," this flexible, battery-free implant emits therapeutic light directly to tumor sites, activated and controlled wirelessly. The device significantly enhances the precision and effectiveness of photodynamic therapy (PDT), reducing damage to surrounding healthy tissues.

This breakthrough has the potential to improve cancer treatment outcomes, reduce side effects, and increase patient comfort by eliminating the need for cumbersome wires and external power sources. By advancing PDT technology, this innovation supports public health by providing a more efficient and patient-friendly cancer treatment option.





Proposal to Redefine Planetary Criteria Aims to Expand Classification Beyond Our Solar System

A proposal to redefine the scientific definition of a planet aims to extend beyond our solar system, challenging the current criteria set by the International Astronomical Union (IAU) since 2006. The existing definition restricts planets to objects orbiting our sun and requires them to clear their orbital path of other debris. However, the new proposal, to be presented at the IAU General Assembly in August 2024 by UCLA professor Jean-Luc Margot, team suggests defining a planet as a celestial body orbiting any star, brown dwarf, or stellar remnant, with a mass between 10^23 kg and 13 Jupiter masses. This quantitative approach aims to clarify the criteria for planetary status, focusing primarily on mass as a measurable attribute, which could simplify classification and stimulate further research into planetary diversity across the universe.

By redefining planets to encompass a broader range of celestial bodies, the proposal seeks to enhance scientific understanding and engagement while potentially influencing future astronomical research and public perception of celestial objects beyond our solar system.

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